The Great Grid Upgrade

Sea Link

Sea Link

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Appendix A 1LVIA9 Natural Beauty Indicators and their Sub-Factors

Table A.1 Natural beauty indicators and their sub-factors

Natural Beauty Indicator Sub-Factor	Effects arising from Suffolk Onshore Scheme	Effects Reported in the LVIA (Application Document 6.3.2.1.C ES Appendix 2.1.C Landscape Designation and Landscape Character Assessment [APP-097])
Landscape Quality		
Intactness of the landscape in visual, functional and ecological perspectives	The construction of the Proposed Project would temporarily impact 7.61 ha of acid grassland within the Suffolk & Essex Coast & Heaths Area of Outstanding Natural Beauty (SECHAONB), along with limited (less than 0.1 ha) boundary features including species poor hedgerows and scattered trees (refer to section 2.2 of **Application Document 9.47 National Landscape Section 85 Duty Technical Note [REP1-120]**). At operation (and maintenance), the acid grassland would be reinstated along with boundary hedgerow features, noting that the acid grassland reinstatement would take comparatively longer to establish compared with other impacted land uses such as arable farmland. The temporarily affected areas of acid grassland lie within a wider area of existing acid grassland habitat outside of the Order Limits which in turn is surrounded by a combination of land uses including Aldeburgh golf course, arable land, residential properties, the Sandlings SPA and North Warren RSPB Reserve. The temporarily affected areas of acid grassland would therefore be within a landscape context where the juxtaposition and intactness of elements would remain during both the construction and operational (and maintenance) phases. Furthermore, a proportion (4.05 ha) of the reinstated areas of acid grassland would be restored to a higher quality than its current condition thereby improving the intactness of the landscape in visual, functional and ecological perspectives.	The conclusions reported within Table 2.1 of a small magnitude of effect on Landscape Quality at construction and operation (and maintenance) remain justified.
The condition of the landscape's features and elements	Whilst a 7.61 ha area of acid grassland would be temporarily affected the strong overall character and condition of the landscape's features and elements would not be altered during the construction period. At operation (and maintenance) the condition of the acid grassland would be improved following reinstatement measures with an additional 6 ha area of increased quality acid grassland compared with the baseline. For the duration of the enhancement there would be a net increase in good quality acid grassland including potentially improved botanical diversity, reduction in invasive species presence, improve habitat structure for wildlife such as reptiles, invertebrates and birds.	
The influence of incongruous features or elements (whether man-made or natural) on the perceived natural beauty of the area	This sub-factor relates predominantly to operational built form rather than temporary construction compounds. The construction works within the SECHAONB associated with the landfall are not considered to be incongruous due to the siting amongst a backcloth of woodland and a location close to the B1122. The other remaining parts of the construction works influencing the SECHAONB directly and indirectly, including laying of the HVDC cable and the cable laying barge out at sea, are also not considered to be incongruous given the existing context of occasional large-scale marine vessels out at sea and similarities to agricultural machinery movements which are a typical characteristic of the agricultural aspects of the landscape. There would be no operational (and maintenance) built form within the SECHAONB or in a location that would have the potential to affect the setting of the SECHAONB.	
Scenic Quality		

Natural Beauty Indicator Sub-Factor	Effects arising from Suffolk Onshore Scheme	Effects Reported in the LVIA (Application Document 6.3.2.1.C ES Appendix 2.1.C Landscape Designation and Landscape Character Assessment [APP-097])
A distinctive sense of place	The temporary impact of habitats within the construction period would not influence the juxtaposition of the semi-natural, cultural and built heritage features therefore retaining the distinctive sense of place. At operation (and maintenance), the areas would be reinstated and would continue to contribute to the distinctive sense of place. Additionally, the 6 ha of acid grassland enhancement would additionally contribute to defining the unique scenic character and semi-natural landscape.	Overall, the conclusions reported within Table 2.1 of a small magnitude of effect on Scenic Quality at construction and negligible magnitude of effect at operation (and maintenance) remain justified.
Striking landform	The striking landform and the strong sense of scale and contrast exemplified by the sea cliffs and shingle beaches contrasting with the flat and gently rolling heaths and farmlands would not be affected by the construction or operational (and maintenance) phases of the Proposed Project, including the opportunities for long distance and panoramic views across the SECHAONB and the open landscape between Aldeburgh and Thorpeness due to the proposed trenchless construction technique at the landfall. Furthermore the 'rhythm' of the landscape dictated by the east-west rivers and estuaries would be unaffected as the landfall and HVDC cable construction would reflect the east-west pattern rather than conflict with it.	
Visual interest in patterns of land cover	The areas of acid grassland temporarily impacted lie within a wider area of retained acid grassland habitat outside of the Order Limits in the immediate context of Aldeburgh golf course, arable land, residential properties, the Sandlings SPA and North Warren RSPB Reserve. The other limited vegetation removal, including hedgerow and trees are typical features present within the landscape. The visual interest in patterns of land cover would therefore remain during both the construction and operational (and maintenance) phases of the Suffolk Onshore Scheme. The perception of landscape change due to cable routeing through the SECHAONB would be minimised due to the layered vegetation pattern. This would be experienced within the surrounding predominantly flat to gently rolling heath and farmland landscape where elevated vantage points do not exist.	
Appeal to the senses	The aesthetic experience of the interrelationship of constituent features resulting in a juxtaposition of colour and texture is unlikely to be affected by the construction plant and activity as the shingle beach and adjacent heathland would not be impacted due to the trenchless construction technique. The construction corridor for the landfall and HVDC corridor would temporarily impact acid grassland which is set within areas of existing acid grassland, agricultural land and a golf course, thereby substantially limiting the potential for the close-knit interrelationship of constituent features in the SECHAONB to be affected. The open nature of views along the coast would remain unaffected with seaward views temporarily affected by the presence of the cable laying barge offshore, however, this would be seen within the context of other vessels at sea. Whilst the introduction of construction plant and activity associated with the landfall and HVDC corridor would effect some views, the extent of this change experienced would be limited due to the intervening layered network of vegetation, landform and built form. Large open vistas and views of landmarks including historic structures would not be affected by the construction or operation of the Proposed Project. Lighting associated with the Proposed Project is expected to be localised and limited to temporary periods during construction and is not considered to alter the dark skies of the SECHAONB. The sensory sounds may be influenced in localised areas where construction activities take place however mitigation measures would avoid any significant adverse effects. In some locations, these would be experienced in the context of local residential areas and road corridors including Leiston Road (B1122). At operation (and maintenance), the removal of small sections of boundary features would not affect the general enclosure of farmland as effects would be localised with reinstatement of these	

Natural Beauty Indicator Sub-Factor	Effects arising from Suffolk Onshore Scheme	Effects Reported in the LVIA (Application Document 6.3.2.1.C ES Appendix 2.1.C Landscape Designation and Landscape Character Assessment [APP-097])
	boundary features. Removal of trees and woodland has been avoided where possible as part of the routeing process. There would be no permanent lighting associated with the Proposed Project within the SECHAONB and whilst there would be limited lighting associated with the Saxmundham Converter Station it is not considered to alter the dark skies of the SECHAONB. The juxtaposition of colours and textures, spatial and emotional experiences, perception of landmark structures and quality of light/space would not be affected at construction or operation (and maintenance).	
Relative Wildness		
A sense of remoteness	Construction vehicles would temporarily increase traffic on existing routes and the construction of the Proposed Project would temporarily introduce elements of uncharacteristic machinery and noise into the SECHAONB and its setting. This would have a temporary and localised influence on the relatively undeveloped character of the Suffolk coast, albeit within the immediate context of Leiston Road (B1122), Aldeburgh golf course and residential areas on the edge of Aldeburgh. These areas are not associated with the parts of the SECHAONB which are perceived as being distant from significant habitation. At operation (and maintenance), the maintenance vehicles would not have an influence on the sense of remoteness.	Overall, the conclusions reported within Table 2.1 of a small magnitude of effect on Relative Wildness at construction and none for magnitude of effect at operation (and maintenance) remain justified.
A relative lack of human influence	The extensive areas of semi-natural habitats, identified as the Sandlings heaths, marshes, reedbeds, estuaries and along the coastline would not be affected by the Proposed Project as the trenchless construction technique would avoid directly impacting them. The construction of the Proposed Project would temporarily affect small areas of acid grassland within the SECHAONB which would be fully reinstated once construction is complete. These areas are already influenced by the presence of the Leiston Road (B1122) and proximity to the urban edge of Aldeburgh. The Proposed Project would not introduce any permanent built features in the SECHAONB or in its setting.	
A sense of openness and exposure	The big ‘Suffolk Skies’ and expansive views offshore would remain unaffected due to the trenchless construction across the exposed coastline and adjacent heath. The sense of openness and exposure would not therefore be affected by the Proposed Development.	
A sense of enclosure and isolation	The sense of enclosure and isolation is typically created by the forestry plantations contrasting with the exposed areas along the coast and on the Sandlings Heath. Such areas would not be affected by the Proposed Project and the removal of small sections of boundary features along the HVDC cable corridor would not affect the mixture of enclosure and isolation present within the SECHAONB. At operation (and maintenance), the land and boundary hedgerow features would be reinstated and the mixture of openness and enclosure would continue to be unaffected.	
A sense of the passing of time and a return to nature	The land temporarily affected by the landfall works and HVDC cable laying within the SECHAONB would be in close proximity to the edge of Aldeburgh and golf course. It therefore, would have a very limited influence on the areas of the SECHAONB where there is little evidence of apparent human activity. At operation (and maintenance), the presence of maintenance vehicles would not be dissimilar to the present vehicle activity in this part of the SECHAONB therefore not influencing the sense of the passing of time and a return to nature.	
Relative Tranquillity		
Contributors to tranquillity	The construction of the Proposed Project would impact a small area of semi natural habitat and would temporarily introduce elements of uncharacteristic machinery and traffic along local roads in	Overall, the conclusions reported within Table 2.1 of a small magnitude of effect on

Natural Beauty Indicator Sub-Factor	Effects arising from Suffolk Onshore Scheme	Effects Reported in the LVIA (Application Document 6.3.2.1.C ES Appendix 2.1.C Landscape Designation and Landscape Character Assessment [APP-097])
	the SECHAONB and its setting. Lighting associated with the Proposed Project is expected to be localised and limited to temporary periods during construction and is not considered to alter the dark skies of the AONB. This would all be within the context of human activity associated with the adjacent residential areas on the edge of Aldeburgh, Leiston Road (B1122) and the golf course which would lessen the influence on the perception of tranquillity. The occasional maintenance access within the SECHAONB would have minimal effects on tranquillity due to limited influence on any of the contributors or detractors of tranquillity and given the existing presence of vehicles present in the local road network within this part of the SECHAONB.	Relative Tranquillity at construction and negligible magnitude of effect at operation (and maintenance) remain justified.
Detractors from tranquillity	See above in relation to effects on detractors from tranquillity.	
Natural Heritage Features		
Geological and geo-morphological features	The Proposed Project would not affect the geological or geo-morphological features that contribute to a sense of place and other aspects of scenic quality within the SECHAONB at any of the project stages.	Overall, the conclusions reported within Table 2.1 of a small magnitude of effect on Natural Heritage features at construction and at operation (and maintenance) remain justified.
Wildlife and habitats	The mosaic of designated habitats (Sandlings SSSI and SPA) would not be directly affected by the construction activity of the Proposed Project due to the trenchless construction technique. The construction of the Proposed Project would include the temporary removal of small sections of boundary vegetation and 7.61 ha of acid grassland which would be temporarily affected by the landfall compound and HVDC cable corridor, noting that only 0.3 ha of this is priority habitat acid grassland. This entire area would be fully reinstated along with the enhancement of a further 6 ha of acid grassland to an improved quality. Although tree loss has been avoided where possible as part of the routeing process, a small number of trees would be permanently lost. The coastline vegetation, including the vegetated shingle, would be unaffected by the Proposed Project. Due to the localised nature of the effects and context of similar habitats in the local vicinity, this impact would result in a limited influence on sense of place and other aspects of scenic quality. Further information on potential effects to natural heritage should be referred to within **Application Document 6.2.2.2 Part 2 Suffolk Chapter 2 Ecology and Biodiversity [REP1-047]**.	
Cultural Heritage		
Built environment, archaeology and designed landscapes	The Proposed Project would not affect the built environment, archaeology and designed landscapes that contribute to sense of place and other aspects of scenic quality within the SECHAONB at any of the project stages. Further information on potential effects to cultural heritage are provided within **Application Document 6.2.2.3 Part 2 Suffolk Chapter 3 Cultural Heritage [APP-050]**.	Overall, the conclusions reported within Table 2.1 of a negligible magnitude of effect on Cultural Heritage at construction and at operation (and maintenance) remain justified.
Historic influence on the landscape	The construction of the Proposed Project would temporarily impact agricultural land and habitats within the SECHAONB. At operation (and maintenance), the temporarily affected areas would be reinstated and would not affect the overall diversity of habitat types and therefore the influence of time depth or historic influence across the SECHAONB. Further information on potential effects to cultural heritage are provided within **Application Document 6.2.2.3 Part 2 Suffolk Chapter 3 Cultural Heritage [APP-050]**.	
Characteristic land management practices	Whilst the construction of the Proposed Project would temporarily impact agricultural land and habitats within the SECHAONB, these are not considered to be reflective of the parts of the SECHAONB landscape which exhibit historic land management practices such as grazing on the coastal marshes, forestry, extensive grazing to maintain heathland, reed cutting or fishing. At	

Natural Beauty Indicator Sub-Factor	Effects arising from Suffolk Onshore Scheme	Effects Reported in the LVIA (Application Document 6.3.2.1.C ES Appendix 2.1.C Landscape Designation and Landscape Character Assessment [APP-097])
	operation (and maintenance), the temporarily affected areas would be reinstated. Further information on potential effects to cultural heritage are provided within **Application Document 6.2.2.3 Part 2 Suffolk Chapter 3 Cultural Heritage [APP-050]**.	
Associations with written descriptions	The Proposed Project would temporarily impact agricultural land and acid grassland within the SECHAONB which is considered to have a limited and temporary effect on the perception of the landscape in terms of features and qualities and would therefore have very limited effect on any written descriptions at all project stages. Further information on potential effects to cultural heritage are provided within **Application Document 6.2.2.3 Part 2 Suffolk Chapter 3 Cultural Heritage [APP-050]**.	
Associations with artistic representations	The Proposed Project would temporarily impact agricultural land and acid grassland within the SECHAONB which is considered to have a limited and temporary effect on the perception of the landscape in terms of features and qualities and would therefore have very limited effect on any artistic representations at all project stages. This would include the works of J.M.W Turner relating to the landscape between Aldeburgh and Thorpeness which would not be affected due to the proposed trenchless technique at the landfall. Further information on potential effects to cultural heritage are provided within **Application Document 6.2.2.3 Part 2 Suffolk Chapter 3 Cultural Heritage [APP-050]**.	
Associations of the landscape with people, places or events	The Proposed Project would temporarily impact agricultural land and acid grassland within the SECHAONB which is considered to have a limited and temporary effect on the perception of the landscape in terms of features and qualities and would therefore have very limited effect on associations of the landscape with people, places or events at all project stages. Further information on potential effects to cultural heritage are provided within **Application Document 6.2.2.3 Part 2 Suffolk Chapter 3 Cultural Heritage [APP-050]**.	

Appendix B 1LVIA12 - Winter Year 15 Visualisation for Viewpoint 8 (a) - Public Bridleway (Friston 260, route 2), East of Friston, Looking Northwest



Note: Images to be viewed at a comfortable arm's length.

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Visualisation Type:	3	Camera:	Canon EOS 5D MkIV	Eye level:	15.7m
Projection:	Cylindrical	Lens:	Sigma 50mm f/1.4 DG HSM	Height of Camera:	1.6m
Enlargement Factor:	96%	Horizontal Field of View:	90°		
Paper Size:	A1	Direction of View:	North West		
Date / Time:	06/04/2024, 12:34	Location:	E641641 N260508		

Sea Link Suffolk Onshore Scheme
Appendix B 1LVIA12 Winter Year 15 Visualisation for Viewpoint 8 (a): Public Bridleway (Friston 260, route 2), east of Friston, looking northwest

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Visualisation Type:	3	Camera:	Canon EOS 5D MkIV	Eye level:	15.7m	**Note**:	
Projection:	Cylindrical	Lens:	Sigma 50mm f/1.4 DG HSM	Height of Camera:	1.6m	The block photomontage shows the maximum parameters for the Proposed Development. The block photomontage shows two new pylons and the removal of one pylon under Friston Scenario 2. No visualisation has been prepared for Friston Scenario 1 as no new infrastructure would be present.	
Enlargement Factor:	96%	Horizontal Field of View:	90°				
Paper Size:	A1	Direction of View:	North West				
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Sea Link Suffolk Onshore Scheme
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Sea Link Suffolk Onshore Scheme

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Appendix C 1GEN11 - Comparison tables between the DCOs for East Anglia One North, East Anglia Two and Sea Link

C.1 Introduction

C.1.1 The below tables provide a comparison between the requirements in the made DCOs for East Anglia One North (EA1N) and East Anglia Two (EA2); and the draft DCO for Sea Link at Friston substation as requested by the Examining Authority's written question 1GEN11. At Friston substation EA1N and EA2 are describing the same development and no differences were identified between the wording of the two DCOs in the text included in the tables. Therefore, the text of these DCOs has been combined and referred to collectively as SPRs DCOs. The final made DCOs for the two projects are the East Anglia ONE North Offshore Wind Farm Order 2022 and the East Anglia TWO Offshore Wind Farm Order 2022. Friston substation is also referred to as the 'National Grid Substation' in the SPR DCOs.

C.1.2 Work number 38, including three cable sealing end compounds, were included in the SPR DCOs associated with Friston substation but are not required, so are not included in the DCO for Sea Link.

C.1.3 The DCO for Sea Link is in its draft form and being regularly updated in response to representations and discussions with Interested Parties. For Sea Link provisions are taken from Application Document 3.1(E) (Version 2, Change Request) draft Development Consent Order **[CR1-027]** unless otherwise specified. A revised draft DCO has been submitted at Deadline 3 alongside this Appendix and should be referred to as the latest version.

C.2 Proposed Works Comparison Table

C.2.1 To aid interpretation of the two DCOs and the other comparisons, the table below specifies the works for the SPR DCOs and the Sea Link DCO relevant to Friston substation. The SPR DCOs contain 43 numbered works. Sea Link draft DCO contains 17 numbered works and are often not directly equivalent to those in the SPR DCOs due to differences in the style and structure of the DCOs. In the below table, the works descriptions are in italics and any commentary added by National Grid to aid understanding is included in standard text.

Table C.1 Proposed Works Comparison Table

Work	SPR Work Description	Sea Link Work Description
Friston substation and internal road access to connect to main access	*Work No. 41 — a new national grid substation to the north west of Work No. 30 at Grove Wood, Friston and extension of permanent access comprised within Work No. 34.*	*Work No. 1B – new Substation at Grove Wood, Friston, Suffolk Works as shown on Sheet 2 of the Work Plans – Suffolk comprising a Substation at Grove Wood, Friston, which may include — (a) access road including junction from the B1121 and culverts; (b) site clearance and preparation and establishment; (c) temporary work areas and laydown areas associated with the installation of the works; (d) earthworks including to create platforms for the new Substation equipment, structures, landscaping, roads and compounds; (e) foundations to support all new structures and equipment; (f) support structures; (g) electrical equipment; (h) gantries; (i) equipment between gantries and switchgear; (j) switchgear and associated equipment; (k) electrical control panels; (l) standby back-up diesel generator(s); (m) troughs and below ground services; (n) earth mat; (o) substation building(s); (p) underground electric cables and fibre optic cables and cable ducts; (q) relay rooms, battery rooms, storage rooms and other welfare facilities; (r) electric vehicle charging points; (s) telecommunications equipment; (t) water tanks; (u) drainage works; (v) other site furniture; (w) security perimeter fence including security gates; (x) site access roads, hardstanding, car parking, footways and roadways; (y) utility service connections for electricity, telecommunications and potable water and/or connection of power supply made from temporary generators; (z) utility service connection for on-site storage for later disposal of grey water and sanitation; (aa) lighting masts and lighting columns; and (bb) landscaping, including mitigation planting.*

Work	SPR Work Description	Sea Link Work Description
Access from the B1121	*Work No. 34 — formation of a new permanent access road from the B1121 north of Kiln Lane to the onshore substation and national grid substation including vegetation clearance on the eastern side of the road. Highway modifications and traffic management measures.*[1]	Included in Work No. 1B for Sea Link
Permanent works to existing overhead line to north west of Friston substation	*Work No. 39 — replacement, upgrade and realignment works to the overhead line pylons in the vicinity of Work No. 38 together with up to one new additional overhead line pylon to the north west of the national grid substation comprised within Work No. 41.*	*Work No. 1A – Suffolk Overhead Electric Line Works* *Works as shown on Sheets 2 and 3 of the Work Plans – Suffolk comprising removal of and modification to existing overhead electric lines and installation of new overhead electric line — (a) removal of and modification works to existing overhead electric lines; (b) foundations and steel work to construct new pylons; and (c) installation of overhead electric line.*
Cable sealing end compounds	*Work No. 38 — up to three cable sealing end compounds, one of which may include circuit breakers, comprising an electrical compound with electrical equipment and overhead line gantries to allow the connection of Work No. 41 to the overhead lines comprised within Work No. 39 together with cables connecting the national grid substation to the cable sealing ends, extension of the permanent access comprised within Work No. 34 and works to the overhead line pylons.*	N/A not included in application. These were originally proposed as part of the works to connect Friston substation to the national grid but are no longer required.
Temporary works to existing overhead line	*Work No. 40 — temporary realignment works to the overhead line pylons in the vicinity of Work No. 38.*	Works included in Work No. 1A for the overhead line realignment, although the works proposed for Sea Link are reduced compared to those proposed by SPR because there is no need to re-align the overhead circuits on the adjacent line due to the cable sealing end compounds not being included in the application.
Landscaping, drainage, footpaths and access at the site north of Friston	*Work No. 33 — landscaping works including bunding and planting together with drainage works, sustainable drainage system ponds, surface water management systems, formation of footpaths and access.*	These works are split over the below works for Sea Link. In the Sea Link DCO the below work numbers apply across the project rather than just at the site of Friston substation. *Work No. 13 – Principal Drainage Works* *Work No. 15 – Principal Environmental Mitigation and Landscaping Environmental mitigation includes works identified in the Environmental Statement and/or the management plans listed in Schedule 3, Requirement 6, which may include — (a) ecological mitigation and enhancement; and (b) landscaping mitigation and enhancement.* *Work No. 17 – Principal Public Right of Way Diversion*
Construction compound and access for Friston substation	*Work No. 42 — temporary construction consolidation sites, access and extension of permanent access comprised within Work No. 34.*	Temporary construction sites are included in Work No. 4 for Sea Link, although the works descriptions are not the same as Works 42 and 43 in the SPR DCOs and access to Friston substation is within 1B rather than being split across two works. *Work No. 4 – Suffolk temporary work compounds Works associated with No.1A, Work No.1B, Work No.2, Work No. 3A, Work No. 3B Work No.5 and Work No.6 shown on Sheets 1, 2, 3, 4 and 5 of the Works Plans – Suffolk, which may include — (a) site clearance, preparation and establishment; (b) earthworks, soil stripping and storage, ground improvement; (c) car parking, hard standing, roadways and access roads (including construction site services and temporary bridges and/or culverts); (d) drainage works (e) office and staff welfare facilities; (f) utility service connections for electricity, communications and potable water and/or connection of power supply made from temporary generators; (g) utility service connection or on site storage for later disposal of grey water and sanitation; (h) emergency electrical generator; (i) materials, tools and fuel storage and laydown areas; (j) assembly areas; (k) plant and equipment storage areas; (l) wheel cleaning facilities; (m) security cabin and fencing and gates; (n) construction and security lighting; and (o) construction waste management facilities.*
Temporary working areas	*Work No. 43 — temporary working areas for the purposes of constructing Work Nos. 39 and 40 including access.*	

C.3 Comparison between Requirements in the SPR and Sea Link DCOs

C.3.1 A comparison between the requirements of the three DCOs is provided in the table below. This comparison should be read alongside the response to question 1GEN11. Text that is directly quoted from the DCOs is in italics and commentary in standard text.

Table C.2 Proposed Works Comparison Table

Topic	SPR DCO Text	Sea Link DCO	Explanation for differences
Time limits	1. *The authorised project must commence no later than the expiration of five years beginning with the date this Order comes into force.*	*2.—(1) The authorised development must be commenced within five years of the date of this Order.* *(2) If any proceedings are begun to challenge that validity of this Order, the period specified in sub-paragraph (1) is extended by a period equivalent to the period beginning with the day the application to challenge is made and ending on the day it is withdrawn or finally determined. (3) An application is not finally determined for the purposes of sub-paragraph (2) if any appeal in respect of the application— (a) could be brought (ignoring any possibility of an appeal out of time with permission), or (b) has been made and not withdrawn or finally determined.*	The timescale for the projects is the same. The Sea Link DCO clarifies within the equivalent requirement that the DCO does not expire where the project is subject to challenge or appeal. This is important to ensure that a critical infrastructure project is not prevented from proceeding by virtue of challenges that may not ultimately be successful but can take time to resolve.
Stages of authorised development onshore	***Stages of authorised development onshore*** *11.—(1) The transmission works may not be commenced until a written scheme setting out the stages of the transmission works has been submitted to, and approved by, the relevant planning authority.* *(2) The grid connection works may not be commenced until a written scheme setting out the stages of the grid connection works has been submitted to, and approved by, the relevant planning authority.* *(3) Any amendments to the approved written schemes must be submitted to, and approved by, the relevant planning authority.* *(4) The written schemes specified in sub-paragraphs (1) and (2) must be implemented as approved. The approved details shall be taken to include any amendments that may subsequently be approved in accordance with sub-paragraph (3).*	***Stages of the Authorised Development*** *4.—(1) Unless otherwise agreed with the relevant planning authority, written notice setting out the anticipated programme for the carrying out of pre-commencement operations must be given to the relevant planning authority no less than seven days prior to the date on which those pre-commencement operations are first carried out.* *(2) The authorised development may not commence until a written scheme setting out all stages of the authorised development has been submitted to the relevant planning authority.* *(3) Any revisions to the written scheme referred to in sub-paragraph 4(2) above must be submitted to the relevant planning authority in advance of the commencement of the stage of the authorised development to which the revisions relate.* *(4) Written notice of the completion of construction for each stage of the authorised development, and the operational use of that part of the authorised development, must be given to the relevant planning authority within 28 days of the relevant event being completed.* *(5) The authorised development must be carried out in accordance with the written scheme submitted further to sub-paragraphs (2) or (3).*	The SPR DCOs and Sea Link all require the applicant to submit the project programme to the relevant planning authority prior to those works starting. The Sea Link DCO additionally includes requirements to submit written notice for the completion of each stage, which is not required in the SPR DCOs, but is considered to deliver beneficial further information to the relevant planning authorities. The SPR DCO states that the relevant planning authority should also 'approve' the programme, whereas the Sea Link DCO does not. It is not considered appropriate or necessary for the project programme to be approved by the relevant planning authority for Sea Link. This approach aligns with both the recent BTNO and Yorkshire GREEN NGET DCOs. The construction programme for Sea Link will be developed by contractors appointed to deliver different aspects of the Proposed Project and managed overall by National Grid. Decisions required to develop the programme such as the order of activities, duration and extent to which activities can occur simultaneously are within the expertise of National Grid and its contractors to make. Construction activities are very tightly controlled across the project by commitments related to factors such seasonal restrictions adding further complexity to programme development. Development of a construction

Topic	SPR DCO Text	Sea Link DCO	Explanation for differences
			programme for a predominantly offshore, complex transmission project is not considered to be an area of expertise for the relevant planning authorities. Where an element of the programme may result in significant environmental effects, this timing and activity is either already tightly controlled in the DCO control documents (e.g. seasonal ecological restrictions) or the relevant planning authority will have approval of measures through the approval of the management plans under requirement 6 (e.g. approving diversions and closures in the Public Right of Way Management Plan). It is considered appropriate for the control to be over the element that may lead to an environmental effect rather than over the programme itself both because this focuses on what is necessary and appropriate; but also because it then provides relevant planning authorities with approval over areas that they have expertise (e.g. landscaping) rather than those they do not (i.e. construction programmes for large scale offshore transmission projects). Construction programmes will also evolve as projects progress depending on factors such as component supply chains, weather and unexpected site factors such as ground conditions or a change to ecology on site. Flexibility is required to respond to all these factors. Therefore, it is considered necessary for there to be a relatively straight-forward way to update programmes; this flexibility is provided in the Sea Link DCO requirement 4 but not in the SPR DCOs. The Sea Link approach is considered best practice. Finally, Sea Link is an urgent, critical national infrastructure project and the programme is particularly important. Introducing additional timescales for the approval of details that are not necessary on a critical project would be contrary to the Government's aims for the accelerated delivery of major transmission projects, decarbonisation of the grid, reducing energy bills and securing energy supplies.
Detailed design parameters onshore	**Detailed design parameters onshore** *12…* *— (3) No stage of the national grid substation comprised within Work No. 41 may commence until details of the layout, scale and external appearance of the national grid substation have been submitted to and approved by the relevant planning authority in*	The majority of controls in this requirement are not included in the requirements section of the draft DCO in the way they are for SPR, therefore other sections of the DCO or control documents are referenced where appropriate. See also Application Document 9.24 Friston Substation Update Letter **[AS-148]**.	(3) and (5) the equivalent provision for Sea Link requires compliance with design principles but does not provide the power for the local planning authority to approve the design of the substation. This is because elements of design which are necessary and appropriate for the relevant

Topic	SPR DCO Text	Sea Link DCO	Explanation for differences
	consultation with Suffolk County Council. Work No. 41 must be carried out in accordance with the approved details… *(5) Any details provided by the undertaker pursuant to sub-paragraphs (1), (2), (3) and (4) must accord with the substations design principles statement and be within the Order limits…* *(7) Buildings comprised within the national grid substation must not exceed—* *(a)where AIS substation arrangement is used, a height of 6 metres above finished ground level; and* *(b)where GIS substation arrangement is used, a height of 16 metres above finished ground level.* *(8) External electrical equipment comprised within the national grid substation must not exceed a height of 16 metres above finished ground level…* *(10) For the purposes of sub-paragraphs (6) to (9), 'finished ground level' will be defined in accordance with the substations design principles statement.* *(11) The maximum number of new additional overhead line pylons comprised within Work No. 39 must not exceed one and the maximum number of permanently relocated and/or reconstructed overhead line pylons comprised within Work No. 39 must not exceed three.* *(12) The maximum height of any additional, relocated or reconstructed overhead line pylons must not exceed 59.2 metres.* *(13) The width of the new permanent access road comprised within Work No. 34 must not exceed 7 metres…* *(15) The fenced compound area (excluding its accesses) for the national grid substation must not exceed—* *(a) where AIS substation arrangement is used, 44,950 m2; and* *(b) where GIS substation arrangement is used, 16,800 m2.* *(17) The total footprint of the construction consolidation sites comprised within the following works must not exceed the following—* *Work Total footprint of construction consolidation sites…* *Work No. 42 23,350 m^2…*	Equivalent to (3) and (5), commitment GG34 in **Application Document 9.84 Register of Environmental Actions and Commitments** (REAC) submitted at deadline 3: *Friston Substation described in Work No. 1B should be designed to be in general accordance with the Key Design Principles set out in Table 4.1 of the Design Principles – Suffolk (Application Document 7.12.1).* (7) (a): unnecessary as this option not included in Sea Link application (7) (b) and (8) Article 5. (3) table of parameters limits the height of Friston substation to *'16m above finished ground level (not including roof mounted equipment)'* (10) No equivalent provision. (11) These works are controlled by the description of Work No. 1A – Suffolk Overhead Electric Line Works and the limits of deviation for this work in the Works Plans. The description of works in the Sea Link Environmental Statement also matches this provision (see paragraphs 4.2.13, Table 4.1 and Table 4.2 in **[REP1A-003]**); see Application Document 9.24 Friston Substation Update Letter **[AS-148]** for further information. (12) Equivalent provision in Article 5 (1)(b) *'in respect of the pylons deviate vertically from the levels of the authorised project (being 53.2m above finished ground level in Suffolk and 51m above finished ground level in Kent)— (i) to any extent upwards not exceeding 6 metres; (ii) to such extent downwards as the undertaker considers necessary or convenient'.* (13) The area for the permanent access road is limited through the lines and situations for Work 1B in the Works Plans. (15)(a) not relevant. (b) No equivalent restriction in the draft DCO but the same area is assessed in the Environmental Statement, see paragraphs 4.2.10 and 4.2.22 in **[REP1A-003]**. (17) The area for the main temporary work compounds are limited by the lines and situations associated with Work No. 4 in the Sea Link Works Plans.	planning authority to approve are already controlled through the approval of the extensive list of management plans in Requirement 6 (e.g. landscaping, public rights of way). In contrast, it is not considered appropriate for the local planning authority to control the overall layout and design of the substation itself because equipment required has very little flexibility in terms of its appearance and the selection of equipment and layout would need to be driven by technical design and product availability. It is also not considered necessary for this to be approved by the relevant planning authority given the limits provided by the design parameters in the draft DCO, limits of deviation and relevant planning authority control over matters relevant to managing environmental effects. A comparison between the design principles referenced in SPRs requirement 12 and Sea Link commitment GG34 is provided in Table 2 of document 9.24 Friston Substation Update Letter **[AS-148]** so is not replicated here. The SPR Design Principles are primarily not about the design of the substations or the site, but about the design process. Therefore, differences in the design principles do not necessarily indicate any difference in the designs. Under Scenario 1, the works developed at Friston would be primarily underground or within an existing substation so would benefit very little from design principles. Under this scenario the majority of development on the site such as landscaping, drainage, public rights of way and other elements being already delivered under the SPR consents. Under Scenario 2, the project would utilise and develop the design developed by National Grid during 2025 with SPR, so there is likely to have already been significant consultation on the plans. The delivery of Friston substation under the SPR consents enables earlier delivery of this critical part of the network than would be possible if it is delivered under Sea Link. Therefore, in reality, if Scenario 2 occurs then the delivery of Friston substation is likely to be behind programme and there would be a particular need to ensure requirements and not imposed that may delay development unnecessarily. (7) and (8) no material differences between provisions.

Topic	SPR DCO Text	Sea Link DCO	Explanation for differences
			(10) Finished ground level - the Applicant has reviewed other made DCOs and this term is not commonly defined. The Applicant is of the view that the drafting is clear and that a definition is not required in the draft DCO or by reference to other documents. (11) and (12) no material differences between provisions (13) The internal access road location is limited by the lines and situations shown on the Works Plans. Whilst the width of the access road is not explicitly restricted, the design is additionally controlled through the provisions in the outline Construction Traffic Management Plan section 6.7 **[CR1-042]**, with the final plan approved by the relevant planning authority, in this case Suffolk County Council (SCC) under requirement 6. The design of the access to the highway at the B1121 is also controlled through requirement 12, which requires that the design is also submitted and approved by the relevant planning authority (SCC). Measures to manage any impacts of the highway, such as due to flood risk, are also controlled by the relevant management plans in requirement 6, which are also approved by the relevant planning authority. It should be noted that tightly constraining the width of the access road can be problematic when a final alignment is developed due to additional areas being required, for example, at bends in the road. The design of the internal access road at this location will need to respond to development on the site being progressed under at least three, if not four, consents so flexibility is required here. (15) It is not considered necessary to specify this restriction although in practice the same design is being progressed by National Grid under both consents to this maximum area. (17) The area is considered to be sufficiently defined by the Works Plans without a restriction on the footprint of the temporary compound.
Landscaping	***Provision of landscaping*** ***14.***—*(1) No stage of the onshore works may commence until for that stage a written landscape management plan and associated work programme (which accords with the outline landscape and ecological management strategy and includes details of the ongoing maintenance and management of the landscaping works) has been submitted to and approved by the relevant planning authority.*	***Construction Management Plans to be Approved*** *6.—(1) No stage of the authorised development may commence until, for that stage, the following plans as relevant to that stage have been submitted to and approved by the relevant planning authority or other discharging authority as may be appropriate to the relevant plan, scheme or strategy concerned—…*	No material differences in the requirements. Any advance planting works would be detailed in the final LEMP for Sea Link and, as a matter of course, it would include a maintenance and management schedule.

Topic	SPR DCO Text	Sea Link DCO	Explanation for differences
	(2) The written landscape management plan(s) and associated work programme(s) must be implemented as approved.	*(f) Landscape and Ecological Management Plan (LEMP) – Suffolk (which must be substantially in accordance with the Outline LEMP – Suffolk)* *(2) The construction works for each stage of the authorised development and mitigation works to minimise the impact of construction must be carried out in accordance with the relevant stage of the approved plans, schemes and strategies referred to in sub-paragraph (1) or with any amended plans, schemes or strategies that may subsequently be approved by the relevant planning authority or other discharging authority as may be appropriate to the relevant plan, scheme or strategy concerned.*	
	Implementation and maintenance of landscaping *15.—(1) All landscaping works must be carried out and maintained in accordance with the landscape management plan(s) approved under requirement 14 (provision of landscaping), and in accordance with the relevant recommendations of appropriate British Standards.* *(2) Any tree or shrub planted as part of an approved landscape management plan that, within a period of five years (save in relation to Work Nos. 19, 24, 29 and 33, for which the relevant period is ten years) after planting, is removed, dies or becomes, in the opinion of the relevant planning authority, seriously damaged or diseased must be replaced in the first available planting season with a specimen of the same species and size as that originally planted unless alternative timing or a different specimen is otherwise approved by the relevant planning authority.*	15(1) see 6(2) above. 15(2) see paragraph 6.2.1 of Application Document 7.5.7.1 (B) Outline Landscape and Ecological Management Plan – Suffolk **[CR1-045],** which is in turn secured by Requirement 6. ***Management Periods*** *6.2.1 All planting associated with the reinstatement of the landfall and HVDC and HVAC corridors will be maintained for a five-year period. All mitigation planting associated with the permanent access road, River Fromus bridge, Saxmundham Converter Station and Friston Substation under Scenario 2, will be maintained for the lifetime of the asset.*	The landscaping that is referenced as part of Work No 33 in the SPR consent has been designed to mitigate the effects of three substations and three cable sealing end compounds, amongst other works such as underground cables and overhead line works, at the site of Friston substation. The Sea Link application has deliberately sought flexibility to enable National Grid to deliver coordinated and integrated landscaping scheme for the site should a more complex Scenario 2 occur. However, the Sea Link Environmental Statement assesses the impacts of the Sea Link project, which focuses on the impacts and mitigation required to address the impacts of a single substation (Friston substation) alongside other works; or to only mitigate the impacts of the underground cables and minor works under Scenario 1. Therefore, whilst cumulative impacts and coordination have been taken into consideration, the landscaping plans for the projects are not seeking to manage the same effects. The maintenance periods for planting are not necessarily referring to the same areas or the same landscaping. Notwithstanding the above, planting related to the mitigation of effects associated with Friston Substation (which would be within Work 33 of SPRs consents) would be maintained for the lifetime of the asset if implemented by the Sea Link team, committing to a longer period in the Sea Link application than is referenced in SPR's requirement 15. To provide further certainty on this, explicit mention of Friston Substation has also been added to commitment LV03 in Application Document 7.5.3.2 Construction Environmental Management Plan Appendix B Register of Environmental Actions and Commitments submitted at Deadline 3 to align

Topic	SPR DCO Text	Sea Link DCO	Explanation for differences
			with the text in the Outline Landscape and Ecological Management Plan – Suffolk.
Fencing	***Fencing and other means of enclosure*** *17.—(1) No stage of the onshore works may commence until for that stage written details of all proposed permanent and temporary fences, walls or other means of enclosure of the onshore works have been submitted to and approved by the relevant planning authority.* *(2) All fencing and other means of enclosure of the onshore works must be in accordance with the approved details.* *(3) Any temporary fencing must be removed on completion of the relevant stage of the onshore works unless otherwise approved by the relevant planning authority.* *(4) Any approved permanent fencing in relation to the onshore substation comprised within Work No. 30, the national grid substation comprised within Work No. 41 and the sealing end compounds comprised within Work No. 38 must be completed before the respective substation or sealing end compound is brought into use and must be maintained for the operational lifetime of the work to which it relates.*	Requirements for fencing is provided in the following commitments for Sea Link but not in the requirements of the draft DCO: Application Document 7.5.3 (B) Outline Onshore Construction Environmental Management Plan **[AS-127]** states: *2.4.4 Where necessary, working areas will be appropriately fenced off from members of the public and to prevent animals from straying onto a working area. National Grid will ensure, as far as reasonably practicable, that the visual intrusion of the construction site fencing is contained and limited, through limiting fencing to that which is essential for the safety of the public, site personnel and private assets. 2.4.5 Fencing and other means of enclosure, including those required for mitigating effects on protected species, will be inspected daily initially and then regularly as appropriate (protected species fencing is likely to remain as daily), repaired and repainted as necessary. Any temporary fencing will be removed as soon as reasonably practicable after completion of the works.* **Application Document 9.84 Register of Environmental Actions and Commitments** submitted at Deadline 3 states: GG26 Fencing Security Requirements Where working areas are fenced, the type of fencing installed will depend on the area to be fenced and will take into consideration the level of security required in relation to the surrounding land and public access, rural or urban environment and arable or stock farming. Consultation on the type of fencing will be undertaken with the relevant landowner and tenant where required. For some locations the fence used may also serve to provide acoustic and visual screening of the work sites and reduce the potential for disturbance of users in the surrounding areas. Fencing will be regularly inspected and maintained and removed as part of the demobilisation unless otherwise specified.	An identical requirement to that included in the SPR DCOs is not included in the Sea Link DCO. The SPR project had significantly greater amounts of fencing at the Friston site compared to Sea Link at the point of consent, including permanent fencing associated with the cable sealing end compounds and the three substations. National Grid specifications for fencing at substations only permits two types of permanent fencing due to the need for fencing to be suitable for matters such as the protection of assets that are part of the national transmission system and health and safety. There is therefore limited flexibility on the type and design of fencing that could be influenced by the relevant planning authority or other parties. The specification for fencing for protection of landscaping measures will be included in the final Landscape and Ecological Management Plan to be approved by the relevant planning authority under requirement 6. The area to be temporarily fenced is also much larger for the SPR projects than for Sea Link. The nature of temporary fencing means that it will change and be introduced/ removed as the construction works move along the linear project. It is therefore considered unnecessarily cumbersome for the Applicant to be required to agree all temporary fencing prior to commencement, or to need to amend this each time fencing may need to be relocated, retained or removed due to, for example, a landowner request, weather, or changes to the construction programme. The specification for temporary fencing will be included in the final Construction Environmental Management Plan, which would be approved by the relevant planning authority under requirement 6. The equivalent provision to (3) is secured in paragraph 2.4.5 of the Outline CEMP for Sea Link and (4) is not relevant to Sea Link.

Topic	SPR DCO Text	Sea Link DCO	Explanation for differences
Pre-Commencement Archaeology	***Pre-commencement archaeology execution plan*** ***19.***—*(1) No intrusive onshore preparation works (including pre-commencement archaeological surveys, archaeological investigations or site preparation works in respect of such surveys or investigations) may be carried out until a pre-commencement archaeology execution plan (which accords with the outline pre-commencement archaeology execution plan and the outline written scheme of investigation (onshore archaeology)) in respect of those works has been submitted to and approved by Suffolk County Council in consultation with the relevant planning authority.* *(2) Intrusive onshore preparation works must be carried out in accordance with the approved plan.*	N/A	There is no equivalent requirement for Sea Link. Archaeological survey works have been carried out for the Sea Link project for many years and indeed are continuing during the Sea Link Examination. These survey works have been discussed on an ongoing basis with the relevant County Archaeologist and Historic England, including providing written schemes of investigation where appropriate. Introduction of this requirement would mean that following consent, surveys that may be ongoing or planned at that time, would need to cease in order for submission of an archaeology execution plan. This would not be in anyone's interests, including landowners and archaeology teams with whom works would be planned, or the county councils. Requirement 5(3) has been amended to make it clear that pre-commencement archaeological works must be carried out in accordance with the Outline Onshore Overarching Written Scheme of Investigation – Suffolk for onshore works within the county of Suffolk; the Outline Onshore Overarching Written Scheme of Investigation – Kent for onshore works within the county of Kent; and the Outline Offshore Overarching Written Scheme of Investigation and the Marine Archaeological Method Statement as appropriate. This requirement is therefore not considered necessary for Sea Link.
Archaeology	***Archaeology*** *20.—(1) No stage of the onshore works may commence until for that stage a written scheme of archaeological investigation (which accords with the outline written scheme of investigation (onshore archaeology) and is informed by the pre-commencement archaeological surveys) has, after consultation with Historic England, been submitted to and approved by Suffolk County Council in consultation with the relevant planning authority.* *(2) In the event that site investigation is required, the scheme must include details of the following—* *(a)an assessment of significance and research questions;* *(b)the programme and methodology of site investigation and recording;* *(c)the programme for post investigation assessment;* *(d)provision to be made for analysis of the site investigation and recording;* *(e)provision to be made for publication and dissemination of the analysis and records of the site investigation;*	The equivalent requirement for Sea Link has been amended in the draft DCO submitted at Deadline 3, with the new requirement included below. *(1) The proposed development must be undertaken in accordance with the following documents as relevant to the location of the works unless otherwise agreed with the relevant planning authority:* *(a) Outline Onshore Overarching Written Scheme of Investigation – Suffolk for onshore works within the county of Suffolk;* *(b) Outline Onshore Overarching Written Scheme of Investigation – Kent for onshore works within the county of Kent; and* *(c) Outline Offshore Overarching Written Scheme of Investigation and the Marine Archaeological Method Statement as appropriate.* *(2) No stage of the authorised development may commence until for that stage either a preservation in situ Historic Environment Management Plan or a site-specific written scheme of*	This requirement for Sea Link on archaeology has evolved in response to feedback from stakeholders throughout the process, including recently from Historic England and is considered a robust requirement to secure management of archaeological impacts. The Applicant has amended the drafting of this requirement for Deadline 3 in response to comments raised by Suffolk County Council which suggested alternative wording to reach agreement on the form of wording in the requirement. There is no necessity for the Sea Link requirement to reflect the SPR requirement, which will have evolved in response to comments received during or prior to 2021 on different projects.

Topic	SPR DCO Text	Sea Link DCO	Explanation for differences
	(f)provision to be made for archive deposition of the analysis and records of the site investigation; and *(g)nomination of a competent person or persons/organisation to undertake the works set out within the written scheme of investigation.* *(3) Any archaeological works or watching brief must be carried out in accordance with the approved written scheme of archaeological investigation for that stage.* *(4) In the event that site investigation is required, the site investigation and post investigation assessment must be completed for that stage in accordance with the programme set out in the written scheme of archaeological investigation and provision made for analysis, publication and dissemination of results and archive deposition secured for that stage*	*investigation (which accords with the relevant Overarching Written Scheme of Investigation and is informed by the pre-commencement archaeological surveys) has been submitted to and approved by the relevant planning authority.* *(3) Site-specific written schemes of investigation must be in accordance with the outline written scheme of investigation and must identify areas where archaeological works are required and the measures to be taken to protect, record or preserve any significant archaeological remains that may be found and must include:* *(a) an assessment of significance and research questions;* *(b) the programme of methodology of site investigation and reporting;* *(c) the programme for post-investigation assessment;* *(d) proposals for providing for the analysis of site investigation and recording;* *(e) proposals for providing archive deposition of the analysis and records of the site investigation;* *(f) nomination of a competent person or persons/organisation to undertake the works set out within the detailed written scheme of investigation; and* *(g) an implementation timetable.* *(4) All archaeological works must be carried out in accordance with the approved site-specific written scheme of investigation for that stage, prior to the commencement of any pre-commencement or construction works in that stage* *(5) Unless otherwise agreed with the relevant planning authority:* *(a) No later than two years following the completion of the fieldwork specified in each site-specific written scheme of investigation, a site-specific post excavation assessment for that site must be completed in accordance with the Overarching Archaeological Written Scheme of Investigation and submitted to the relevant planning authority for approval;* *(b) No later than one year following the approval of the final site-specific post excavation assessment, an archaeological updated project design for all sites, must be submitted to the relevant planning authority for approval. The archaeological updated project design must be produced in general accordance with the Overarching Archaeological Written Scheme of Investigation, include details of the scope of post-excavation analysis and publication and have regard to the site-specific research agendas set out in the site-specific written schemes of investigation;* *(c) Post-excavation analysis and publication must be carried out in accordance with the approved archaeological updated project design;* *(d) The full archaeological archive must be submitted to the relevant planning authority in accordance with the archaeological updated project design.*	

Topic	SPR DCO Text	Sea Link DCO	Explanation for differences
Ecological management plan	***Ecological management plan*** *21.—(1) No stage of the onshore works may commence until for that stage a written ecological management plan (which accords with the outline landscape and ecological management strategy) reflecting pre-construction survey results, and the ecological mitigation measures included in the environmental statement and including—* *(a)a breeding bird protection plan;* *(b)an arboricultural method statement;* *(c)an invasive species method statement;* *(d)where appropriate, a special protection area crossing method statement (which accords with the outline SPA crossing method statement); and* *(e)a precautionary method of working for reptiles;* *has been submitted to and approved by the relevant planning authority in consultation with the relevant statutory nature conservation body.* *(2) Onshore preparation works may not be carried out until a written ecological management plan (which accords with the outline landscape and ecological management strategy) for those works reflecting survey results and the ecological mitigation measures included in the environmental statement has been submitted to and approved by the relevant planning authority in consultation with the relevant statutory nature conservation body.* *(3) The ecological management plan(s) must include an implementation timetable and must be carried out as approved.*	**Construction Management Plans to be Approved** *6. —(1) No stage of the authorised development may commence until, for that stage, the following plans as relevant to that stage have been submitted to and approved by the relevant planning authority or other discharging authority as may be appropriate to the relevant plan, scheme or strategy concerned—…* *(f) Landscape and Ecological Management Plan (LEMP) – Suffolk (which must be substantially in accordance with the Outline LEMP – Suffolk)* *(g) Landscape and Ecological Management Plan (LEMP) – Kent (which must be substantially in accordance with the Outline LEMP – Kent);* 21(d) is not relevant to Sea Link because the Sea Link project is not traversing the Sandlings Special Protection Area. In addition Requirement 8 is specifically on the arboricultural method statement. ***Retention and protection of existing trees and hedgerows states:*** *8. —(1) No stage of the authorised development may commence until, for that stage, an Arboricultural Method Statement identifying the trees, groups of trees and hedgerows to be retained during that stage has been submitted to and approved by the relevant planning authority. (2) The Statement referred to in sub-paragraph (1) must include— (a) a schedule of all proposed tree and hedgerow removal and management; (b) specification for temporary physical protection including clearly defined root protection areas to prevent damage / compaction of roots by machinery; and (c) details of an auditable system of compliance. (3) The relevant works in proximity to the protected tree or hedgerow must not commence until the approved protection measures referred to in sub-paragraph (2) are in place, and they must thereafter be maintained during the construction of the relevant stage of the authorised development. (4) The authorised development must proceed in accordance with the Statement referred to in sub-paragraph (1) unless otherwise approved by the relevant planning authority.*	The information required in SPR requirement 21 will be provided in the Landscape and Ecological Management Plan for Sea Link, where relevant, with the exception of an arboricultural method statement, which is subject to requirement 8. The information to be supplied is consistent across projects insofar as is relevant to both projects.
Code of construction practice	***Code of construction practice*** *22.—(1) No stage of the onshore works may commence until for that stage a code of construction practice (which must accord with the outline code of construction practice) has been submitted to and approved by the relevant discharging authority.* *(2) The code of construction practice must include—* *(a)a surface water and drainage management plan;* *(b)a flood management plan;* *(c)a construction phase noise and vibration management plan;*	For Sea Link the Outline Code of Construction Practice has been provided at Deadline 3 as a standalone document (9.83) (it was previously an appendix to the 7.5.3 Outline Onshore Construction Environmental Management Plan; at Application Document 7.5.3.1 CEMP Appendix A Outline Code of Construction Practice). It is secured in requirement 6 (which has been updated as at Deadline 3 to refer to both documents): *'6.—(1) No stage of the authorised development may commence until, for that stage, the following plans as relevant to that stage have been submitted to and approved by the relevant planning authority or other discharging authority as may be appropriate to*	22(1) is not materially different from 6(1) 22(2) is not required for Sea Link related to the Code of Construction Practice because these documents are not proposed to be included in that document.

Topic	SPR DCO Text	Sea Link DCO	Explanation for differences
	(d)a site waste management plan; *(e)a soil management plan including method statements for soil handling;* *(f)an air quality management plan;* *(g)a materials management plan;* *(h)a pollution prevention and response plan including a groundwater protection method statement and construction method statements for the protection of onshore water;* *(i)a stakeholder communications plan;* *(j)an artificial light emissions management plan;* *(k)a watercourse crossing method statement (which accords with the outline watercourse crossing method statement); and* *(l)a Sizewell Gap construction method statement (which accords with the outline Sizewell Gap construction method statement).* *(3) The relevant discharging authority is the relevant planning authority, except in relation to any surface water and drainage management plan prepared under requirements 22(2)(a) or flood management plan prepared under requirement 22(2)(b), where it is the relevant lead local flood authority.* *(4) The code of construction practice approved in relation to the relevant stage of the onshore works must be followed in relation to that stage of the onshore works.* *(5) In approving the code of construction practice the relevant discharging authority must consult with the relevant planning authority in relation to the following plans—* *(a)the surface water and drainage management plan; and* *(b)the flood management plan.* *(6) In approving the code of construction practice the relevant discharging authority must consult with the relevant statutory nature conservation body in relation to the watercourse crossing method statement and in relation to the following plans to the extent that they relate to the Works Nos. specified—…* [no works relevant to Friston Substation]	*the relevant plan, scheme or strategy concerned… (r) Outline Code of Construction Practice '.*	
Lighting	***Control of artificial light emissions during operational phase*** *25.—…* *(3) Work No. 41 must not begin operation until an operational artificial light emissions management plan providing details of artificial light emissions during the operation of Work No. 41, including measures to minimise lighting pollution and the hours of lighting, has been submitted to and approved by the relevant planning authority.* *(4) The approved operational artificial light emissions management plan must be implemented upon, and maintained during, the operation of Work No. 41.*	No equivalent requirement on lighting.	See response to 1LVIA4 explaining the requirements for lighting at National Grid substations and converter stations.
Construction working hours	***Construction hours for the grid connection works*** *24.—(1) Construction work for the grid connection works must only take place between 0700 hours and 1900 hours Monday to*	***Construction hours 7.—*** *… (7) In respect of Work No.1A and Work No. 1B, construction work may only take place between 0700 hours and 1900 hours*	No difference between the requirements.

Topic	SPR DCO Text	Sea Link DCO	Explanation for differences
	Friday and 0700 hours and 1300 hours on Saturdays, with no activity on Sundays or bank holidays, except as specified in sub-paragraph (2). *(2) Outside the hours specified in sub-paragraph (1), construction work may be undertaken for essential activities including but not limited to—* *(a)continuous periods of operation that are required as assessed in the environmental statement, such as concrete pouring and the installation and removal of conductors, pilot wires and associated protective netting across highways or public footpaths;* *(b)internal fitting out works associated with the national grid substation;* *(c)the completion of construction activities commenced during the approved working hours which cannot safely be stopped;* *(d)the testing or commissioning of any electrical plant installed as part of the authorised development; and* *(e)activity necessary in the instance of an emergency where there is a risk to persons or property.* *(3) With the exception of activities undertaken in accordance with sub-paragraph (2)(e), the timing and duration of construction work undertaken in accordance with sub-paragraph (2) and, where works do not fall within sub-paragraphs (2)(a) to (2)(e), whether such works are essential, must be approved by the relevant planning authority in writing in advance, and must be carried out within the approved time.*	*Monday to Friday and 0700 hours and 1300 hours on Saturdays, with no activity on Sundays or bank holidays, except as specified in sub-paragraph (8).* *(8) Outside the hours specified in sub-paragraph (7), construction work may be undertaken for essential activities including but not limited to—* *(a) continuous periods of operation that are required as assessed in the environmental statement, such as concrete pouring and the installation and removal of conductors, pilot wires and associated protective netting across highways or public footpaths;* *(b) internal fitting out works associated with the substation;* *(c) the completion of construction activities commenced during the approved working hours which cannot safely be stopped;* *(d) the testing or commissioning of any electrical plant installed as part of the authorised development; and* *(e) activity necessary in the instance of an emergency where there is a risk to persons or property.* *(9) With the exception of activities undertaken in accordance with sub-paragraph (2)(e), the timing and duration of construction work undertaken in accordance with sub-paragraph (8) and, where works do not fall within sub-paragraphs (2)(a) to (2)(e), whether such works are essential, must be approved by the relevant planning authority in writing in advance, and must be carried out within the approved time.*	
	Onshore preparation works management plan *26.—(1) Prior to carrying out specified onshore preparation works, an onshore preparation works management plan in respect of those works (which accords with appendix 1 of the outline code of construction practice) must be submitted to and approved by the relevant planning authority in consultation with Suffolk County Council.* *(2) The specified onshore preparation works must be carried out in accordance with the approved onshore preparation works management plan.* *(3) For the purposes of this requirement, "specified onshore preparation works" means operations consisting of site clearance, demolition work, early planting of landscaping works, intrusive ecological mitigation, investigations for the purpose of assessing ground conditions, remedial work in respect of any contamination or other adverse ground conditions, diversion and laying of services, erection of temporary means of enclosure, creation of site accesses, footpath creation and erection of welfare facilities.*	N/A	Specified onshore preparation works are defined within the SPR DCOs as *'onshore preparation works means operations consisting of site clearance, demolition work, early planting of landscaping works, archaeological investigations, environmental surveys, ecological mitigation, investigations for the purpose of assessing ground conditions, remedial work in respect of any contamination or other adverse ground conditions, diversion and laying of services, erection of temporary means of enclosure, creation of site accesses, footpath creation, erection of welfare facilities and the temporary display of site notices or advertisements'.* Many of these works are pre-commencement works that are normally possible to undertake prior to the discharge of requirements and include works that are minor and would, if outside a DCO, likely not constitute development or be permitted development. Indeed, environmental surveys have been undertaken for years on the Sea Link project without a requirement for the approach to

Topic	SPR DCO Text	Sea Link DCO	Explanation for differences
			be submitted to and approved by the relevant planning authority. Requiring submission of a plan to be discharged prior to pre-commencement works is likely to delay the start of major infrastructure projects as it prevents preparation works from starting soon after consent. Given the nature of the works, this is not considered necessary or appropriate for this requirement to be incorporated into the Sea Link DCO. Sea Link has included a provision in Requirement 5(3) that states: *'(3) For the avoidance of doubt, all pre-commencement operations must be carried out in accordance with the plans listed in paragraph (2) above and the outline management plans listed in paragraph 6(1) below, unless otherwise agreed with the relevant planning authority or other discharging authority as may be appropriate to the relevant plan concerned.'* This is considered to provide the necessary controls over the pre-commencement works. Works that would constitute commencement of development are extensively controlled by all other requirements in the DCO; including numerous plans that need to be submitted and approved by the relevant planning authority.
Noise	***Control of noise during operational phase*** *27.—(1) The combined noise rating level for the standard operation of Work No. 30 cumulatively with the standard operation of the new national grid substation and the East Anglia ONE North onshore substation must not exceed—* *(a)32dB LAeq (15 min) at any time at a free field location immediately adjacent to the following noise sensitive locations—* *(i)1 Woodside Cottages, Grove Road (641837, 261172);* *(ii)Woodside Barn Cottages, Church Road (641237, 260645);* *(b)31dB LAeq (15 min) at any time at a free field location immediately adjacent to the noise sensitive location—* • *Little Moor Farm, Knodishall (641228, 261676).* *(2) Work No. 30 must not operate at the same time as the new national grid substation or the East Anglia ONE North onshore substation until a scheme for monitoring compliance with the noise rating levels set out in sub-paragraph (1) above has been submitted to and approved by the relevant planning authority. The scheme must be based on principles set out in BS 4142:2014+A1:2019. The reference method set out in Annex D to BS 4142:2014+A1:2019 shall be used in the assessment of whether tonal penalties apply. The scheme must identify—*	Commitment NV07 in Application Document 7.5.3.1 Register of Environmental Actions and Commitments states that: *'Saxmundham Converter Station and Friston Substation will include appropriate noise mitigation measures in the design (e.g. plant selection, and transformer noise enclosures). Proposed substations and converter stations will be designed such that noise from their normal operation does not cause a significant adverse effect at nearby noise sensitive receptors. Additionally, where feasible the substation and converter station designs will seek to achieve noise levels at nearby noise sensitive receptors in line with the aims of the local authorities, or otherwise as low as reasonably possible.'*	It is possible for the SPR DCOs to include a complex requirement on operational noise of the three substations because Friston substation and (in this wording) the East Anglia Two substation are both included in the application; and the East Anglia One North substation is also being consented and constructed by SPR. This is not the case for Sea Link because National Grid has no control over the design, construction and operation of the SPR substations. A commitment that therefore restricts cumulative noise levels at Friston substation as part of the Sea Link consent would impose a commitment over which National Grid does not have control. A similar requirement is therefore not included in the Sea Link DCO. Additionally, the proposed Friston substation does not contain notable noise sources, such as transformers, as the substation contains connections only. Noise from auxiliary plant and equipment within the Friston substation is not expected to lead to significant effects. There are therefore no sources of noise within the proposed Friston substation that would lead to significant

Topic	SPR DCO Text	Sea Link DCO	Explanation for differences
	(a)the required meteorological and other conditions under which the measurements will be taken, acknowledging that data obtained during emergency operation or testing of certain plant and equipment is not to be taken in to account; *(b)suitable monitoring locations (and alternative surrogate locations if appropriate); and* *(c)times when the monitoring is to take place* *to demonstrate that the noise levels have been achieved after—* *(d)initial commencement of—* *(i)Work No. 30, the new national grid substation and the East Anglia ONE North onshore substation all operating at the same time; and* *(ii)where Work No. 30 begins operation before the East Anglia ONE North onshore substation, Work No. 30 and the new national grid substation operating at the same time; and* *(e)six months after—* *(i)Work No. 30, the new national grid substation and the East Anglia ONE North onshore substation have all been operating cumulatively at full capacity; and* *(ii)where Work No. 30 begins operation at least six months before the East Anglia ONE North onshore substation, both Work No. 30 and the new national grid substation have been operating cumulatively at full capacity.* *(3) The monitoring scheme must be implemented as approved.* *(4) For the purposes of this requirement—* *(a)"East Anglia ONE North onshore substation" means the onshore substation comprised within Work No. 30 of the East Anglia ONE North Order;* *(b)"new national grid substation" means the national grid substation comprised within Work No. 41 of this Order and Work No. 41 of the East Anglia ONE North Order; and* *(c)"standard operation" means the ordinary operation of the substations excluding emergency operation and the testing of plant and equipment associated with emergency operation.*		adverse effects, either individually or cumulatively with the SPR substations. By contrast, the SPR substations do contain notable noise sources, such as transformers, and therefore cumulative operational noise limits are relevant.
Reinstatement of land	***Restoration of land used temporarily for construction*** *29. Any land landward of mean low water springs within the Order limits which is used temporarily for construction of the onshore works and not ultimately incorporated in permanent works or approved landscaping must be reinstated, in accordance with such details as the relevant planning authority in consultation with the relevant highway authority may approve, within twelve months of completion of the relevant stage of the onshore works or such other period as the relevant planning authority may approve.*	***Reinstatement schemes*** *9.—(1) Subject to sub-paragraphs (2) and (3), any land within the Order limits which is used temporarily for construction is to be reinstated to a condition suitable for its former use, or such condition as the relevant planning authority may approve, within 12 months of completion of the construction of the stage of authorised development for which it was required, or such further time as may be approved by the relevant planning authority.* *(2) The requirement to reinstate the land to a condition suitable for its former use does not apply to land above or within 10 metres of underground cables installed as part of the authorised development.*	The Sea Link requirement is considered to be more precise and provide clarity on reinstatement within 10 m of underground cables, where there are restrictions particularly on tree planting.

Topic	SPR DCO Text	Sea Link DCO	Explanation for differences
		(3) The requirement to reinstate the land to a condition suitable for its former use is subject to the provisions of article 27 (temporary use of land for carrying out the authorised project).	
Decommissioning	***Onshore decommissioning*** *30.—…* *(3) The undertaker must notify the relevant planning authority of the permanent cessation of commercial operation of the grid connection works within 14 days following the date of permanent cessation.* *(4) Within six months following the permanent cessation of commercial operation of the grid connection works an onshore decommissioning plan in respect of the grid connection works must be submitted to and approved by the relevant planning authority in consultation with the relevant highway authority and the relevant statutory nature conservation body.* *(5) The decommissioning plans must be implemented as approved.*	***Decommissioning*** *13.—(1) Excluding for substations, in the event that, at some future date, the authorised development, or part of it, is to be decommissioned, a written scheme of decommissioning must be submitted for approval by the relevant planning authority at least six months prior to any decommissioning works.* *(2) The approved scheme must be implemented as approved as part of the decommissioning of the authorised development or relevant part of it.* *(3) This requirement does not apply to the part of the authorised development and associated development described in Schedule 1 (authorised project) which relates to the dismantling and removal of existing infrastructure or apparatus.*	Substations are excluded from paragraph 13(1) of the Proposed Project draft DCO due to the fact that they form part of the wider Transmission Network and therefore would be required to remain in operation even if the Proposed Project were to be decommissioned. Friston substation is already included in two consented DCOs and is proposed to be the connection point for future projects (e.g. Lionlink). If Sea Link ceases to operate and is decommissioned, this does not mean that Friston substation should be decommissioned, nor would it be appropriate for the decommissioning of a substation, should it happen in the future, to be approved through numerous different consents. It is noted that the SPR DCOs, at Requirement 30(3), provide for a potential situation whereby the grid connection works (which, as defined in the SPR DCOs, comprise the National Grid substation at Friston and associated access and tie-ins to the network) may permanently cease to be in commercial operation. As part of the wider Transmission Network, the National Grid substation would similarly remain in operation even if the SPR projects were decommissioned. It is not anticipated that the National Grid substation would cease to be in commercial operation, and therefore it is not anticipated that Requirement 30(3) of the SPR DCOs would ever be triggered.
Public Rights of Way	***Public rights of way*** *32.—(1) No stage of the authorised development or onshore preparation works that would affect a public right of way specified in Schedule 3 (public rights of way to be temporarily stopped up) or Schedule 4 (footpaths to be stopped up) is to be undertaken until a public rights of way strategy in respect of that stage and in accordance with the outline public rights of way strategy, including the specification for the making up of an alternative right of way (where appropriate) has been submitted to and approved by the relevant highway authority in consultation with the relevant planning authority.* *(2) Any alternative public rights of way must be implemented in accordance with the approved public rights of way strategy.*	The approach to Public Rights of Way and provision of a document on their management is included in Sea Link Requirement 6: *'6.—(1) No stage of the authorised development may commence until, for that stage, the following plans as relevant to that stage have been submitted to and approved by the relevant planning authority or other discharging authority as may be appropriate to the relevant plan, scheme or strategy concerned—…* *(j) Public Rights of Way (PRoW) Management Plan – Suffolk (which must be substantially in accordance with the Outline PRoW - Suffolk)* *(k) Public Rights of Way (PRoW) Management Plan – Kent (which must be substantially in accordance with the Outline PRoW - Kent)'*	The strategy for the stopping up footpaths and diversions would be submitted and approved by the relevant highway authority in consultation with the relevant planning authority in all applications; but with different document names.

Topic	SPR DCO Text	Sea Link DCO	Explanation for differences
	Restriction on carrying out grid connection works where consented in another order *38.—(1) Where any part of the grid connection works are being or have been constructed under another development consent order, that part of the grid connection works must not be constructed under this Order.* *(2) Work No. 34 must not—* *(a)be constructed more than once under this Order;* *(b)be constructed under this Order if it is being or has been constructed under another development consent order.*	***Restriction on carrying out works when consented in another order*** *15. Where any part of Work No.1B has been completed pursuant to another development consent order, those works must not be constructed under this Order, save where amendments to those works are required for the purposes of the Authorised Project.*	The requirements all achieve the intended outcome, which is to prevent the Friston substation being constructed under one Order after already being constructed under another. This restriction has been included in Sea Link due to requests from Interested Parties although the Applicant does not consider it a necessary requirement. At the time that the SPR DCOs were made, this requirement was requested by Interested Parties on the SPR DCOs due to the replication of powers across the two SPR offshore wind DCOs. SPR has control over both DCOs so there is no reason why works would need to be completed under one DCO, having been started by another and SPR has control over what requirements are discharged. The context is different for Sea Link because National Grid has no control over what is and is not completed under the SPR DCOs. It is therefore possible, although highly unlikely, that SPR could partially construct the substation and National Grid would require the ability to complete it; or for the substation to be constructed in a way that amendments would be required as part of the Sea Link project. The Sea Link requirement needs to allow for these scenarios.
	Amendments to approved details *40.—(1) With respect to any requirement which requires the authorised project to be carried out in accordance with the details approved by the relevant planning authority or another person, the approved details must be carried out as approved unless an amendment or variation is previously approved in writing by the relevant planning authority or that other person in accordance with sub-paragraph (2).* *(2) Any amendments to or variations from the approved details must be in accordance with the principles and assessments set out in the environmental statement. Such agreement may only be given in relation to immaterial changes where it has been demonstrated to the satisfaction of the relevant planning authority or that other person that the subject matter of the agreement sought is unlikely to give rise to any materially new or materially different environmental effects from those assessed in the environmental statement.* *(3) The approved details must be taken to include any amendments that may subsequently be approved in writing by the relevant planning authority or that other person.*	***Construction Management Plans to be Approved*** *6 —… (2) The construction works for each stage of the authorised development and mitigation works to minimise the impact of construction must be carried out in accordance with the relevant stage of the approved plans, schemes and strategies referred to in sub-paragraph (1) or with any amended plans, schemes or strategies that may subsequently be approved by the relevant planning authority or other discharging authority as may be appropriate to the relevant plan, scheme or strategy concerned.*	All requirements achieve the aim of allowing change to management plans and approved details after they have been discharged, if submitted and approved by the relevant party. The Sea Link requirement uses well precedented wording, allowing for documents to be amended should it be necessary or beneficial to do so; for example if lower impact solutions or technologies are identified; the context changes or there is a need to change design because of something that is discovered during construction. The SPR requirement is considered to be unnecessarily restrictive by stating that only immaterial amendments can be made following the discharge of a requirement. Given that amendments to a detailed plan could theoretically be material, but still beneficial and in line with outline plans, the SPR wording restricts the flexibility of the developer to deliver major infrastructure projects, without a clear rationale for doing so.

Topic	SPR DCO Text	Sea Link DCO	Explanation for differences
	Operational drainage management plan *41.—(1) No part of Work Nos. 30, 34, 38 or 41 may commence until an operational drainage management plan in respect of that part (which accords with the outline operational drainage management plan) and includes provision for the maintenance of any measures identified, has been submitted to and approved by the relevant lead local flood authority, in consultation with the relevant planning authority and the Environment Agency.* *(2) The operational drainage management plan must be implemented as approved.*	***Construction Management Plans to be Approved*** *6.—(1) No stage of the authorised development may commence until, for that stage, the following plans as relevant to that stage have been submitted to and approved by the relevant planning authority or other discharging authority as may be appropriate to the relevant plan, scheme or strategy concerned—…* *(q) Operational Drainage Management Plan.*	Both requirements necessitate the need for preparation of an operational drainage management plan for Friston substation.
	Restriction on carrying out grid connection works *43. No part of the grid connection works may commence under this Order until either—* *(a)the offshore works have commenced; or* *(b)the undertaker has provided appropriate evidence to the Secretary of State demonstrating its commitment to commence the authorised development described within paragraph 1 of Schedule 1, Part 1 and the Secretary of State has confirmed that the grid connection works may commence.*	N/A	This restriction is not appropriate for Sea Link as it is an integrated grid connection project and there is no reason for the construction of Friston substation to be delayed until any other part of the connection is started. Indeed, construction of Friston substation is likely to commence before Sea Link is consented.
	Control of development during operational phase ***44****.—(1) During the operation of and within operational land related to Work No. 30 and Work No. 41, any development in addition to that authorised in this Order that is permitted under Schedule 2 Part 15 Class B (d), (e) or (f) of the General Permitted Development Order 2015 ("electricity undertakings permitted development") or any equivalent successor provision is subject to the following conditions—* *(2) In respect of operational drainage—* *(a)No electricity undertakings permitted development may commence until an amendment to the operational drainage management plan approved pursuant to requirement 41 that includes provision for the replacement of any existing drainage measures to be removed and maintenance of any new drainage measures to be provided as part of the permitted development, has been submitted to and approved by the relevant lead local flood authority, in consultation with the relevant planning authority and the Environment Agency; and* *(b)The measures in the amendment to the operational drainage management plan in respect of the permitted development must be implemented as approved.* *(3) In respect of the provision, implementation and maintenance of landscaping—* *(a)No electricity undertakings permitted development may commence until an amendment to the written landscape management plan and associated work programme approved*	N/A	This requirement is not considered appropriate for Sea Link.

Topic	SPR DCO Text	Sea Link DCO	Explanation for differences
	pursuant to requirement 14 that includes provision for the replacement of any existing landscape measures to be removed and maintenance of any new landscape measures to be provided as part of the permitted development, has been submitted to and approved by the relevant planning authority; and *(b)The measures in the amendment to the written landscape management plan and associated work programme plan in respect of the permitted development must be implemented as approved.*		

C.4 Comparison between Documents to be Certified

C.4.1 A comparison between the documents to be certified in the three DCOs is provided in the table below. The list of documents below for SPR is taken from Schedule 17 in the DCO for East Anglia TWO; although the list is almost identical for East Anglia ONE North. The list for Sea Link is as listed in Schedule 19 of the draft DCO **[CR1-027]**. The Applicant is also considering whether further documents should be added to the list of certified documents and will update the draft DCO at Deadline 3 and future deadlines as appropriate.

Table C.3 Proposed Works Comparison Table

SPR DCO Text	Sea Link DCO	Explanation for differences
Environmental Statement (including figures and appendices) Applicants' Responses to WQ1 Appendix 10 Landfall Indicative HDD Working Area Applicants' Responses to WQ1 Appendix 11 Landfall HDD Cross Sections HDD Verification Clarification Note Applicants' Responses to WQ1 Appendix 6 Illustrative Open Trench and Trenchless Onshore Cable Route Applicants' Responses to WQ1 Appendix 7 Onshore Crossing Schedule Onshore Cable Route Works Programme Clarification Note Onshore Substations Update Clarification Note Construction in Proximity to Properties EA2 Environmental Statement Appendix 6.2 Relationship of Onshore Plans Secured by the DCO EA2 Environmental Statement Appendix 6.3 Relationship of Offshore Plans Secured by the DCO EA2 Environmental Statement Appendix 6.4 Cumulative Project Description Applicant's Comments on Relevant Representations Appendix 6 Disposal Site Locations (Windfarm Site) Applicant's Comments on Relevant Representations Appendix 2 Wave Climatology Clarification Note Effects on Supporting Habitats of Outer Thames Estuary SPA Clarification Note Applicant's Comments on Relevant Representations. Appendix 3 Fish and Shellfish Ecology Clarification Note Underwater Noise Modelling Report Update Cumulative Auk Displacement and Seabird Assemblage Assessment of FFC SPA and Gannet PVA Displacement of red-throated divers in the Outer Thames Estuary SPA Deadline 1 Air Quality Clarification Note Deadline 3 Air Quality Clarification Note Applicants' Responses to WQ1 Appendix 8 Environment Agency Flood Zones Clarification Note SuDS Infiltration Note Landfall Hydrogeological Risk Assessment Flood Risk and Drainage Clarification Note Land Use Clarification Note Applicants' Responses to WQ1 Appendix 4 Ecological Mitigation Works Onshore Ecology Clarification Note	Access, Rights of Way and Public Rights of Navigation Plans Land Plans Special Category Land Plans Traffic Regulation Order Plans Trees and Hedgerows to be Removed or Managed Plans Work Plans Book of Reference Environmental Statement (together with any supplemental or additional environmental information) Outline Onshore Construction Environmental Management Plan Outline Offshore Construction Environmental Management Plan Outline Construction Traffic Management and Travel Plan – Kent Outline Construction Traffic Management and Travel Plan – Kent Outline Air Quality Management Plan – Kent Outline Air Quality Management Plan – Suffolk Outline Landscape and Ecological Management Plan (LEMP) - Suffolk Outline Landscape and Ecological Management Plan (LEMP) – Kent Outline Construction Noise and Vibration Management Plan (NVMP) – Suffolk Outline Construction Noise and Vibration Management Plan (NVMP) – Kent Outline Public Rights of Way (PRoW) Management Plan – Suffolk Outline Public Rights of Way (PRoW) Management Plan Outline Soil Management Plan – Suffolk Outline Soil Management Plan – Kent Greenhouse Gas Reduction Strategy	The DCOs for the projects are structured differently and documents with similar titles do not necessarily contain similar information. It would therefore be incorrect to assume because a document is certified for one project, it is necessary for it to be certified on another. It should be noted that a lot of documents on the list for SPR were submitted during the course of their Examination and constitute clarifications or answers to queries rather than core documents. The SPR list also individually lists documents that would be included in the 'supplemental or additional environmental information' category in the Sea Link list.

SPR DCO Text	Sea Link DCO	Explanation for differences
Ecological Enhancement Clarification Note		
Deadline 3 Onshore Ecology Clarification Note		
Deadline 4 Onshore Ecology Clarification Note		
Deadline 6 Onshore Ecology Clarification Note		
Ecology Survey Results: February 2021		
Ecological Enhancement Clarification Note Addendum		
Archaeology and Cultural Heritage Clarification Note		
Pre-Construction Trial Trenching Report		
Onshore Archaeology Geophysical Survey Report (Parts 1 to 9)		
Onshore Archaeology Earthworks Report		
Cultural heritage Viewpoint 5 Additional Visualisation		
Updated Photomontages Clarification Note		
Heritage Assessment Addendum		
Heritage Assessment Addendum Appendix 1 CHVP2 –PRoW between Friston Hall and Friston (Appendix 24.7, Figure 7 Update)		
Heritage Assessment Addendum Appendix 2 CHVP3 – PRoW between Moor Farm and Little Moor Farm (Appendix 24.7, Figure 8 Update)		
Heritage Assessment Addendum Appendix 3 CHVP4 – PRoW to east of Little Moor Farm (Appendix 24.7, Figure 9 Update)		
Heritage Assessment Addendum Appendix 4 CHVP5 – PRoW at Woodside Farm (Appendix 24.7, Figure 10 Update)		
Heritage Assessment Addendum Appendix 5 CHVP7 – Friston House (b) (Appendix 24.7, Figure 12 Update)		
Heritage Assessment Addendum Appendix 6 CHVP8 – Friston War Memorial (Appendix 24.7, Figure 13 Update)		
Heritage Assessment GIS Addendum		
Heritage Assessment GIS Addendum App 1 CHVP2 App 24.7 Fig 7 Update		
Heritage Assessment GIS Addendum App 2 CHVP3 App 24.7 Fig 8 Update		
Heritage Assessment GIS Addendum App 3 CHVP4 App 24.7 Fig 9 Update		
Heritage Assessment GIS Addendum App 4 CHVP5 App 24.7 Fig 10 Update		
Heritage Assessment GIS Addendum App 5 CHVP7 App 24.7 Fig 12 Update		
Heritage Assessment GIS Addendum App 6 CHVP8 App 24.7 Fig 13		
Applicants' Position Statement on Noise		
Noise and Vibration Assessment Clarification Note		
Noise Modelling Clarification Note		
Applicants' Responses to WQ1 Appendix 14 Junction Locations		
Traffic and Transport Clarification Note for Deadline 1		
Sizewell C Cumulative Impact Assessment Note (Traffic and Transport)		
Traffic and Transport Clarification Note for Deadline 3		
Traffic and Transport Deadline 4 Clarification Note		
Public Rights of Way Clarification Note		
Effects with Regard to the Statutory Purposes of the Suffolk Coast and Heaths Area of Outstanding Natural Beauty and Accordance with NPS Policy		
Landscape and Visual: Sizewell C Cumulative Impact Assessment		

SPR DCO Text	Sea Link DCO	Explanation for differences
Applicants' Responses to WQ1 Appendix 9.7 EA2 Annotated Viewpoint 1		
Applicants' Responses to WQ1 Appendix 9.8 EA2 Annotated Viewpoint 2		
Applicants' Responses to WQ1 Appendix 9.9 EA2 Annotated Viewpoint 3		
Applicants' Responses to WQ1 Appendix 9.10 EA2 Annotated Viewpoint 4		
Applicants' Responses to WQ1 Appendix 9.11 EA2 Annotated Viewpoint 5		
Applicants' Responses to WQ1 Appendix 9.12 EA2 Annotated Viewpoint 8		
Sizewell C Cumulative Impact Assessment Note (Landscape and Visual)		
Landscape and Visual Impact Assessment Addendum		
Landscape and Visual Impact Assessment Addendum Appendix 1 Viewpoint 1 – Public Right of Way (PRoW) near Friston House (Figure 29.13 Update)		
Landscape and Visual Impact Assessment Addendum Appendix 2 Viewpoint 2 – Friston, Church Road (Figure 29.14 Update)		
Landscape and Visual Impact Assessment Addendum Appendix 3 Viewpoint 3 – Grove Road, near Pear Tree Farm (Figure 29.15 Update)		
Landscape and Visual Impact Assessment Addendum Appendix 4 Viewpoint 4 – Grove Road, near Church Road (Friston) (Figure 29.16 Update)		
Landscape and Visual Impact Assessment Addendum Appendix 5 Viewpoint 5 – PRoW near Moor Farm (Figure 29.17 Update)		
Landscape and Visual Impact Assessment Addendum Appendix 6 Viewpoint 6 – Friston, Village Green (Figure 29.18 Update)		
Landscape and Visual Impact Assessment Addendum Appendix 7 Viewpoint 8 – Saxmundham Road (North of Friston) (Figure 29.20 Update)		
Landscape and Visual Impact Assessment Addendum Appendix 8 Viewpoint 9 – B1121 Aldeburgh Road, south of Friston (Figure 29.21 Update)		
Updated Figure 29.37- Viewpoint 5 Public Rights of Way, near Moor Farm (with National Grid GIS Substation)		
National Grid GIS Substation Photomontages: Figure 29.13 Update Viewpoint 1 Public Rights of Way near Friston House		
National Grid GIS Substation Photomontages: Figure 29.14 Update Viewpoint 2 Friston, Church Road		
National Grid GIS Substation Photomontages: Figure 29.17 Update Viewpoint 5 Public Rights of Way, near Moor Farm		
National Grid GIS Substation Photomontages: Figure 29.20 Update Viewpoint 8 Saxmundham Road (North of Friston)		
National Grid GIS Substation Photomontages: Figure 29.21 Update Viewpoint 9: B1121 Aldeburgh Road (south of Friston)		
National Grid GIS Substation Photomontages: CHVP3 – PRoW between Moor Farm and Little Moor Farm (Appendix 24.7, Figure 8-Update)		
National Grid GIS Substation Photomontages: CHVP4 – PRoW to east of Little Moor Farm (Appendix 24.7, Figure 9-Update)		
National Grid GIS Substation Photomontages: CHVP5 – PRoW at Woodside Farm (Appendix 24.7, Figure 10-Update)		
Different colour schemes for Substations Design Principles Statement : Viewpoint 1 Public Rights of Way near Friston House		
Different colour schemes for Substations Design Principles Statement: Viewpoint 2 Friston, Church Road		

SPR DCO Text	Sea Link DCO	Explanation for differences
Different colour schemes for Substations Design Principles Statement: Viewpoint 9 – B1121 Aldeburgh Road, south of Friston		
Viewpoint Photomontages with Potential National Grid Extension Bays: Figure 29.14 Update Viewpoint 2 Friston, Church Road		
Viewpoint Photomontages with Potential National Grid Extension Bays: Figure 29.17 Update Viewpoint 5 Public Rights of Way, near Moor Farm		
Viewpoint Photomontages with Potential National Grid Extension Bays: Figure 29.20 Update Viewpoint 8 Saxmundham Road (North of Friston)		
Viewpoint Photomontages with Potential National Grid Extension Bays: CHVP3 – PRoW between Moor Farm and Little Moor Farm (Appendix 24.7, Figure 8-Update)		
Viewpoint Photomontages with Potential National Grid Extension Bays: CHVP4 – PRoW to east of Little Moor Farm (Appendix 24.7, Figure 9-Update)		
Extension of National Grid Substation Appraisal		
Landscape and Visual Impact Assessment GIS Addendum		
LVIA GIS Addendum Appendix 1 Viewpoint 1 Figure 29.13 GIS Update		
LVIA GIS Addendum Appendix 2 Viewpoint 2 Figure 29.14 GIS Update		
LVIA GIS Addendum Appendix 3 Viewpoint 3 Figure 29.15 GIS Update		
LVIA GIS Addendum Appendix 4 Viewpoint 4 Figure 29.16 GIS Update		
LVIA GIS Addendum Appendix 5 Viewpoint 5 Figure 29.17 GIS Update		
LVIA GIS Addendum Appendix 14 Viewpoint 6 Figure 29.18 AIS Update		
LVIA GIS Addendum Appendix 15 Viewpoint 8 Figure 29.20 AIS Update		
LVIA GIS Addendum Appendix 16 Viewpoint 9 Figure 29.21 AIS Update		
Socio-Economics and Tourism Clarification Note (SZC CIA)		
Applicants' Responses to WQ1 Appendix 13 Tourism Impact Review		
Habitat Regulations Assessment - Information to Support the Appropriate Assessment Report		
Habitat Regulations Assessment - Appendix 1 - Information to Support AA Report - HRA Screening Report		
Habitat Regulations Assessment Appendix 2 – Information to Support AA Report – Screening Matrices		
Habitat Regulations Assessment - Appendix 3 - Information to Support AA Report - Integrity Matrices		
Information to Support AA – Addendum for Marine Mammals		
Deadline 1 Offshore Ornithology Cumulative and In Combination Collision Risk Update		
Deadline 4 Offshore Ornithology Cumulative and In Combination Collision Risk Update		
Deadline 8 Offshore Ornithology Cumulative and In Combination Collision Risk Update		
Deadline 11 Offshore Ornithology Cumulative and In Combination Collision Risk and Displacement Update		
Deadline 12 Offshore Ornithology Cumulative and In Combination Collision Risk and Displacement Update		
Deadline 13 Offshore Ornithology Cumulative and In-Combination Collision Risk and Displacement Update		
Updated Offshore Ornithology Cumulative and In-Combination Collision Risk and Displacement Assessment"		
Land Plans (onshore)		
Land Plans (offshore) (Rev 2)		

SPR DCO Text	Sea Link DCO	Explanation for differences
Works Plans (offshore) (Rev 4)]		
Works Plans (onshore)		
Access to Works Plan (Rev 2)		
Temporary Stopping up of Public Rights of Way Plan (Rev 4)		
Permanent Stopping up of Public Rights of Way Plan (Rev 4)		
Important Hedgerows and Tree Preservation Order Plan (Rev 4)		
Order limits boundary coordinates plan (offshore)		
Book of Reference (Version 10)		
Outline Code of Construction Practice (Version 10)		
Outline Public Rights of Way Strategy		
Outline Written Scheme of Investigation (Onshore Archaeology)		
Outline Written Scheme of Investigation (Offshore)		
Outline Landscape and Ecological Management Strategy (Version 08)		
Outline Construction Traffic Management Plan		
Outline Access Management Plan (Version 07)		
Outline Travel Plan		
Outline Offshore Operations and Maintenance Plan		
Offshore In Principle Monitoring Plan		
Draft Marine Mammal Mitigation Protocol		
In Principle East Anglia TWO Project Southern North Sea SAC Site Integrity Plan		
Outline Navigation Monitoring Strategy		
Outline pre-commencement archaeology execution plan (onshore)		
Outline Landfall Construction Method Statement (Version 04)		
Outline SPA Crossing Method Statement (Version 03)		
Outline Sizewell Gap Construction Method Statement		
Outline Fisheries Liaison and Coexistence Plan		
Outline Sabellaria Reef Management Plan		
Outline Operational Drainage Management Plan (Version 07)		
Outline Port Construction Traffic Management and Travel Plan		
Outline Watercourse Crossing Method Statement		
Best Practice Protocol for Minimising Disturbance to Red-Throated Diver		
Substations Design Principles Statement (Rev 04)		
Offshore Ornithology Without Prejudice Compensation Measures		
Activity Exclusion Zones Plan		
Sizewell C Order Limits Interaction – Offshore Plan		
Layout Principles Statement		

Appendix D 1LVIA15 Coordination with Friston Substation Landscape Mitigation Technical Note

D.1 Introduction

Purpose of this Technical Note

D.1.1 The Examining Authority's first written questions on the Sea Link project (EN20026) were published on 17 December 2025 **[PD-017]**. This Technical Note provides further information to respond to question 1LVIA15, which requested that National Grid Electricity Transmission (NGET), as the Applicant for Sea Link:

D.1.2 *'Provide a response to SCC's comment at deadline 2 Ref A2.1 in relation to the need for HDD to connect to the substation to avoid undermining SPR mitigation planting.'*

D.1.3 This Technical Note addresses this question in full, included the points raised by Suffolk County Council (SCC) and East Suffolk Council (ESC) that are cross referenced in the question.

Position Articulated by Suffolk County Council

D.1.4 Question 1LVIA15 references a comment made by SCC in table A2 – 2.3 Landscape and Visual in Comments on Submissions Received by Deadline 1 and 1A **[REP2-062].** This comment reads as follows:

D.1.5 *'Whilst SCC welcomes greater coordination between the Applicant and SPR, it does not see how this could avoid compromising the effectiveness of the landscape mitigation planting implemented by EA1N and EA2 along with the accompanying footpath around the substation. ESC explains in paragraphs 6.4.3.5 and 6.4.3.6 of its LIR [REP1-128] that the mitigation planting could not be replaced if open cut cable installation is used due to root interaction with the cables causing permanent reduction in the effectiveness of that mitigation. This concern also applies to the footpath being created by SPR around the substation site which would face closure and disruption through Sea Link's open cut connection to the Kiln Lane substation. This would likely influence the habits of users and reduce future usage due to lengthy disruption and would require reinstatement. SCC does not see how the Applicant's commitment to coordination will secure avoidance of these impacts. SCC therefore reiterates its position that HDD should be used to connect to the Kiln Lane substation where the cable route interacts with SPR's mitigation as a necessary measure to avoid impacting that mitigation as far as possible.'*

D.1.6 In response to this comment, NGET's position is that:

- Sea Link does not compromise the effectiveness of the landscape mitigation planting implemented by SPR because:
  - Sea Link does not materially affect mitigation in the SPR consents as secured in the Development Consent Orders (DCOs) (i.e. detailed in the Outline Landscape and Ecological Management Strategy, January 2022 (OLEMS)).

- The Applicant is aware that SPR has been considering introducing additional planting at the site and planting in different locations than was presented in the SPR consents. These draft plans have been consulted upon, including with SCC and ESC. This additional planting includes the introduction of a continuous woodland belt to the north of Friston substation that was not included in the OLEMS. Previously there was some planting to the north east of the substation but it did not form a continuous belt and was largely around cable sealing end compounds that are no longer being delivered. At the time SCC's response was written, the plan that this belt was contained in was not in the public domain, but had been consulted upon with select audiences. The additional planting has not yet been approved and does not form part of the SPR consents. Further, in the Applicant's view, the continuous woodland belt is not essential to deliver landscape and visual mitigation for either the SPR projects or Sea Link.
- Even if the additional planting were considered essential mitigation, the interaction between Sea Link and the additional planting described above is localised and limited to requiring planting of hedgerows rather than trees where underground cables pass under woodland belts. It is not considered that this interaction would compromise the functionality of the landscape framework being prepared by SPR. This position is reinforced by SPR in the landscape masterplan submitted to discharge their requirements.

- SCC is correct that planting trees over cables that form part of the national transmission network can be problematic due to the risks associated with high voltage cables and tree roots; and the criticality of the network. However, installing the cables using trenchless methods such as Horizontal Directional Drilling (HDD) does not necessary resolve the issue. For cables to be installed under trees, whether installed by open cut or HDD, the cables must be at a significant depth. If the cables cannot be installed at a greater depth then it would not be possible to plant trees over the cables even if installed using a HDD method. The feasibility of installing cables at greater depths is specific to the location of a cable (e.g. ground conditions), the species of tree and the rating of the cables required. HDD is particularly challenging in this location for the high voltage alternative current cables (HVAC) cables at Friston as explained in section D.9 of this Appendix, where a shallow depth is required to deliver the rating of the cable.
- The installation of Sea Link cables that cross the footpath being created by SPR would not result in lengthy disruption. At any Public Right of Way (PRoW) crossing at the site north of Friston, the footpath would be diverted during the open cut, with a diversion in place for approximately a week. It is not considered that this length of diversion would result in changes to the habit of users. The SCC response also implies that a HDD solution would not result in any disruption to PRoW. Whilst it is likely that no closure and diversion would be required for an HDD solution, users would not be able to use the footpath when the drill passes under it for health and safety reasons. It is therefore not considered that the impact of the installation technique on users of a future footpath would justify use of HDD.
- It is agreed that the footpath would need to be reinstated. The temporary diversion discussed above would be managed through the PRoW Management Plan to be discharged under requirement 6. The footpath section affected would be reinstated following construction of the section of cable or haul road, so after the week long diversion.

- For all the above reasons, NGET disagree that installing the underground cables using HDD at the site north of Friston is necessary or beneficial in this case.

D.1.7 Further detail to explain all the above is provided in this Appendix.

Position Articulated by East Suffolk Council

D.1.8 The SCC response above references the ESC Local Impact Report (LIR) **[REP1-128].** The ESC LIR stated the following on this topic:

D.1.9 *'6.4.3.1 The current lack of co-ordination is of particular concern around the Friston substation in the context of HVAC cable routes leaving the Saxmundham converter station and heading to the Frison substation. An uncoordinated and piecemeal approach to the cable ducts associated with Sea Link and LionLink will result in multiple separate cable routes entering the Friston substation site, subsequently adversely affecting (or even removing) the mitigation planting around the Friston substation agreed under the East Anglia ONE North and East Anglia TWO project consents. The mitigation planting was required to reduce the visual impacts of the SPR (and NGET) substations consented under the SPR DCOs on the village of Friston. It is unacceptable for multiple successive projects to come forward and diminish that mitigation planting by actively avoiding the co-ordination of cable routes between projects resulting in a greater number of routes chipping away at the consented mitigation. ESC notes that the ExA for the SPR projects states in Section 28.4.4 of the Recommendation Report (Volume 2 – Chapters 18-3113) that 'the local harm that the ExA has identified is substantial and should not be under-estimated in effect. Its mitigation has in certain key respects been found to be only just sufficient on balance. However, the benefits of the Proposed Development principally in terms of addressing the need for renewable energy development identified in NPS EN-1 outweigh those effects'. ESC wishes to stress that whilst the overarching need case was found to outweigh the adverse effects introduced, the agreed mitigation across the projects were found to be only just sufficient. This reinforces ESC's view that it is unacceptable for the Sea Link project to diminish this mitigation planting.*

D.1.10 *6.4.3.2 There is a serious risk that the HVAC cable corridor entering the proposed Friston substation site will undermine the effectiveness of the consented landscape mitigation. ESC has a strong preference for NGET to use horizontal directional drilling (HDD) to minimise adverse impacts on this landscape mitigation and this has been raised in multiple meetings by ESC officers prior to the submission of the DCO application.*

D.1.11 *6.4.3.3 ESC notes the HVAC cable route interaction with the proposed Friston substation is depicted on Sheet 2 of 6 within the submitted Work Plans – Suffolk [APP-021].*

D.1.12 *6.4.3.4 ESC understands that NGET are reluctant to HDD under the consented landscape mitigation for the SPR projects due to cost. The alternative, however, is open cut and fill trenching through the landscape mitigation. This goes against the fundamental principle of the landscape mitigation scheme, a required measure for the SPR consents to help mitigate landscape visual impacts in the vicinity of Friston village.*

D.1.13 *6.4.3.5 Bearing in mind that NGET are not proposing any coordination in terms of laying cable ducts for LionLink at the same time as for Sea Link (as discussed earlier), NGET's justification of cost being the primary reason not to HDD under SPR's approved landscape mitigation would subsequently set a precedent for NGV's LionLink project, reducing the likelihood of NGV using HDD methods at a later date (if*

consented). Any future desire for a coordinated HVAC to use HDD methods to avoid disruption to the landscape mitigation should not be restricted at this stage by NGET. Moreover, NGET is under statutory duties under section 38 and schedule 9 of the Electricity Act 1989 to have regard to the desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest and of protecting sites, buildings and objects of architectural, historic or archaeological interest; and to do what can reasonably be done to mitigate any effect which the proposals would have on the natural beauty of the countryside or on any such flora, fauna, features, sites, buildings or objects. Cost is not, therefore, the only consideration and there is a statutory duty resting on the applicant to mitigate. By refusing to use HDD in this location, NGET is failing in its statutory obligations, getting the balance of its duties wrong, and infringing the section 38 and schedule 9 duties.

D.1.14 *6.4.3.6 The SPR consents included a substation for each of the wind farm projects, and a substation for National Grid at the proposed Friston site. The National Grid substation consented within the SPR DCOs was not justified at that time for its capacity to accommodate connections for future projects at Friston, it was solely intended to serve the needs of the SPR EA1N and EA2 offshore wind farm projects. ESC wishes to highlight that the NGET and NGV projects, if coordinated and sharing a single HVAC cable route, would be required to split before entering the consented landscape mitigation, and effectively punch multiple holes through this due to the projects linking into the National Grid substation at different ends of the National Grid substation site. If HDD is not used to cross the mitigation planting areas, this scenario would leave large gaps in the landscape shielding efforts of SPR. Additionally, it is understood that mitigation planting cannot be placed over buried cable trenches due to root interaction with the cables, resulting in planting gaps in landscaping. Whilst ESC understands that SPR, NGET and NGV are currently exploring options for HVAC cable routing and installation methods. It is therefore highly likely given the current feedback from NGET that open cut trenching will be the preference for crossing SPR's consented landscape mitigation areas, and as explained above, this will dilute SPR's consented landscape mitigation planting areas which were a hot topic of debate at the examination hearings for those projects. Any such detriment in this regard would be a serious concern for ESC and the local community.*

D.1.15 *6.4.3.7 It is unacceptable for multiple successive projects to come forward and diminish that mitigation planting by actively avoiding coordinating cable routes between projects. ESC therefore continues to request that NGET review their position on this and includes the ability within their DCO to provide the ducting for the LionLink project and commit to the minimum number of HVAC cable routes which would help to reduce unnecessary disruption to the local community, environment, and consented and secured mitigation planting.'*

D.1.16 The Applicant's response to ESC LIR is provided in pages 42-46 of Applicant's Comments on Local Impact Report from East Suffolk Council **[REP2-027]**. The Applicant is now able to provide fuller answers to points raised because SPR has submitted their landscaping masterplan to ESC; a document that is frequently discussed by ESC and SCC but was previously not in the public domain.

D.1.17 To pick up on a key point, ESC states that: '*The mitigation planting was required to reduce the visual impacts of the SPR (and NGET) substations consented under the SPR DCOs on the village of Friston.'* Friston village is located to the south of the site where the three substations are located and significant positive work has been completed by SPR to develop a landscaping masterplan that includes mitigation bunding and planting between Friston and the SPR substations to mitigate these

effects. Friston substation and the Sea Link cables are located to the north of the SPR substations and do not have any impact on the mitigation proposed for the village of Friston.

Applicant's Response to Comments and Structure of this Technical Note

D.1.18 The Applicant disagrees with SCC and ESC that the Sea Link project will compromise the effectiveness of the landscape mitigation proposed by SPR. This is important because this is the main reason that ESC and SCC have suggested that it would be necessary to install Sea Link cables using HDD. The Applicant similarly disagrees that there has been a lack of coordination between the Applicant and SPR, and can now provide a landscape masterplan to show how the projects could work together. The Applicant is also of the view that approaches to PRoW can be easily addressed and are being so by the developers.

D.1.19 There has been frequent confusion amongst Interested Parties during the Sea Link Pre-Examination and Examination periods about the status of the plans that were consented as part of the SPR DCOs (which did not show a continuous woodland belt to the north east of the substation where Sea Link cables must route through to reach the substation) and the draft plans that ESC had been shown confidentially by SPR in the process of discharging their requirements (which do show more planting in the area of Sea Link cables). This confusion is evident in ESC's LIR, which frequently discusses 'consented' plans as being those that have been prepared to discharge requirements and, at the time the LIR was submitted, were confidential drafts and not in the public domain. The plans that were hotly debated at the SPR Examinations and show essential mitigation for EA1N and EA2 are those that were consented, not the plans now in production. In the Applicant's view, a landscape masterplan can be developed that delivers the essential mitigation outcomes required by the SPR consents, is in line with the OLEMS and accommodates Sea Link. A plan showing how this could work is provided in section D.6. Implementation of this solution would mean that the Sea Link proposals do not diminish, chip away at or conflict with the consented landscaping plans or with SPRs proposed landscape *mitigation.* Indeed the plan provided in section D.6 provides more planting than is specified in the SPR OLEMS despite the lesser above ground development on the site due to removal of the cable sealing end compounds.

D.1.20 However, there is an interaction between the proposed underground cables for Sea Link and the additional planting that SPR has added to their landscape masterplan since the projects were consented. The Applicant understands that SPR submitted their landscape masterplan to ESC to discharge their requirement on 11 December 2025 but that is has not been discharged. NGET is supportive of the provision of additional planting on the site and has been working with SPR to look at revisions to the landscape masterplan that would still deliver additional planting with the Sea Link cables in place. However, in the Applicant's view, it is incorrect for this additional planting proposed by SPR, particularly the continuous woodland belt, to be characterised as 'essential mitigation' or to suggest that the minor amendments required to this planting to accommodate Sea Link cables would constitute *'large gaps in the landscape shielding efforts of SPR'* as suggested by ESC. It should be noted that as the planting in the OLEMS did not include a continuous woodland belt, there were larger gaps in the landscaping in the OLEMS than would be in place with the SPR landscaping and the Sea Link cables. The Applicant's conclusion on this matter is supported by text included in the SPR landscape masterplan as explored in section D.5 of this Technical Note.

D.1.21 This Technical Note provides a response to all the above by:

- setting out the Applicant's understanding of what is required to mitigate effects of the three projects: ***see sections D3 and D4***;
- examining the proposed SPR landscape masterplan submitted to discharge their requirement and the Applicant's understanding of what it would achieve, including what is and is not essential mitigation required to address significant effects identified in the Environmental Statements for the East Anglia One North (EA1N) and East Anglia Two (EA2) projects: ***see section D5***;
- exploring how landscaping can be delivered on site for all projects, including describing how the Sea Link project would affect the landscaping masterplan submitted by SPR: ***see section D6***;
- exploration of the coordinated approach agreed by SPR and NGET to manage development of an integrated landscape masterplan on the site in the context of different project programmes: ***see Section D7***;
- reviewing the extent to which HDD would be required due to the impact of an open cut cable installation method on PRoW: ***see Section D8***; and,
- conclusion: see ***Section D9***.

D.2 Overview of Works Required at Friston for East Anglia One North, East Anglia Two and Sea Link

Introduction

D.2.1 The works required at the site to the north of Friston include works required to facilitate the connection of two new offshore wind farms (EA1N and EA2) and the Sea Link project to the National Electricity Transmission System (NETS). The full descriptions of the three developments are provided in the three DCO applications and this section does not replicate these descriptions in full. However, it is important to understand the development proposed for each project, because it is the development proposed that results in the environmental impacts associated with the projects individually and cumulatively; and the mitigation requirements to address the impacts associated with each project. Therefore, a summary of the key elements of each project is provided below.

Friston (Kiln Lane) National Grid Substation and Associated Works

D.2.2 A new substation is required in the Friston area to provide connections for new electricity generation, transmission and interconnector developments. This substation is referred to in the Sea Link application as 'Friston Substation', in documents for the EA1N and EA2 projects as the 'National Grid' substation and in more recent SPR documents as 'Kiln Lane' substation. To retain consistency with other Sea Link documents, in this Technical Note this substation is referred to as Friston Substation. The two substations proposed adjacent to Friston Substation required for EA1N and EA2 are referred to collectively as the 'SPR substations'.

D.2.3 It would not be economic, efficient or beneficial from an environmental perspective to construct a new substation for each project that is given a connection offer in any given area, so a single substation will generally provide connections for a number of new developments, as is proposed at Friston Substation.

D.2.4 Consent for new transmission substations can be progressed by NGET or (depending on the agreements in place) another developer as part of a generation or interconnection project, and can be consented through a planning application submitted under the Town and Country Planning Act 1990 or as development associated with a DCO project through the Planning Act 2008. At this site SPR included the new Friston substation in the applications for the offshore wind farms, EA1N and EA2.

D.2.5 As explained in pages 7-12 of document 9.72.1: Applicant's Response to Issue Specific Hearing 1 Action Points – Deadline 1 **[REP1-124]**, it is necessary for the Friston Substation to be included in the Sea Link application because NGET does not have the powers to construct the substation under the EA1N and EA2 consents and the substation is an essential part of the Sea Link project. However, the elements of the project below would not be constructed under the Sea Link application if already constructed under the EA1N or EA2 projects. This is secured under requirement 15 of the draft DCO (Application Document 3.1) for the Sea Link application.

D.2.6 All three applications therefore include:

- **A Gas Insulated Substation** (GIS) with a maximum height of 16m above finished ground level and a maximum area of 16,800m^2. The EA1N and EA2 applications alternatively allowed for construction of an Air Insulated Switchgear (AIS) substation with a maximum height of 6m and maximum area of 44,950m^2, but this optionality

was not included in the Sea Link application because the decision had been made to proceed with a GIS substation by the time the Sea Link application was submitted.

- **Overhead line modification works** including one new pylon and one permanently relocated pylon to the north of the substation. The EA1N and EA2 consents also allow for the relocation of two additional pylons; these works are not included in the Sea Link application.
- **A permanent access road from the B1121 Saxmundham Road** to the west of the proposed Friston Substation and associated works.
- **Temporary construction works** for Friston Substation including temporary construction compound(s) and temporary drainage. The location and nature of the construction works would differ between projects because the total works for Sea Link at the site are considerably less than for the EA1N and EA2 projects and the location of works for each project varies across the site.
- **A permanent water supply** to the proposed Friston Substation to support operational needs, including welfare.

D.2.7 Four of the developments proposed to connect at Friston Substation are at an advanced stage of development, including EA1N (consented), EA2 (consented), Sea Link (Examination) and LionLink (pre-application). Although the substation itself was designed to accommodate and connect the SPR projects only, NGET is obligated under its licence to consider what works may be necessary to facilitate other connections which might be made to developers by the National Energy System Operator (NESO), and to deliver the physical connections where required. The design of NGET substations, including any surrounding landscape mitigation, must therefore not sterilise land around the substation, to enable these future connections to take place. The number and nature of future developments that will connect at a new substation cannot be known with certainty so an element of flexibility is required.

East Anglia One North Works

D.2.8 EA1N requires the construction of Friston Substation above, but also all components required for the construction, operation and decommissioning of the EA1N offshore wind farm including up to 67 wind turbines up to 282m in height and all associated works.

D.2.9 In the Friston area the application for the project also sought consent for the following key works:

- A **new substation** for EA1N, with the fenced area for the compound not exceeding 32,300m^2, with building height not exceeding 14 metres above finished ground level and a maximum of six lightning protection masts not exceeding 20 metres.
- Up to **three cable sealing end compounds** with a fenced area of up to 5,000m^2 where circuit breakers are required and 2,500m2 where no circuit breakers are required (these cable sealing end compounds are not required). Note that these three compounds are the same as those proposed for EA2, so there would have been three required in total for the two projects rather than six.
- Up to **six onshore cables**, up to two fibre optic cables and up to two distributed temperature sensing (DTS) cables installed underground and associated underground jointing bays. Cable width to be limited to 32 meters except in exception areas; for example in Sandlings Special Protection Aarea a width of 16.1

metres is proposed for open cut trenching and 90 metres for trenchless solution. These cables will connect to the EA1N substation.

- **Electrical cable connection** between the EA1N substation and Friston Substation
- **Realignment of up to two additional overhead pylons** that are not required for Sea Link, so are not included in the Friston Substation works above.
- **Permanent access works** to the EA1N substation and associated infrastructure such as the cable sealing end compounds.
- **Temporary works to facilitate construction** of all works in addition to construction of Friston Substation discussed above.
- Permanent works and activities to **avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment**[2] resulting from the EA1N project. This will include, for example, permanent landscape and ecological plans, PRoW diversions and drainage. Given the application was submitted at the same time as EA2 by the same applicant, in reality both projects considered the other in development of their measures to address the mitigation hierarchy and planned an integrated solution to the site.

East Anglia Two Works

D.2.10 EA2 also requires the construction of Friston Substation above, but also all components required for the construction, operation and decommissioning of the East Anglia Two offshore wind farm including up to 75 wind turbines up to 282m in height and all associated works.

D.2.11 In the Friston area the application for the project also sought consent for the following key works:

- A **new substation for EA2**, with the fenced area for the compound not exceeding 32,300m^2, with building height not exceeding 14 metres above finished ground level and a maximum of six lightning protection masts not exceeding 20 metres.
- Up to **three cable sealing end compounds** with a fenced area of up to 5,000m^2 where circuit breakers are required and 2,500m^2 where no circuit breakers are required (these cable sealing end compounds are not required) Note that these three compounds are the same as those proposed for EA1N, so there would have been three required in total for the two projects rather than six.
- Up to **six onshore cables**, up to two fibre optic cables and up to two distributed temperature sensing (DTS) cables installed underground and associated underground jointing bays. Cable width to be limited to 32 meters except in exception areas; for example in Sandlings Special Protection Aarea a width of 16.1 metres is proposed for open cut trenching and 90 metres for trenchless solution. These cables will connect to the EA2 substation.
- **Electrical cable connection** between the EA2 substation and Friston Substation
- **Realignment of up to two additional overhead pylons** that are not required for Sea Link, so are not included in the Friston Substation works above. These are the same additional pylons as would be have been relocated for EA1N.

[2] Applicants are required to do this by Article 14 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.

- **Permanent access works** to the EA2 substation and associated infrastructure such as the cable sealing end compounds.
- **Temporary works to facilitate construction** of all works in addition to construction of Friston Substation discussed above.
- Permanent works and activities to **avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment**[3] resulting from the EA2 project. This will include, for example, permanent landscape and ecological plans, PRoW diversions and drainage. Given the application was submitted at the same time as EA1N by the same applicant, in reality both projects considered the other in development of their measures to address the mitigation hierarchy and planned an integrated solution to the site.

D.2.12 Sea Link Works

D.2.13 Sea Link also requires the construction of Friston Substation above. In addition to works associated with Friston Substation, the Sea Link project in the area north of Friston also includes:

- **High Voltage Alternating Current (HVAC) connection** between the new Friston Substation and the proposed Saxmundham Converter Station. These cables would be routed north west from the proposed Friston Substation and located underground.
- **High Voltage Direct Current (HVDC) connection** from Saxmundham Converter Station to the proposed Suffolk landfall located underground. These cables do not connect to Friston Substation but would pass to the north of Friston Substation and then route to the north of Old Broom Covert. Between Friston Substation and Saxmundham Converter Station the HVAC and HVDC cables for Sea Link would be combined within the same construction swathe. This has been done intentionally in response to consultation comments and to reduce intra project cumulative effects.
- **Works within the Friston Substation to facilitate the HVAC connection.** These works would not expand the area within the fenced compound or increase the maximum height of buildings or equipment compared to that consented as part of the EA1N and EA2 projects, but would enable Sea Link to connect to the NETS.
- **Temporary works to facilitate construction** of all the works above. Under Scenario 2 (where Friston Substation is constructed under the Sea Link consent), the construction compounds would likely be adjacent to Friston Substation as shown in the Sea Link Works Plans (Application Document 2.5.1).
- Permanent works and activities to **avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment**[4] resulting from the EA2 project. This will include, for example, permanent landscape and ecological plans, PRoW diversions and drainage. It should be noted that for Sea Link these works are predominantly associated with Friston Substation, given that the permanent effects of other aspects of the Sea Link project at Friston are limited by the nature of the works, which are primarily underground or within an existing compound. In the scenario (Scenario 1) where Friston Substation is constructed

[3] Applicants are required to do this by Article 14 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.

[4] Applicants are required to do this by Article 14 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.

under the SPR consents, the works required to mitigate the landscape and visual impacts of Sea Link would therefore be very limited, comprising only the reinstatement of hedgerows and soils that the HVDC and HVAC corridors affect during construction.

D.3 Landscape and Visual Mitigation Required for East Anglia One North and East Anglia Two

Introduction

D.3.1 The environmental impacts of the development proposed for the EA1N and EA2 projects are assessed in the Environmental Statements for the respective projects. Article 14 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 requires that an applicant includes within an environmental statement *'a description of the features of the proposed development or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment'*. The Environmental Statements for the respective projects set out the measures incorporated in the project to mitigate impacts and measures considered necessary are secured within control documents in the relevant consent. These are the documents that should therefore be referenced when considering what measures are essential mitigation.

D.3.2 Requirement 14 in the SPR DCOs states that no stage of onshore works may commence until a landscape management plan *'which accords with the outline landscape and ecological management strategy'* has been submitted and approved by the relevant planning authority. The Outline Landscape and Ecological Management Strategy (Version 08), 31 January 2022 (OLEMS) in this case is the control document detailing measures required to mitigate the landscape and visual effects of the EA1 and EA2 projects. The OLEMS confirms this by stating that: *'The measures within this OLEMS are reflective of and proportionate to the findings of the EIA presented within the ES…'.* The OLEMS underwent very significant scrutiny during the Examinations for the SPR projects, as evidenced by the number of versions submitted during the Examinations.

D.3.3 Given that Requirement 14 requires that the final landscape management plan accords with the OLEMS and the OLEMS itself states that the measures within the OLEMS are reflective and proportionate to the findings of the ES, it would be reasonable to conclude that the measures proposed in the OLEMS are sufficient to mitigate the impacts of the project as proposed in the EA1N and EA2 consents. In this context, justification would be required to argue that additional planting that is not included in the OLEMS is nevertheless 'landscape mitigation' or is 'necessary'. Further, as described in section D.6 of this Technical Note, it is possible to develop a plan that delivers the mitigation outcomes required for all three projects and accords with the OLEMS and does not hinder the development of Sea Link.

Landscape and Visual Effects and Proposed Mitigation: East Anglia One North and East Anglia Two

D.3.4 The significant residual Landscape and Visual Effects from EA1N and EA2 are set out in Chapter 29, Landscape and Visual Impact Assessment (LVIA) submitted for the application and the significant effects identified in the vicinity of Friston Substation are summarised as follows:

- Localised area of the Ancient Estate Claylands LCT (01) and Estate Sandlands LCT (07) to the north of Friston, between Grove Road and Fristonmoor.
- Residents of parts of Friston as represented by Viewpoints 1, 2 and 9.
- People walking on the local PRoW network to the north of Friston (between Friston and Fristonmoor) as represented by Viewpoints 2 and 5.

- Residents of scattered rural dwellings near Friston as represented by Viewpoints 5 and 8.
- Motorists/cyclists travelling on Grove Road between Friston and Grove Wood/Manor Farm as represented by Viewpoint 14.

D.3.5 The OLEMS identifies mitigation measures reflective of the landscape and visual (and ecological) impacts identified in the Environmental Statement. The landscape mitigation planting in the forms of new woodland, hedgerow and tree planting are proposed in the Outline Landscape Mitigation Plan (OLMP) (Figures 3-7) which includes the updates to woodland planting made following various DCO deadlines.

D.3.6 Paragraph 87 of the OLEMS identifies the main landscape components and their mitigatory function as follows: *'Woodland blocks to the south of the onshore substation and National Grid substation are intended to provide screening for the main visual receptors on the northern edges of Friston. Woodland block planting to the north-east is intended to provide screening from road-users of Grove Road and from Knodishall. Hedgerow reinforcement and small woodland block planting to the north of the overhead lines is to provide screening from isolated properties and from users of the PRoW network along the southern edge of Fristonmoor. Hedgerow planting to the west and south-west is intended to provide screening from residential receptors along the Saxmundham Road, and from road-users of Saxmundham Road.'*

D.3.7 Additionally, the OLEMS notes in paragraphs 90 and 91 that the proposals seek to be historically appropriate by re-establishing lost field boundaries and using multiple lines of planting to achieve screening with a mix of blocks, belts, tree lines and hedges. Tree belts are designed to not be placed hard against houses, footpaths or villages to avoid enclosure. Paragraph 91 specifically states that '*On the paths, this creates an experience of walking through farmland that includes woodand and the onshore substations, rather than always walking past woodland…The OLMP includes re-establishment of historically mapped tree-lined enclosures close to the farms to achieve screening whilst retaining the farms in a more open farmed landscape'*.

D.3.8 Woodland planting seeks to link Grove Wood and Friston House with the intention to separate the site from Friston and Grove Road, whilst not significantly impacting the setting of Friston by retaining the open rural setting of the village.

D.3.9 The OLEMS also provides mitigation for users of the permanent PRoW diversions with options for longer, medium or shorter routes. The longer diversion retains some of the open/rural experience along with new wooded sections. Hedgerow reinforcement and small woodland belts provide screening from users of the PRoW network along the southern edge of Fristonmoor. A triangular area of woodland south east of Little Moor Farm and an associated woodland belt between Fareacres and Little Moor Farm was introduced at Deadline 4 to provide screening in views from the PRoW near Little Moor Farm. The western extent of this planting was further extended at Deadline 6 to increase the level of screening of south facing views from the PRoW near Little Moor Farm with woodland planting proposed up to the edge of the existing PRoW.

D.3.10 The OLEMS details in paragraph 39 the measures covered by the OLMP, including [our emphasis]: '*This OLMP provides a strategic core of landscape planting proposals for development which accommodates either AIS (Air Insulated Switchgear) or GIS (Gas Insulated Switchgear) National Grid substation designs (refer to Chapter 6 Project Description for associated parameters for AIS or GIS NGET substation designs). The outline design of the strategic planting proposals of the landscape scheme (i.e. that planting which provides the most effective landscape framework and*

visual mitigation) is such that it does not sterilise land for potential future development associated with the National Grid substation, although future consultation with stakeholders and local communities (under the Substations Design Principles Statement (AS- Outline Landscape and Ecological Management Strategy 5th July 2021 Applicable to East Anglia TWO Page 10 133)) may result in the refinement of the landscaping proposals. Any landscaping or surface water infrastructure established for the East Anglia TWO project which subsequently requires modification due to any future extension of the National Grid substation must be considered as part of any future consent application for an extension, and must ensure no detriment to the East Anglia TWO project'.

D.3.11 This aim was achieved with the plan for the OLEMS, with no planting proposed immediately adjacent to Friston Substation, and no full belts of planting that would prevent cables reaching the substation. Any final landscape proposals should align with the measures set out in the OLMP, including not sterilising land for future development associated with National Grid substation. Sea Link is future development associated with National Grid substations, as would other connections such as that required for the LionLink project. A final landscaping scheme that sterilised land associated with the future development of the substation, such as the cables required for the Sea Link project, would not be in line with the OLEMS.

Interactions between the Sea Link Project and Consented Mitigation

D.3.12 The alignment of the Sea Link HVAC cables that have been developed following multi-part meetings with SPR and National Grid Ventures and is shown in Figure D-1, would enter the site of the Friston Substation from the north west and enter the new substation from the west. The Sea Link DCO provides significant flexibility for the cable routing to enable collaborative design of the cables specifically in order to enable development of alignments that minimise the impact on other developments and landscaping on the site.

D.3.13 The current alignment shown in the Works Plans (document 2.5.1) would interact with three features as shown on the EA2 OLEMS; a proposed cable sealing end compound to the north west of the substation, planting around the new cable sealing end compound and a proposed new sustainable drainage system pond to the west of the proposed Friston Substation. The cable sealing end compound and the northern drainage pond are no longer being progressed and plans that have now been submitted to ESC to discharge SPR's requirements do not show these features.

D.3.14 The small amount of planting to the north and west of the proposed sealing end compound in the OLEMS was primarily proposed to screen the compound so would not be required in the same form without the compound in place and are not included in the locations shown in the final landscape masterplan submitted by SPR. Given the limited area required for the cable easement, it would be possible to plant significantly more planting to the north west and west of Friston Substation than is shown in the OLEMS with Sea Link cables in place. This would achieve better outcomes than can be achieved through the planting shown in the OLEMS and better outcomes than is required by the EA1N and EA2 DCOs. Section Landscape Masterplan Produced by Scottish Power Renewables6 of this Technical Note shows the Applicant's proposals for how this could work.

D.3.15 The Sea Link HVDC cables similarly enter from the north west and travel south east to the east of the proposed Friston substation. The key interactions between these cables and features in the EA2 OLEMS are between the cables and two further proposed sealing end compounds and planting around these compounds. As with the

compound to the north west of the substation, these elements of the project are not being taken forward. These cables would also interact with planting to the east of the Friston substation, although again, the aims of the Outline LEMS can be achieved with Sea Link cables in place due to the limited interaction with this planting and the interaction being directed to a location where it would not open up views from sensitive receptors.

D.3.16 Importantly, the Sea Link proposals do not interact with any of the substantial woodland belts between Grove Road and the EA1N and EA2 substations as well as the woodland belts, hedgerows and field boundary trees to the south and south west of the substations, which are designed to provide screening for the main visual receptors on the northern edges of Friston. Neither do the Sea Link proposals interact with any of the woodland planting to the west of the Kiln Lane substation or along the permanent access road or the hedgerow and belt of woodland planting around the PRoW to the east of Little Moor Farm that is required to mitigate the effects of the SPR projects. The Sea Link proposals therefore do not materially interact with the essential mitigation described in the Environmental Statement or the OLEMS.

Comments on the adequacy of mitigation in the Examining Authority's (ExA) Recommendation on EA1N and EA2

D.3.17 The ESC LIR stated that: *'ESC notes that the ExA for the SPR projects states in Section 28.4.4 of the Recommendation Report (Volume 2 – Chapters 18-3113) that 'the local harm that the ExA has identified is substantial and should not be under-estimated in effect. Its mitigation has in certain key respects been found to be only just sufficient on balance'.*

D.3.18 The comment referenced above is contained in the ExA's Report of Findings and Conclusions and Recommendation to the SoS for Business, Energy and Industrial Strategy (October, 2021) (the ExA's recommendation). The comment is not clearly explained in the report and its meaning is not clear. Great care should therefore be taken when taking this general comment and stating that it has a very specific meaning for a particular environmental effect in a particular location; or means that a particular solution should be sought. NGET disagrees with the implication in ESC's LIR that this comment means that the outline management plans secured in the SPR consents are in some way insufficient; much less that this comment specifically requires introduction of a continuous woodland belt to the north of Friston Substation (which is the key planting that the Sea Link HVDC and HVAC cables interact with, see section D-5).

D.3.19 The Applicant would further note on that:

- The comment referenced by ESC was made by the ExA but was not echoed by the Secretary of State (SoS) in his final decision[5] (SoS Decision).
- The above comment was made in the summary of the application as a whole and not in a section about landscape and visual impacts or Friston specifically. A review of the report suggests that it could be about one or more of:
  - Onshore ecology: the ExA suggests that the proposed areas of ecological enhancement would not be sufficient overall to outweigh the adverse impacts on habitats that have been identified, particularly in the short-term due to construction operation (paragraph 10.6.1). But overall, the development was found to comply

[5] Department for Business, Energy and Industrial Strategy, 31 March 2022, Decision of the Application for Development Consent For the East Anglia Two Offshore Wind Farm.

with relevant legislation and policy with regard to ecological matters (paragraph 10.6.1).

  - Flood risk: The ExA was not satisfied that flood risk can be satisfactorily managed during construction, due to insufficient evidence provided, but they were satisfied that there would be no significant effects on flood risk during operation (paragraph 6.6.1).
  - Historic environment: Medium levels of harm to heritage assets were assessed, which the ExA considers it at the top end of the scale within the medium level (paragraph 8.6.2).
  - Landscape and visual: The ExA concludes that the development has been designed as carefully as possible and complies with para. 5.9.17 of EN-1 (development within setting of heritage assets), but significant harm would occur to the landscape and the proposal would not protect and enhance the special qualities of the area or the visual relationship and environment around Friston and Fristonmoor (paragraph 7.6.2).

- On the final point, the ExA and SoS particularly note that the EA1N and EA2 proposals would *'effectively divorce Friston from its northerly satellite'* (Fristonmoor) (paragraph 5.21 of the SoS Decision) and affect the *'landscape and settlement pattern'* (paragraph 5.22 of the SoS Decision). This impact is caused primarily by the development of the three substations between Friston and Fristonmoor and this effect cannot therefore be effectively mitigated by planting or otherwise. Therefore, even if this comment was specifically about landscaping at Friston, and there is no evidence that it is, there is no suggestion in the ExA's recommendation that this could be addressed through more planting than is included in the OLEMS.
- The OLEMS was examined extensively during the Examination for the EA1N and EA2 projects, and was secured in its final form as described in this Technical Note. Neither the ExA nor the SoS suggested significantly more mitigation planting would be required in the final version in their reports. Indeed, the SoS's Decision stated at paragraph 24.18 that: *'24.18 The ExA accepted [ER 26.4.26] that the OLEMS evolved throughout the examination and became a more detailed and useful document, but notes that although the additional planting proposed would provide benefits to visual receptors, that the change to openness of the landscape would have a consequential adverse effect.'* This acknowledges that the additional planting added to the OLEMS during Examination would itself have an adverse effect. This analysis does not suggest that the ExA or the SoS considered that more planting is required.
- The ExA and SoS agreed with the assessments of visual effects contained within the Applicant's assessment, apart from to residents at VP4 where the ExA considered significant harm would be caused (paragraph 5.21 of the SoS Decision). VP4 is to the south of Friston Substation, with the two SPR substations located between Friston Substation at VP4. This provides reassurance that there are no additional or different significant effects identified by the ExA and SoS that were not adequately mitigated by measures in the OLEMS.
- The ExA and SoS considered that the legal and policy framework for the consideration of alternatives and site selection (including Friston transmission connection location and cable corridors to it) had been met (paragraph 25.5.11 of the SoS Decision) and had been sufficient for EIA purposes (paragraph 25.6.1of the SoS Decision).

D.3.20 For all the reasons above, it is not considered that the referenced comment in the ExA's recommendation for the SPR projects is an important or relevant matter for the Sea Link application.

D.4 Mitigation Required for Sea Link

D.4.1 The ES for Sea Link considers two scenarios for Friston substation. Friston Substation Scenario 1 where Friston Substation is installed under the SPR consents and Friston Substation Scenario 2 where Friston Substation is built under the Sea Link consent.

D.4.2 Friston Substation Scenario 1 does not require specific landscape and visual mitigation in the area north of Friston as the Sea Link works, as outlined in section D-2 above, are either underground or limited to the existing compound. **Application Document 7.5.7.1 (B) Outline Landscape and Ecological Management Plan – Suffolk [CR1-045]** confirms the mitigation required for the underground cables. This mitigation predominantly comprises reinstatement of hedgerows in the first available planting season post construction, with a combination of whips where hedgerows are reinstated over the cable corridor, and whips and light standards or feathered trees beyond the cable corridor.

D.4.3 As described above, it is not considered that Sea Link will have a material impact on the essential mitigation for the SPR projects or the planting as required by the OLEMS. However, given that the Order limits for the projects overlap (and as acknowledged in section 5.7 of **Application Document 7.5.7.1 (B) Outline Landscape and Ecological Management Plan – Suffolk [CR1-045]**) there was the potential for the Sea Link HVDC and HVAC cable corridors to have a very minor effect on small areas of SPR planting as shown in the OLEMS. The main areas of planting in the OLEMS that could be affected are those around the cable sealing end compounds. However, given that these compounds have been removed from the SPR project, removing significant infrastructure located closer to northern properties than other elements of the project, the planting around the cable sealing end compounds is also not considered to be required. Had the planting around the cable sealing end compounds been required, it remains likely that it would still have been possible to avoid this planting with the cable corridors as gaps were left to enable cables to access Friston Substation.

D.4.4 There would also be a small area of woodland planting to the north east of the substation that would need to be hedgerow and shallower rooted scrub planting rather than trees where the underground HVDC cables pass through heading east. It is not considered that this would have had a material impact on the planting given hedgerow and scrub planting would still be present (so there would not be a ‘gap), the area affected would be small and the area is positioned so as not to be directly creating a view from a sensitive receptor to the substations. There is also already a gap in the planting in this location to accommodate the woodland planting offset from the existing overhead line. The cables would also need to pass under field boundaries where hedgerows and trees would be proposed, but as hedgerows can be retained the planting at these boundaries is not considered to be significantly impaired by the cables.

D.4.5 Given that there would have been no material impact on the functionality of the landscaping introduced by SPR under the OLEMS, it is not considered that there would have been a requirement for any mitigation for this impact beyond the mitigation required in other areas where the cables pass under existing hedgerows, i.e. the reinstatement of hedgerows as described in paragraph D.4.2.

D.4.6 Friston Substation Scenario 2 will require landscape and ecological mitigation for Friston Substation itself as outlined in section 5.7 and Figure 5 of **CR1-045**. The landscape and ecological mitigation presented in Figure 5 was developed based on

the consented SPR mitigation (in the OLEMS) and provided a combination of woodland planting, native hedgerow planting and grassland as set out in section 5.7 of **CR1-045**. This is an outline version and therefore it is expected that it will evolve to respond to the detailed design of the project after consent and in response to any details discharged or developed by SPR on the site prior to the start of construction for Sea Link. Whilst it is not considered necessary to continually update the Sea Link Outline LEMP based on the evolution of SPR plans on site, it is intended that this will be updated for Deadline 4 to increase consistency between this plan and the latest landscape masterplan produced by SPR.

D.4.7 In reality, Scenario 2 is considered to be highly unlikely and the final landscaping scheme under this scenario would depend on the amount of EA1N and EA2 that had been developed on site prior to work being required under the Sea Link consent, the status of any management plans discharged under the SPR consents and the programme for final completion of SPR works. Therefore, any management plan developed for this scenario will be subject to change depending on the reason that Scenario 2 is proceeding.

D.5 Landscape Masterplan Produced by Scottish Power Renewables

D.5.1 SPR have developed a landscape masterplan and submitted it to ESC to discharge requirement 14 on the EA2 DCO. This masterplan is understood to have been submitted on 11 December 2025 and is available on the East Suffolk Council website[6]. It is contained within a document entitled Onshore Substation Detailed Design Report: DCO Requirement 12 1) to (16) (Applicable to Work No.s 30 and 41), Scottish Power Renewables, December 2025. The requirement has not yet been discharged so this document does not currently form part of the consented project. NGET is making a representation in response to the document submitted raising the points raised in this Technical Note. ESC will be required to take these matters into account before discharging the requirement.

D.5.2 The Landscape Management Plan (LMP) and accompanying Onshore Substation Landscape Masterplan (Figure 2) and Landscape Mitigation Plans (Appendix 1) contained in the December 2025 submission describes the landscape proposals and the general maintenance and management requirements for EA2 Substations Stage to fulfil DCO Requirement 14 (1) & (2). The document states that it has been prepared in accordance with the OLEMS 2022 and refined as part of the detailed design, site visits, further modelling of views and landowner engagement.

D.5.3 Section 2.4 of the LMP states: '*It is anticipated that the landscape masterplan would have to be amended where the Sea Link or Lionlink cables come through. SPR will continue to work closely with both Sea Link and Lionlink on revised mitigation plans that address the effects of these cables on the landscape masterplan. EA2's engagement with NGET and NGV to date indicates that the cables for Sea Link and Lionlink could affect limited sections of trees to the north east and north west. Based on our knowledge, and engagement with NGET and NGV, it is considered that the functionality of the landscape framework can be maintained in the circumstances above*.'

D.5.4 The Landscape Masterplan includes some significant differences and additional planting that were not included in the OLEMS as set out below:

- Removal of woodland copse planting around sealing end compounds as these compounds are no longer required.
- Removal of SUDs pond to the west of Friston Substation as no longer required.
- Additional woodland planting to the eastern and western sides of Friston Substation where none previously existed.
- Additional woodland belt along the field boundary to the south of Little Moor Farm with the original triangle of woodland removed.
- New woodland belt extending from the south of Little Moor Farm in a south westerly direction creating a new field boundary, which the proposed PRoW diversion follows along the northern edge.

[6] See East Suffolk Planning Application Documents website, application reference DC/25/4827/DRR. Document accessed here on 8 January 2026: https://publicaccess.eastsuffolk.gov.uk/online-applications/files/5915EE81398006C6B0DF1ACED68EFF66/pdf/DC_25_4827_DRR-EA2-OND-CNS-REP-IBR-000001_DETAILED_DESIGN_REPORT__SUBSTATION_STAGE__REV._2-5717972.pdf

- New woodland belt along a historic field boundary replacing the previous boundary tree planting.
- Removal of the hedgerows, woodland belt and boundary tree planting previously proposed reinstating historic field boundaries to the south of Fristonmoor.
- Introduction of a lower growing and shallower rooted shrub/scrub mix of native species to be used over cable routes and in the vicinity of overhead cables.
- Introduction of an evergreen mix containing non-native species to be used in one location adjacent to the south of Moor Farm where fast, evergreen screening is desirable.

D.5.5 Whilst the majority of these changes are in accordance with the OLEMS, there are some notable exceptions, which introduce planting in the area proposed for Sea Link that did not previously exist with the OLEMS. The main difference is the introduction of a continuous belt of woodland creating a new field boundary and in effect entirely closing off the landscape to the north west of the substations. Whilst previously the Sea Link HVAC and HVDC cables could pass through this area crossing sections of hedgerows and field boundary trees, avoiding the woodland belts reinstating historic field boundaries south of Fristonmoor and copses of woodland, it is now not possible to design cable routes to access the substation and avoid the proposed new planting. Should it not be possible to replace some of the new planting with hedgerows to enable cables for the Sea Link project to reach Friston substation, this additional planting would be sterilising the future development of Friston substation, which would not be in accordance with the OLEMS.

D.5.6 Given that the OLEMS states that the measures within it are reflective and proportionate to the findings of the ES, it would be reasonable to conclude that the landscape mitigation presented in the OLEMS was sufficient to mitigate the impacts of the project as proposed in the EA1N and EA2 consents. Therefore, the additional planting described above is not 'necessary' for the EA1N and EA2 projects and is not essential 'mitigation' for the effects of the projects. Further detail on the landscape and visual effects reported in the Environmental Statements for EA1N and EA2, required mitigation and the interaction between that mitigation and the Sea Link project is provided in Table D.1 Table D.1 Summary of Potential Effects during Operation, mitigation and interface with Sea Link cable corridorsto provide further support for this position.

D.5.7 Should the additional planting proposed by SPR be required to be maintained in perpetuity with no potential parts of this belt to be hedgerows rather than trees, this could be considered as sterilising future development of Friston Substation, which would not then meant that the LMP was not in accordance with the OLEMS. However, the masterplan makes it clear that SPR consider that the small amendments required to the plan to facilitate Sea Link would not compromise the landscape framework. This is stated in paragraph 4.2.1.5 of the LMP:

D.5.8 *'It is anticipated that the landscape masterplan would have to be amended where the Sea Link or Lionlink cables come through. EA2L will continue to work closely with both Sea Link and Lionlink on revised mitigation plans that address the effects of these cables on the landscape masterplan. EA2L's engagement with NGET and NGV to date indicates that the cables for Sea Link and Lionlink could affect limited sections of trees to the north east and north west. Based on our knowledge, and engagement with NGET and NGV, it is considered that the functionality of the landscape framework can be maintained in the circumstances above.*

D.5.9 Table D.1 below presents a summary of the potential effects identified in the SPR LVIA for those landscape receptors and representative viewpoints that were assessed as experiencing potential significant effects at operation (Table 29.10 of Document 6.1.29) along with the consented mitigation (OLEMS 2022), the LMP 2025 mitigation and the interface with Sea Link.

This analysis demonstrates that whilst there may be minor amendments required to the landscaping presented in the LMP, or even more minor amendments to that presented in the OLEMP, the Sea Link project would not compromise the effectiveness of the landscape mitigation planting, as suggested by SCC and ESC.

Table D.1 Summary of Potential Effects during Operation, mitigation and interface with Sea Link cable corridors

Receptor	Significance of Effect (operation, first year of operational phase)	Significance of Effect (operation, 15 years post construction)	Mitigation (OLEMS 2022)	Interface with Sea Link cables and OLEMS 2022	Mitigation (Landscape Management Plan (LMP) 2025)	Interface with Sea Link cables and LMP 2025	Conclusion
LCT 01 Ancient Estate Claylands	**Significant** within localised area north of Friston within approximate 1 km area around onshore substation and National Grid substation. Not significant for remaining areas of LCT.	**Significant** within localised area north of Friston within approximate 1 km area around onshore substation and National Grid substation. Not significant for remaining areas of LCT.	OLEMS 2022, noting that the mitigation does not fully mitigate the effects due to the locally characterising effect that the substations have being present in the landscape.	The majority of the landscape mitigation would remain entirely unaffected other than in the following areas to the north west and north east of the substations. HVDC cables would cross the woodland belt to the north of Laurel Covert. HVDC and HVAC cables would cross the tree planting along the hedgerows to the south of Fristonmoor.	Onshore Substation Landscape Masterplan 2025 noting as with the OLEMS 2022, that the mitigation does not fully mitigate the effects due to the locally characterising effect that the substations have being present in the landscape.	The majority of the landscape mitigation would remain entirely unaffected other than in the following areas to the north west and north east of the substations. HVDC cables would cross the woodland belt to the north of Laurel Covert. HVDC and HVAC cables would cross the woodland belt to the north west of the substations and the hedgerow and tree planting to the south of Fristonmoor.	The Sea Link cable corridors would have a limited impact on the integrity and function of the landscape mitigation in both the OLEMS 2022 and the LMP 2025. The majority of the landscape structure would be unaffected and the small section of woodland belt, hedgerow and hedgerow tree planting that would be affected would be re-planted with hedgerows and native scrub planting such that the mitigation function would remain effective and SPR's predicted residual effects unchanged.
LCT 07 Estate Sandlands	**Significant** within localised area north of Friston within approximate 1 km area around onshore substation and National Grid substation. Not significant for remaining areas of LCT.	**Significant** within localised area north of Friston within approximate 1 km area around onshore substation and National Grid substation. Not significant for remaining areas of LCT.	As above	As above	As above	As above	As above
Viewpoint 1 Public Right of Way near Friston House	Significant	Not significant	OLEMS 2022, specifically woodland planting belts and hedgerows to the south west of the substations	Sea Link cables would not affect any of the planting designed to mitigate effects from this viewpoint	Onshore Substation Landscape Masterplan 2025, specifically woodland planting belts and hedgerows to the south west of the substations	Sea Link cables would not affect any of the planting designed to mitigate effects from this viewpoint	No impact to SPR mitigation planting or the residual effects

Receptor	Significance of Effect (operation, first year of operational phase)	Significance of Effect (operation, 15 years post construction)	Mitigation (OLEMS 2022)	Interface with Sea Link cables and OLEMS 2022	Mitigation (Landscape Management Plan (LMP) 2025)	Interface with Sea Link cables and LMP 2025	Conclusion
Viewpoint 2: Friston, Church Road	Significant	Significant	OLEMS 2022, specifically woodland planting belts and hedgerows to the south and south west of the substations.	Sea Link cables would not affect any of the planting designed to mitigate effects from this viewpoint.	Onshore Substation Landscape Masterplan 2025, specifically woodland planting belts and hedgerows to the south and south west of the substations	Sea Link cables would not affect any of the planting designed to mitigate effects from this viewpoint.	No impact to SPR mitigation planting or the residual effects.
Viewpoint 3: Grove Road, near Pear Tree Farm	No potential for significant effects and scoped out of further assessment	No potential for significant effects and scoped out of further assessment	N/A	N/A	N/A	N/A	N/A
Viewpoint 4: Friston, Grove Road	Not significant	Not significant	OLEMS 2022, specifically woodland planting belts and hedgerows to the south and south west of the substations.	Sea Link cables would not affect any of the planting designed to mitigate effects from this viewpoint.	Onshore Substation Landscape Masterplan 2025, specifically woodland planting belts and hedgerows to the south and south west of the substations.	Sea Link cables would not affect any of the planting designed to mitigate effects from this viewpoint.	No impact to SPR mitigation planting or the residual effects.
Viewpoint 5: Public Right of Way, near Moor Farm	Significant	Significant	OLEMS 2022, specifically the hedgerow and field boundary trees along the PRoW which the viewpoint is situated on and the woodland blocks to the south of Fristonmoor.	Sea Link cables would not affect the hedgerow and field boundary trees along the PRoW or the woodland blocks to the south of Fristonmoor. The cables would cross a section of the hedgerow and field boundary trees along a different section of the PRoW as it follows the field edge in a southerly direction but this would have limited influence on views from this viewpoint as the assessment concludes that the hedgerow lining the PRoW would provide an effective and immediate screening function alongside the PRoW such that walkers will not be able to see	Onshore Substation Landscape Masterplan 2025, specifically the hedgerow and field boundary trees along the PRoW which the viewpoint is situated on and the continuous belt of woodland to the south of Fristonmoor.	Sea Link cables would not affect the hedgerow and field boundary trees along the PRoW but would cross the woodland belt to the south of Fristonmoor. Whilst the break in the woodland belt would not be reinstated with trees, native scrub planting would provide a degree of layering within the landscape such that the desired screening from the various layers of re-instated hedgerows, individual field boundaries and the remaining belt of woodland would remain effective in its desired function. As with the OLEMS 2022 mitigation design the cables would also cross a	The Sea Link cable corridors would have a limited impact on the integrity and function of the landscape mitigation in both the OLEMS 2022 or the LMP 2025. The majority of the landscape structure would be unaffected and the small section of woodland belt, hedgerow and hedgerow tree planting that would be affected would be re-planted with hedgerows and native scrub planting such that the mitigation function would remain effective and SPR's predicted residual effects unchanged.

Receptor	Significance of Effect (operation, first year of operational phase)	Significance of Effect (operation, 15 years post construction)	Mitigation (OLEMS 2022)	Interface with Sea Link cables and OLEMS 2022	Mitigation (Landscape Management Plan (LMP) 2025)	Interface with Sea Link cables and LMP 2025	Conclusion
				directly the view of the substations.		section of the hedgerow and field boundary trees along a different section of the PRoW as it follows the field edge in a southerly direction. The hedgerow would be reinstated following the cable laying with hedgerow trees replanted either side of the cable corridor. This would have limited influence on views from this viewpoint as the assessment concludes that the hedgerow lining the PRoW would provide an effective and immediate screening function alongside the PRoW such that walkers will not be able to see directly the view of the substations.	
Viewpoint 6: Friston, Village Green	Not significant	Not significant	OLEMS 2022, specifically woodland planting belts and hedgerows to the south and south west of the substations.	Sea Link cables would not affect any of the planting designed to mitigate effects from this viewpoint.	Onshore Substation Landscape Masterplan 2025, specifically woodland planting belts and hedgerows to the south and south west of the substations.	Sea Link cables would not affect any of the planting designed to mitigate effects from this viewpoint.	No impact to SPR mitigation planting or the residual effects.
Viewpoint 7: Public Right of Way, east of Friston	No potential for significant effects and scoped out of further assessment	No potential for significant effects and scoped out of further assessment	N/A	N/A	N/A	N/A	N/A
Viewpoint 8: B1121 Saxmundham Road, north of Friston	Significant (residents) Not significant (motorists)	Significant (residents) Not significant (motorists)	OLEMS 2022, specifically woodland planting belts and hedgerows to the west of the substations.	Sea Link cables would not affect any of the planting designed to mitigate effects from this viewpoint.	Onshore Substation Landscape Masterplan 2025, specifically woodland planting belts and hedgerows to the west of the substations.	Sea Link cables would not affect any of the planting designed to mitigate effects from this viewpoint.	No impact to SPR mitigation planting or the residual effects.

Receptor	Significance of Effect (operation, first year of operational phase)	Significance of Effect (operation, 15 years post construction)	Mitigation (OLEMS 2022)	Interface with Sea Link cables and OLEMS 2022	Mitigation (Landscape Management Plan (LMP) 2025)	Interface with Sea Link cables and LMP 2025	Conclusion
Viewpoint 9: B1121 Aldeburgh Road, south of Friston	Significant (residents) Not significant (motorists)	Significant (residents) Not significant (motorists)	OLEMS 2022, specifically woodland planting belts and hedgerows to the south and south west of the substations.	Sea Link cables would not affect any of the planting designed to mitigate effects from this viewpoint.	Onshore Substation Landscape Masterplan 2025, specifically woodland planting belts and hedgerows to the south and south west of the substations.	Sea Link cables would not affect any of the planting designed to mitigate effects from this viewpoint.	No impact to SPR mitigation planting or the residual effects.
Viewpoint 10: B1119 Saxmundham Road	Not-significant	Not-significant	OLEMS 2022, specifically woodland planting belts and hedgerows to the north of the substations.	Sea Link cables would not affect any of the planting designed to mitigate effects from this viewpoint.	Onshore Substation Landscape Masterplan 2025, specifically woodland planting belts and hedgerows to the north of the substations.	Sea Link cables would not affect any of the planting designed to mitigate effects from this viewpoint.	No impact to SPR mitigation planting or the residual effects.
Viewpoint 11: Knodishall Hall	No potential for significant effects and scoped out of further assessment	No potential for significant effects and scoped out of further assessment	N/A	N/A	N/A	N/A	N/A
Viewpoint 12: Knodishall Common	No potential for significant effects and scoped out of further assessment	No potential for significant effects and scoped out of further assessment	N/A	N/A	N/A	N/A	N/A
Viewpoint 13: B1069 Snape Road	No potential for significant effects and scoped out of further assessment	No potential for significant effects and scoped out of further assessment	N/A	N/A	N/A	N/A	N/A
Viewpoint 14: Grove Road	Significant	Not-significant	OLEMS 2022, specifically woodland planting belts to the south and south east of the substations.	Sea Link cables would not affect any of the planting designed to mitigate effects from this viewpoint.	Onshore Substation Landscape Masterplan 2025, specifically woodland planting belts to the south and south east of the substations.	Sea Link cables would not affect any of the planting designed to mitigate effects from this viewpoint.	No impact to SPR mitigation planting or the residual effects.

D.6 Landscape Masterplan: NGET version

D.6.1 NGET has been working with SPR to discuss final proposals for the site at Friston and how the projects will work together. As part of this coordination, a landscape masterplan for the site with Sea Link cables in place has been developed by NGET. This is presented in Plate D.1. NGET's landscape masterplan for the whole site is based on the draft version of the Onshore Substation Landscape Masterplan contained in SPR's LMP 2025 (shared with NGET on 25 November 2025). It shows how the Sea Link HVDC and HVAC cables can interact with the LMP planting whilst maintaining the mitigatory function, particularly in screening the substation in key views from residential properties to the north, as identified as an objective in the OLEMS.

D.6.2 Sea Link cables would interface with three areas of the SPR Onshore Substation Landscape Masterplan as shown on Plate D.1, located at the end of this appendix, as follows:

- HVDC cables (denoted by A on Plate D.1) - eastern belt of woodland to the north of Laurel Covert and to the south of Fareacres. This has been designed to provide screening in views from Grove Road to the east and scattered properties in the wider landscape to the north east.
- HVAC and HVDC cables (denoted by B on Plate D.1) - northern belt of woodland to the south of Fristonmoor creating a new field boundary to the south of the diverted PRoW. This provides a screening function from sensitive visual receptors to the north (Fristonmoor and Little Moor Farm) as well as providing screening of the substations in views from users of the diverted PRoW.
- HVDC cables (denoted by C on Plate D.1) - hedgerow and field boundary tree planting along the historic field boundary to the south of Fristonmoor.

D.6.3 As illustrated in Plate D.1, it is possible that the Sea Link cables interface with the least sensitive sections of the SPR Landscape Masterplan enabling the desired function above to be retained. This is explained further below:

- The HVDC cables can cross the northern part of the woodland belt close to the existing overhead line and towers thereby maintaining the integrity of the screening function required by the woodland. This is denoted as B on Plate D.1. Whilst the HVDC cable corridor can't be planted over by woodland species, a shallower rooted shrub/scrub mix as identified in SPR's LMP can be used which would provide continuity of planting.
- The HVAC and HVDC cables can cross the western part of the belt of woodland south of Fristonmoor (denoted by B on Plate D.1). This would ensure that the woodland belt which screens views from the most sensitive viewing corridors from the properties to the north is entirely retained thereby maintaining the integrity of the desired screening function. Whilst the HVAC and HVDC cable corridors can't be planted over by woodland species, a shallower rooted shrub/scrub mix as identified in SPR's LMP can be used which would provide continuity of planting and would largely screen views of the substations from users of the diverted PRoW. The hedgerow along part of the northern edge of the diverted PRoW can be fully planted above the cable corridors.
- The HVDC cable corridors can cross the hedgerow and field boundary tree planting to the south of Fristonmoor maintaining all but a small section where boundary trees could not be planted (denoted by C on Plate D.1). This hedgerow and tree planting

follows a historic field boundary, provides vegetated layers within the landscape and runs alongside an existing PRoW. All of these desired mitigation functions can be fully retained with Sea Links cable corridors.

D.6.4 The necessary amendments as illustrated in Plate D.1 to the planting in SPR's Onshore Substation Landscape Masterplan to accommodate Sea Link can be achieved without altering the desired landscape function identified in SPR's LMP, nor give rise to any new potentially significant effects, as demonstrated in Table D.1. The plan would deliver enhancements to the site and significantly greater planting than was included in the consented OLEMS.

D.6.5 NGET is continuing to work with SPR on final proposals and intends to incorporate a final version of this plan into the Sea Link OLEMP at Deadline 4.

D.7 Process to Discharge and Amend SPR's Requirement Should it be Necessary

D.7.1 At present the SPR landscape masterplan referenced in this submission has not been discharged and is not therefore part of the consent for the EA1N and EA2 projects. NGET will be making representations to ESC raising the points discussed in this technical note. ESC will be required to take these matters into account before discharging the requirement. The LMP may not therefore be consented as currently submitted bearing in mind the significance of the points being made by NGET and to ensure effective coordination. However, should the LMP be nonetheless consented as drafted, there would be a need for SPR to re-discharge the requirement to accommodate the changes required to the LMP to accommodate the Sea Link cables.

D.7.2 The EA1N and EA2 consents include an identical requirement at requirement 40, which states:

D.7.3 *'Amendments to approved details*

D.7.4 *40.—(1) With respect to any requirement which requires the authorised project to be carried out in accordance with the details approved by the relevant planning authority or another person, the approved details must be carried out as approved unless an amendment or variation is previously approved in writing by the relevant planning authority or that other person in accordance with sub[1]paragraph (2).*

D.7.5 *(2) Any amendments to or variations from the approved details must be in accordance with the principles and assessments set out in the environmental statement. Such agreement may only be given in relation to immaterial changes where it has been demonstrated to the satisfaction of the relevant planning authority or that other person that the subject matter of the agreement sought is unlikely to give rise to any materially new or materially different environmental effects from those assessed in the environmental statement.*

D.7.6 *(3) The approved details must be taken to include any amendments that may subsequently be approved in writing by the relevant planning authority or that other person.'*

D.7.7 The SPR LMP makes it clear that the intention is for the changes required to the masterplan to accommodate Sea Link would be pursued through requirement 40, should the masterplan be discharged as currently proposed. This is stated in paragraph 4.2.1.5 of the LMP:

'It is anticipated that the landscape masterplan would have to be amended where the Sea Link or Lionlink cables come through. EA2L will continue to work closely with both Sea Link and Lionlink on revised mitigation plans that address the effects of these cables on the landscape masterplan. EA2L's engagement with NGET and NGV to date indicates that the cables for Sea Link and Lionlink could affect limited sections of trees to the north east and north west. Based on our knowledge, and engagement with NGET and NGV, it is considered that the functionality of the landscape framework can be maintained in the circumstances above. Based on our engagement with NGET and NGV, we have not been advised of any other changes that would be needed and we envisage that an appropriate revised mitigation plan can be agreed. Once an appropriate revised mitigation plan is agreed, EA2L will seek an amendment to its masterplan under Requirement 40 of the Development Consent Order and EA2L will work closely with NGET and/or NGV to bring forward amendments.'

D.7.8 Sea Link would primarily affect planting that was not included in the OLEMS, the planting effected is not essential mitigation, the impacts on the additional planting are minor, there would be no change to significant effects and the LMP would still deliver enhancements compared to that set out in the OLEMS. It is therefore considered that the changes required to accommodate Sea Link would meet all the required criteria for a variation to be approved under requirement 40. The changes would be immaterial and would not give rise to any materially new or materially different environmental effects from those assessed in the SPR Environmental Statement.

D.7.9 Further, if no amendment could be made to the LMP because the variation would not meet the criteria in requirement 40, then by definition the LMP would not accord with the OLEMS because it would sterilise land required for further development of the substation; and the LMP should then not be discharged as drafted. Similarly, any landscaping that prevented delivery of Sea Link would conflict with policies that support coordination between infrastructure projects, particularly given the recognised urgent and critical need for the Sea Link project (e.g. see coordination drivers set out in the Sea Link Coordination Document at section 2 **[APP-363]**).

D.7.10 Therefore, by definition, the SPR requirement should only be discharged as currently drafted if it is possible to amend the LMP under requirement 40 to make the amendments as presented in this section of the Technical Note.

D.8 Public Rights of Way

D.8.1 The SCC response quoted in D.1 states that:

D.8.2 *'This concern also applies to the footpath being created by SPR around the substation site which would face closure and disruption through Sea Link's open cut connection to the Kiln Lane substation. This would likely influence the habits of users and reduce future usage due to lengthy disruption and would require reinstatement. SCC does not see how the Applicant's commitment to coordination will secure avoidance of these impacts.'*

D.8.3 Should the PRoW be diverted in the manner currently envisaged in the SPR LMP, then a PRoW would be created in a circular loop around the substations and any new cables that connect into Friston substation would need to cross the new PRoW alignment. Linear elements of projects, including the HVDC and HVAC cables for Sea Link, are built in sections. Therefore, a section of cable, haul road and drainage that affects the PRoW would be constructed and then works would move on to the next section of the route. During the works that affect a PRoW, the Applicant would provide a localised diversion within the limits of deviation of the works. Diverted routes would be installed to the standard of the original PRoW and would be located a short distance from the original alignment. Any diversions would be constructed prior to works in the location of the PRoW so this PRoW would not be closed during works.

D.8.4 Once construction corridors are established, a controlled crossing on the alignment of the PRoW would be installed where the haul road crosses the PRoW. The haul road would have level crossing style gates, which would be open to walkers and only closed during vehicles passing. This means users of the PRoW would have right of way and would use the PRoW as normal once the short section has been constructed.

D.8.5 The diversions would not be lengthy, with each diversion likely to take approximately a week. It is not considered that this length of diversion would result in changes to the habit of users, particularly given that the diversions would be localised and in place before any works take place on the original PRoW alignment. PRoWs are frequently diverted for short periods of time for works to underground utilities and the impact on this PRoW north of Friston Substation is not considered to be significantly different to the temporary diversions required elsewhere on the Sea Link project, or indeed that are required for business as usual activities for utility providers.

D.8.6 The SCC response also assumes that a HDD solution would not result in any disruption to PRoW. Whilst it is likely that no closure and diversion would be required for an HDD solution, users would be temporarily stopped from using the footpath when the drill head passes under it for health and safety reasons, this could be up to 30mins per drill (we would have eight drills under the PRoW to the north of the substation). As we are proposing local diversions for the trenched crossing, the HDD would potentially be more disruptive to the PRoW user, therefore it is not considered less disruptive to use HDD.

D.8.7 The final proposals for management of PRoW affected by the Sea Link project will be set out in the final Public Rights of Way Management Plan submitted to discharge requirement 6 on the draft DCO and approved by the relevant planning authority. It is anticipated that by this time SPR will have diverted this PRoW and a final plan developed by Sea Link would likely align with proposed routes unless there is a reason this is not appropriate. The proposed approach would be discussed with the PRoW officer prior to a final plan being developed and submitted. National Grid is working

closely with SPR on all proposals affecting Friston Substation, including discussing the best solutions for PRoW on the site.

D.9 Alternative Installation Options

Introduction

D.9.1 The suggestion proposed by ESC and SCC on how to resolve the interaction between the SPR proposed additional landscaping described in D.5 and the underground Sea Link cables is that the cables should be installed using HDD rather than through an open cut trench. The main location for this HDD would be where the HVDC and HVAC cables cross the additional planting.

D.9.2 The ESC comment referenced in D1 stated that:

'ESC understands that NGET are reluctant to HDD under the consented landscape mitigation for the SPR projects due to cost. The alternative, however, is open cut and fill trenching through the landscape mitigation.'

D.9.3 SCC similarly stated in the comment referenced in D1 that:

D.9.4 *'SCC therefore reiterates its position that HDD should be used to connect to the Kiln Lane substation where the cable route interacts with SPR's mitigation as a necessary measure to avoid impacting that mitigation as far as possible.'*

D.9.5 The primary reason for the decision not to use HDD beneath the landscaping is not driven by cost. However, HDD is a significantly more expensive installation method so use of this method must be justified in the context of NGET's Electricity Licence obligations to be economic and efficient. SCC is correct that planting trees over cables that form part of the national transmission network is problematic due to the risks associated with high voltage cables and tree roots; and the criticality of the NETS. However, the presence of trees over high voltage cables can be problematic regardless of whether cables are installed through open cut trenching or using trenchless methods such as HDD. Therefore, it is incorrect to assume that this issue would be easily solved through a different installation technique.

D.9.6 This section provides further information on the below by explaining the challenges associated with HDD in this location and why, therefore, NGET consider that a materially better solution is the delivery of a coordinated, integrated masterplan as presented in D.7 and the cables to be installed using open cut.

D.9.7 **HDD and Tree Planting**

D.9.8 The assumption made in the statements from ESC and SCC is that trees can be planted over cables where cables are installed using HDD methods and not where cables are installed through open cut trenching.

D.9.9 Where it is necessary to install cables under trees (or plant trees over cables), the cables would need to be installed at a depth that ensures cables would not affect or be affected by the tree roots either through damage or drying out of the ground. This is the case regardless of whether a cable is installed via open cut or HDD, although it is easier to achieve the greater depths required using HDD. If the cables are installed at a shallow depth using HDD, trees cannot be planted over the cables.

D.9.10 Where the HDD depths required to enable retention of trees over a cable are achievable based on the geology, the cables would then need to be rated[7], sized and spaced apart to accommodate the additional depth required. Where cables are buried

[7] the rating is a comprehensive set of electrical and thermal limits ensuring the cable performs safely and reliably under demanding high-voltage conditions,

deeper this has an effect on the rating due to the inability for the heat to dissipate from the cables.

D.9.11 HDD is particularly challenging for the HVAC cables north of Friston. The Sea Link HVAC cables follow a route from the Saxmundham converter site to the Friston Substation and are the cable alignments shown in blue in Figure D1. There are two circuits required to achieve the necessary cable rating for Sea Link and this will mean one cable for each phase of each three phase circuit (6 cables in total) in this location, with necessary separation between the cables. It is presumed that ESC and SCC's suggestion is that these cables are installed using HDD for the section where they cross the additional planting proposed by SPR to the north west of Friston Substation and the proposed PRoW diversion. The HVAC cables at this location are proposed to be direct buried at a depth of between 0.9 and 1.2m along this route. This is a relatively shallow depth.

D.9.12 The ratings that can be achieved by a cable system are dependent on the thermal resistivity, depth and spacing of the cable at the most constrained point of the system. The Sea Link HVAC cables are designed with a 2500mm^2 copper conductor, which is the largest cable size currently in service in the NGET network. Despite the large cable being proposed, the rating required dictates a shallow cable burial. Should a HDD be used to pass under trees, the depth of any such HDD may need to be up to 15m to ensure adequate spacing from the route zone of the trees. At this depth, the cable system would not achieve the rating required.

D.9.13 From a theoretical perspective, it would be possible to increase the rating of the cable by increasing the cross section of the conductor; a copper conductor of 3200mm^2 or greater may be able to achieve the necessary rating at the depth required. However, there are a number of challenges with this solution that would need to be overcome:

- There is currently no cable system on the NGET network of this size, this presents a first of a kind technology risk.
- There is currently no type registered cable system of this size that NGET could readily deploy. Type registration is the process that National Grid uses to ensure that all equipment deployed on the transmission system meets National Grid Standards and Technical Requirements.
- It is unclear if the manufacturer of the cable has a commercially available and deliverable product suitable and if there was availability, the lead times for such a cable are unknown. This is important given the critical nature of the programme for the Sea Link project.
- HDD requires large working areas to be set up at the launch and receive pits when implementing trenchless technologies and, due to the increased depth of cables required for HDD and the additional construction space required, the greater cable separation further increases the working area at each end. The greater cable separation also means a greater area is required for the final cable easement as a whole.
- The impact of the larger conductor on the converter station and substation would need further study to establish if further equipment would be required. The areas for the facilities may need to be expanded compared to that currently presented.
- Assuming the above challenges could be overcome, the area required for HDD may prevent a future project, such as LionLink, from sharing the same route corridor. This

may result in greater cumulative effects with future projects compared to the current open cut solution.

- The environmental impacts of an HDD solution would need to be assessed, however, it is considered highly likely that the environmental impacts of an HDD solution would be greater than those of the open cut solution in this location when all disciplines are considered. This is because the programme is generally longer for an HDD solution, HDD is a 24/7 operation rather than completed within set working hours (potentially with greater noise effects), HDD would require closures (albeit short in duration) of PRoW rather than diversions, and if the cables are installed at a shallow depth, the planting over the cables would be no different to that over cables at the same depth installed using open cut. Given that the cables are underground after installation, the operational effects of the cables are very limited so the greater construction effects are likely to mean that HDD performs worse from an environmental perspective than open cut.

D.9.14 The challenges, risks, programme delays and cost implications of an HDD solution for the HVAC cables are significant. NGET have duties under the Electricity Act 1989 to develop a coordinated, economic and efficient system (as do other developers with licences issued under the 1989 Act). It is considered that the coordinated and efficient solution is for a coordinated landscaping scheme to be developed for the site that accommodates Sea Link as described in section D.7 of this Technical Note. It is not considered necessary or reasonable for NGET to consider using HDD to install cables north of Friston Substation in the above context. This is particularly given that the trees to be affected have not yet been planted and the landscaping affected was not included in the OLEMS for the SPR project.

D.9.15 The technical challenges associated with the HVAC cables are significantly greater than those for the HVDC cables. However, the HVDC cables also affect a significantly smaller area of planting because they comprise a single circuit of two cables rather than two circuits of three cables with a space in between. Therefore, the benefits of an HDD method to the planting for HVDC cables are even more limited than for the HVAC cables. The adverse effects of the cables in terms of requiring a longer installation period, significantly greater cost and larger working areas cannot be justified in the context of the very limited benefits.

D.10 Conclusion

D.10.1 The Examining Authorities written question 1LVIA15 requested that the Applicant:

D.10.2 *'Provide a response to SCC's comment at deadline 2 Ref A2.1 in relation to the need for HDD to connect to the substation to avoid undermining SPR mitigation planting.'*

D.10.3 This Technical Note has responded to this request by discussing in detail the mitigation planting required in the SPR consent and how the Sea Link proposals would not undermine that landscaping under current proposals. The Technical Note also examines the landscaping proposals that have been developed by SPR and explains that whilst there are greater interactions between the Sea Link cables and the proposed planting, this additional planting is not considered to be essential mitigation and the Sea Link cables would not undermine the effectiveness of the SPR landscaping. It is also noted that SPR's documents support the Applicant's position, concluding that the Sea Link cables could be installed in a way which would not compromise the landscape framework.

D.10.4 This Technical Note also provides a proposed coordinated masterplan for the site that would deliver additional planting compared to the SPR OLEMS and a landscape masterplan that is very similar the recent SPR proposal with the Sea Link cables in place and installed using an open cut solution. NGET is coordinating with SPR to agree this further and intends to include a final version in a revised version of the Outline LEMP at Deadline 4. Given that Sea Link would not undermine SPR's landscaping and an integrated, coordinated solution can be delivered on site, the Applicant disagrees that there is any need for the cables at the site north of Friston to be installed using an HDD method.

D.10.5 The Technical Note also explores the impact of the cables on the proposed PRoW diversion to the north of Friston Substation, concluding that the impacts are very limited and again, would not justify installation of cables using an HDD method.

D.10.6 Finally, the Technical Note provides further information on the reasons why a HDD method is particularly unsuitable for the HVAC cables at Friston Substation, and why the need for this installation method would need to be very strong to justify this solution.

D.10.7 Overall, whilst a HDD solution is not impossible, it is not necessary, proportional, nor would it deliver the best outcome for the environment where the proposal is to HDD under an area of open field where trees may be planted in the future. Nor would it be the best option for the efficient and economical delivery of this urgent major infrastructure project.



Legend

- Species Rich Neutral Grassland
- Native woodland and tree planting
- Native shrub planting across Sea Link HVDC cable corridors
- Diverted drainage channel with hedgerow planting
- SUDs
- Hedgerow
- Tree planting
- Sea Link HVAC Cable indicative alignment
- Sea Link HVDC Cable indicative alignment
- Viewing cone

A, B, C Refer to section D.6 of Appendix D of Application Document 9.73.1 Applicant's Responses to First Written Questions

Note: This drawing uses the draft version of the Landscape Masterplan provided to NGET by SPR on 25/11/2025, not yet approved

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nationalgrid

Scheme:	SEA LINK
Document Title:	NGET version of the Landscape Masterplan produced by SPR accommodating Sea Link

Creator:	Date:	Checker:	Date:	Approver:	Date:
BL	07/01/26	RM	07/01/26	BS	

Document Ref:	Scale:	Format:	Sheets:	Rev:
D-1	1:7500	A3	1	2026.01.07

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Appendix E Cultural Heritage Figures

Legend

- Order Limits
- Sea Link Evaluation Trenching
- East Anglia 1 and East Anglia 2 Evaluation Trenching
- Area of Lion Link Evaluation Trenching
- Not subject to trenching due to crops (i.e. Christmas Tree cultivation)
- Not subject to trenching due to other developments taking place
- Not subject to trenching due to other reasons (i.e. Order Limit changes)
- Not subject to trenching due to Suffolk Onshore Scheme not involving intrusive works (i.e. ecological mitigation areas and OHL works)

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Rev	Date	Description	GIS	Chk	App
0	19/12/2025	APPLICANT'S RESPONSES TO FIRST WRITTEN QUESTIONS APPENDIX E: CULTURAL HERITAGE FIGURES	DF	EB	JS

nationalgrid

Scheme: SEA LINK

Document Title: ARCHAEOLOGICAL EVALUATION TRENCHING WITHIN THE SEA LINK ORDER LIMITS

Creator:	Date:	Checker:	Date:	Approver:	Date:
DF	19/12/2025	EB	19/12/2025	JS	19/12/2025

Document Ref:	Scale:	Format:	Sheets:	Rev:
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Appendix F Lists of Heritage Assets Scoped Out of Assessment

F.1 Introduction

F.1.1 The agreed Study Areas for the Cultural Heritage impact assessment are defined in Section 3.1 of **Application Document 6.3.2.3.A Part 2 Suffolk Chapter 3 Appendix 2.3.A Cultural Heritage Baseline Report [APP-109]** and **Application Document 6.3.3.3.A Part 2 Kent Chapter 3 Appendix 3.3.A Cultural Heritage Baseline Report [APP-161]**. **Tables F.1- F.4** in this appendix list all designated and non-designated heritage assets within the defined Study Areas which were scoped out of full impact assessment in the Cultural Heritage ES Chapters for the Suffolk Onshore Scheme and the Kent Onshore Scheme, due to the likelihood for their being no impact or negligible impact to their heritage value. In response to question 1CH2 from the Examining Authority, a rationale is provided for scoping the assets out of the ES chapters, and an assessment of any impacts and effects to the asset is provided, as well as an assessment of the degree of harm to the assets.

F.1.2 Both the 500 m Study Area adopted to inform the baseline and the wider 2 km Study Area used to assess impacts through change to the setting of designated heritage assets were agreed with the Archaeological Advisors at KCC and SCC and the Inspector of Ancient Monuments at Historic England at the EIA scoping stage.

Table F.1 Suffolk Onshore Scheme designated assets within the 2km Study Area for assessment of effects through change to setting which were scoped out of full assessment in the Cultural Heritage ES Chapter.

Asset ID (NHLE)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
1287864	Grade II* Listed	Church of St Mary	Scoped Out	Asset assessed as part of the consented EA1N/2 project. No additional impacts predicted in relation to the Suffolk Onshore Scheme	No additional impact. **Neutral** (not significant)	No additional harm
1278252	Grade II* Listed	Church of St Mary Magdalene	Scoped Out	Lack of potential for significant impacts due to existing screening vegetation and lack of functional setting relationship with land within the Order Limits	Negligible impact on an asset of High Value resulting in a **Minor Adverse** effect (not significant)	Less than substantial harm at the low end of the scale
1215741	Grade II* Listed	Friston Post Mill	Scoped Out	Asset assessed as part of the consented EA1N/2 project. No additional impacts predicted in relation to the Suffolk Onshore Scheme	No additional impact. **Neutral** (not significant)	No additional harm
1215749	Grade II* Listed	Buxlow Manor	Scoped Out	Lack of potential for significant impacts due to existing screening vegetation and local topography	Negligible impact on an asset of High Value resulting in a **Minor Adverse** effect (not significant)	Less than substantial harm at the low end of the scale
1365996	Grade II* listed	The Beeches Including Stable Block	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
1215745	Grade II* listed	Church Of St Lawrence	Scoped Out	Asset assessed as part of the consented EA1N/2 project with no impact predicted. No additional impacts predicted in relation to the Suffolk Onshore Scheme	No impact. **Neutral** (not significant)	No harm
1030902	Grade II* listed	Church Of St Mary	Scoped Out	Lack of potential for significant impacts due to distance, existing screening vegetation, and local topography	No impact. **Neutral** (not significant)	No harm
1030668	Grade II* listed	Church Of St Peter	Scoped Out	Lack of potential for significant impacts due to distance, existing screening through intervening built form, and local topography	No impact. **Neutral** (not significant)	No harm
1215744	Grade II Listed	Woodside Farmhouse	Scoped Out	Asset assessed as part of the consented EA1N/2 project. No additional impacts predicted in relation to the Suffolk Onshore Scheme	No additional impact. **Neutral** (not significant)	No additional harm
1216049	Grade II Listed	High House Farm	Scoped Out	Asset assessed as part of the consented EA1N/2 project. No additional impacts predicted in relation to the Suffolk Onshore Scheme	No additional impact. **Neutral** (not significant)	No additional harm
1215743	Grade II Listed	Little Moor Farm	Scoped Out	Asset assessed as part of the consented EA1N/2 project. No additional impacts predicted in relation to the Suffolk Onshore Scheme	No additional impact. **Neutral** (not significant)	No additional harm
1287971	Grade II Listed	Numbers 1 and 2 (Church Walls), Numbers 3 and 4	Scoped Out	Asset assessed as part of the consented EA1N/2 project. No additional impacts predicted in relation to the Suffolk Onshore Scheme	No additional impact. **Neutral** (not significant)	No additional harm

Asset ID (NHLE)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
		(Church Walls Cottage)				
1216066	Grade II Listed	Friston House	Scoped Out	Asset assessed as part of the consented EA1N/2 project. No additional impacts predicted in relation to the Suffolk Onshore Scheme	No additional impact. **Neutral** (not significant)	No additional harm
1278253	Grade II Listed	8-10, Church Hill	Scoped Out	Lack of potential for significant impacts due to existing screening vegetation and lack of functional setting relationship with land within the Order Limits	No impact. **Neutral** (not significant)	No harm
1435814	Grade II Listed	Friston War Memorial	Scoped Out	Asset assessed as part of the consented EA1N/2 project. No additional impacts predicted in relation to the Suffolk Onshore Scheme	No additional impact. **Neutral** (not significant)	No additional harm
1258312	Grade II Listed	Garden Cottage	Scoped Out	Lack of potential for significant impacts due to existing screening vegetation and lack of functional setting relationship with land within the Order Limits	No impact. **Neutral** (not significant)	No harm
1030866	Grade II Listed	The Limes	Scoped Out	Lack of potential for significant impacts due to existing screening vegetation and lack of functional setting relationship with land within the Order Limits	No impact. **Neutral** (not significant)	No harm
1215751	Grade II Listed	Duffield House	Scoped Out	Lack of potential for significant impacts due to existing screening vegetation and lack of functional setting relationship with land within the Order Limits	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
1458741	Grade II Listed	Sternfield War Memorial	Scoped Out	Lack of potential for significant impacts due to existing screening vegetation and lack of functional setting relationship with land within the Order Limits	No impact. **Neutral** (not significant)	No harm
1231300	Grade II Listed	Sternfield House	Scoped Out	Lack of potential for significant impacts due to existing screening vegetation and lack of functional setting relationship with land within the Order Limits	Negligible impact on an asset of Medium value resulting in a **Negligible Adverse** effect (not significant)	Less than substantial harm at the low end of the scale
1268183	Grade II Listed	Church House	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1287772	Grade II Listed	Pattle's Farmhouse	Scoped Out	Asset assessed as part of the consented EA1N/2 project with no impact predicted. No additional impacts predicted in relation to the Suffolk Onshore Scheme	No impact. **Neutral** (not significant)	No harm
1231355	Grade II Listed	Thatched Cottage	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Sternfield with screening provided by intervening built form and vegetation.	No impact. **Neutral** (not significant)	No harm
1287969	Grade II Listed	Gate And Gate Piers 15 Metres North East of Friston Hall	Scoped Out	Asset assessed as part of the consented EA1N/2 project with no impact predicted. No additional impacts predicted in relation to the Suffolk Onshore Scheme	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
1278254	Grade II Listed	Start Farm	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Sternfield with screening provided by intervening built form and vegetation.	No impact. **Neutral** (not significant)	No harm
1278255	Grade II Listed	34 and 35, The Street	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Sternfield with screening provided by intervening built form and vegetation.	No impact. **Neutral** (not significant)	No harm
1278167	Grade II Listed	1 and 2, The Street	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Sternfield with screening provided by intervening built form and vegetation.	No impact. **Neutral** (not significant)	No harm
1215909	Grade II Listed	Friston Hall	Scoped Out	Asset assessed as part of the consented EA1N/2 project with no impact predicted. No additional impacts predicted in relation to the Suffolk Onshore Scheme	No impact. **Neutral** (not significant)	No harm
1268164	Grade II Listed	Crown House	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1268163	Grade II Listed	The White House	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
1268162	Grade II Listed	Monks Cottages	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1278159	Grade II Listed	Sternfield Hall	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Sternfield with screening provided by intervening built form and vegetation.	No impact. **Neutral** (not significant)	No harm
1268161	Grade II listed	16, South Entrance	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1268160	Grade II listed	Ivy House	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1268159	Grade II listed	Beech Lawn House Including Orangery to Rear	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1268158	Grade II listed	Beech Lawn Cottage	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				screening provided by intervening built form.		
1366002	Grade II listed	Priory House	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1268186	Grade II listed	2, High Street	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1268189	Grade II listed	Holly Lodge	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1268187	Grade II listed	6, 6a and 8, High Street	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1268181	Grade II listed	Chantry Cottages	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1268188	Grade II listed	10, High Street	Scoped Out	Lack of potential for significant impacts due to asset's location within the built	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				environment of Saxmundham with screening provided by intervening built form.		
1268182	Grade II listed	14 and 16, Chantry Road	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1268190	Grade II listed	White Hart Hotel	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1268191	Grade II listed	23, High Street	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1268192	Grade II listed	25 and 27, High Street	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1365984	Grade II listed	Market Hall, Front Steps and Attached Railings	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
1268193	Grade II listed	26, 26a and 26b, High Street	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1268195	Grade II listed	Bell Hotel	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1365983	Grade II listed	Ashford House	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1365985	Grade II listed	Old Bank House Including Railings to Front	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1268196	Grade II listed	33, High Street	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1365990	Grade II listed	Wingfield House	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				screening provided by intervening built form.		
1268197	Grade II listed	35, High Street	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1268194	Grade II listed	28 and 30, High Street	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1365986	Grade II listed	4 and 6, Market Place	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1268180	Grade II listed	10 and 12, Albion Street	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1268179	Grade II listed	1-15, Albion Street	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
1365987	Grade II listed	7 and 7a, Market Place	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1365988	Grade II listed	8, Market Place	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1268198	Grade II listed	39, High Street	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1365991	Grade II listed	9, 11, 15 and 19, Market Place	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1365992	Grade II listed	17, Market Place	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1377133	Grade II listed	5 and 6, Benhall Green	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Sternfield with screening	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				provided by intervening built form and vegetation.		
1365993	Grade II listed	21 and 23, Market Place	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1365989	Grade II listed	16, Market Place	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1365982	Grade II listed	46, High Street	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1030906	Grade II listed	7 and 8, Benhall Green	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Sternfield with screening provided by intervening built form and vegetation.	No impact. **Neutral** (not significant)	No harm
1030905	Grade II listed	Bay Tree Cottages	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Sternfield with screening provided by intervening built form and vegetation.	No impact. **Neutral** (not significant)	No harm
1187694	Grade II listed	Benhall Stores	Scoped Out	Lack of potential for significant impacts due to asset's location within the built	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				environment of Sternfield with screening provided by intervening built form and vegetation.		
1280113	Grade II listed	Lime Tree House	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Sternfield with screening provided by intervening built form and vegetation.	No impact. **Neutral** (not significant)	No harm
1030907	Grade II listed	Oak Cottage	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Sternfield with screening provided by intervening built form and vegetation.	No impact. **Neutral** (not significant)	No harm
1366000	Grade II listed	Post Mill Roundhouse	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1280112	Grade II listed	31 and 33, Benhall Green	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Sternfield with screening provided by intervening built form and vegetation.	No impact. **Neutral** (not significant)	No harm
1231182	Grade II listed	Briar Cottage	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Sternfield with screening provided by intervening built form and vegetation.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
1231328	Grade II listed	Sandy Cottage	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Sternfield with screening provided by intervening built form and vegetation.	No impact. **Neutral** (not significant)	No harm
1365994	Grade II listed	Lynwood House	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1030908	Grade II listed	Benhall Cottage	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Sternfield with screening provided by intervening built form and vegetation.	No impact. **Neutral** (not significant)	No harm
1377134	Grade II listed	28, Benhall Green	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Sternfield with screening provided by intervening built form and vegetation.	No impact. **Neutral** (not significant)	No harm
1377095	Grade II listed	Whitehouse Farmhouse	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Sternfield with screening provided by intervening built form and vegetation.	No impact. **Neutral** (not significant)	No harm
1365995	Grade II listed	Varley House	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				screening provided by intervening built form.		
1365997	Grade II listed	Fairfield Preparatory School	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1231183	Grade II listed	Brook Farmhouse	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Sternfield with screening provided by intervening built form and vegetation.	No impact. **Neutral** (not significant)	No harm
1268185	Grade II listed	Fairfield House East, Fairfield House South, Brook Farmhouse	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1365998	Grade II listed	24, North Entrance	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1365999	Grade II listed	Brook Cottage	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Saxmundham with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
1458639	Grade II listed	Knodishall War Memorial	Scoped Out	Asset assessed as part of the consented EA1N/2 project with no impact predicted. No additional impacts predicted in relation to the Suffolk Onshore Scheme	No impact. **Neutral** (not significant)	No harm
1298587	Grade II listed	The Old House	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Sternfield with screening provided by intervening built form and vegetation.	No impact. **Neutral** (not significant)	No harm
1051979	Grade II listed	Old Vicarage	Scoped Out	Lack of potential for significant impacts due to asset's location within the built environment of Sternfield with screening provided by intervening built form and vegetation.	No impact. **Neutral** (not significant)	No harm
1287793	Grade II listed	Knodishall Place	Scoped Out	Asset assessed as part of the consented EA1N/2 project with no impact predicted. No additional impacts predicted in relation to the Suffolk Onshore Scheme	No impact. **Neutral** (not significant)	No harm
1278703	Grade II listed	Home Farmhouse	Scoped Out	Asset assessed as part of the consented EA1N/2 project with no impact predicted. No additional impacts predicted in relation to the Suffolk Onshore Scheme	No impact. **Neutral** (not significant)	No harm
1452390	Grade II listed	Benhall War Memorial Cross	Scoped Out	Asset assessed as part of the consented EA1N/2 project with no impact predicted. No additional impacts predicted in relation to the Suffolk Onshore Scheme	No impact. **Neutral** (not significant)	No harm
1377218	Grade II listed	Carlton Rookery	Scoped Out	Lack of potential for significant impacts due to distance, existing screening	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				through intervening built form, and local topography		
1198857	Grade II listed	Carlton Cross	Scoped Out	Lack of potential for significant impacts due to distance, existing screening through intervening built form, and local topography	No impact. **Neutral** (not significant)	No harm
1278152	Grade II listed	Watering End	Scoped Out	Lack of potential for significant impacts due to distance, existing screening vegetation and built form, and local topography	No impact. **Neutral** (not significant)	No harm
1198955	Grade II listed	Oak Tree Farmhouse	Scoped Out	Lack of potential for significant impacts due to distance, existing screening vegetation, and local topography	No impact. **Neutral** (not significant)	No harm
1030901	Grade II listed	Benhall Lodge Stables	Scoped Out	Lack of potential for significant impacts due to distance, existing screening vegetation and built form, and local topography	No impact. **Neutral** (not significant)	No harm
1227893	Grade II listed	Westhouse Farmhouse	Scoped Out	Lack of potential for significant impacts due to distance, existing screening vegetation, and local topography	No impact. **Neutral** (not significant)	No harm
1030903	Grade II listed	Old Lodge	Scoped Out	Lack of potential for significant impacts due to distance, existing screening vegetation, and local topography	No impact. **Neutral** (not significant)	No harm
1230328	Grade II listed	Walnut Tree Farmhouse	Scoped Out	Lack of potential for significant impacts due to distance, existing screening vegetation, and local topography	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
1206668	Grade II listed	Hill House Farmhouse	Scoped Out	Lack of potential for significant impacts due to distance, existing screening vegetation, and local topography	No impact. **Neutral** (not significant)	No harm

Table F.2 Suffolk Onshore Scheme designated and non-designated assets within the 500m Study Area for establishing the cultural heritage baseline which were scoped out of full assessment in the Cultural Heritage ES Chapter. Note this excludes designated assets that also fall within the 2km Study Area for assessment of effects through change to setting as those assets are discussed in Table F.1 above.

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
1269753	Grade II Listed	Gorsehill	Scoped Out	Lack of potential for impact. Asset located outside the 2km Study Area for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
1269711	Grade II Listed	Red House	Scoped Out	Lack of potential for impact. Asset located outside the 2km Study Area for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SXM 086	Non-designated	OUTLINE RECORD - Test pitting and Borehole, Lion Link (CA) MON GEO	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
SNF 036	Non-designated	Outline Record - Lion link (WA) GEO CA (MON)	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 064	Non-designated	Subcircular and circular geophysical anomalies	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 203	Non-designated	Possible soilmark enclosure	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 010	Non-designated	Medieval scatter of pottery and red burnt clay.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 253	Non-designated	Brick Kiln Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				effects through change to setting and there would be no physical impact to the asset.		
ADB 063	Non-designated	World War II anti-aircraft ditches.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 003	Non-designated	Gorse Hill	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 060	Non-designated	World War II anti-tank ditches.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 356	Non-designated	Outline Record - Sea Link (OA) EVAL	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
ADB 040	Non-designated	Three Post-Medieval quarries.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 058	Non-designated	Post-Medieval sea bank, Aldeburgh.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 096	Non-designated	Quarry, visible as an earthwork north of Eight Acre Covert.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 101	Non-designated	Post-Medieval path or track.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 069	Non-designated	Post-Medieval brick- earth quarry pit.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
ADB 063	Non-designated	World War II anti-aircraft ditches.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 204	Non-designated	Probable World War Two practice trench	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 095	Non-designated	Linear banks, of unknown date, visible on the golf course at South Warren.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 349	Non-designated	Location of Second World War Roadblock at Aldeburgh	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 163	Non-designated	Small finds assemblage	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				effects through change to setting and there would be no physical impact to the asset.		
ADB 063	Non-designated	World War II anti-aircraft ditches.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 006	Non-designated	Extensive cropmark site.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 261	Non-designated	OUTLINE RECORD: Grainstore Field, west of Chapel Field (ADLHS) FW	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 038	Non-designated	Four Post-Medieval quarries, visible as earthworks.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
ADB 269	Non-designated	North Warren, Aldeburgh	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 226	Non-designated	Aldeburgh branch railway line	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 268	Non-designated	Farmstead: Crag Pit Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 061	Non-designated	Remains of a footbridge crossing The Haven leading to Haven House.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 265	Non-designated	Farmstead: Chapel Barn	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
ADB 205	Non-designated	Probable World War Two practice trench	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 093	Non-designated	Linear bank, visible as an earthwork to the south of Valley Grange.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 102	Non-designated	Post-Medieval clay extraction pit.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 223	Non-designated	Chapel Barn Farm, Aldeburgh (ADLHS) FW	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
ADB 209	Non-designated	Possible gun emplacement for 'Diver' HAA site	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 350	Non-designated	Location of Second World War Roadblock at South Warren, Aldeburgh	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 264	Non-designated	Farmstead: Red House Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 015	Non-designated	The Red House	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 095	Non-designated	Linear banks, of unknown date, visible on the golf course at South Warren.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
ADB 348	Non-designated	Location of Second World War Roadblock at Aldeburgh	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 181	Non-designated	Modern features and several sherds of Roman pottery	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 011	Non-designated	Golf Course	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 206	Non-designated	World War Two searchlight battery	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 005	Non-designated	Hazlewood Church; Church of St Mary	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				effects through change to setting and there would be no physical impact to the asset.		
ADB 339	Non-designated	Position for a Second World War Machine Gun Post at Aldeburgh	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 347	Non-designated	Location of Second World War road crater position at Aldeburgh	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 037	Non-designated	World War II anti-aircraft obstructions.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 092	Non-designated	A possible World War II strongpoint including trenches and barbed wire.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
ADB 159	Non-designated	A sea-bank, probably Post-Medieval in date, on the northern bank of the river Alde.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 207	Non-designated	Soilmark of possible field boundary/trackway	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 095	Non-designated	Linear banks, of unknown date, visible on the golf course at South Warren.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 020	Non-designated	World War Two strongpoint comprising communication trenches and pillboxes	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 023	Non-designated	Milestone on the A1094	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
ADB 200	Non-designated	World War II 'Diver' HAA battery	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 103	Non-designated	World War II 'Diver' HAA battery.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ADB 106	Non-designated	A World War II Anti-tank ditch	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
ARG 092	Non-designated	Post-Medieval brick kiln	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
ARG 119	Non-designated	Thorpe and Aldringham Commons	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
BNL 006	Non-designated	Catnaps Field, Bigsby's Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
BNL 007	Non-designated	Green Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
BNL 043	Non-designated	Neolithic polished axe, Benhall Green	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
DUN 148	Non-designated	Neolithic flint axe, Dunwhich shore	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
FRS 018	Non-designated	Thee Post-Medieval quarry pits	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 009	Non-designated	Ring ditch and possible round barrow, both of unknown date	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 093	Non-designated	Position for a Second World War Machine Gun Post west of north of Snape Road, Friston	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 018	Non-designated	Thee Post-Medieval quarry pits	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 019	Non-designated	WW2 emplacements,	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
		military training site and slit trenches		effects through change to setting and there would be no physical impact to the asset.		
FRS 096	Non-designated	Outline Record - Sea Link (OA) EVAL	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 055	Non-designated	Quarry visible as an earthwork, unknown date.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 076	Non-designated	Farmstead: Moor Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 092	Non-designated	Outline Record - Lion link (WA) GEO (CA) MON anomalies of occupation features	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
FRS 079	Non-designated	Farmstead: Park Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 003	Non-designated	Moor Farm; High House Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 095	Non-designated	Outline Record - Sea Link (OA) EVAL	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 007	Non-designated	Church of St Mary	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 016	Non-designated	Six Post-Medieval quarry pits, one labelled sand pit	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
FRS 087	Non-designated	Friston Green/Blackheath	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 008	Non-designated	Great Wood	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 067	Non-designated	Post-medieval quarry/possible sand pit	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 094	Non-designated	Outline Record - Sea Link (OA) EVAL	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 044	Non-designated	Probable Post-medieval sea bank	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				effects through change to setting and there would be no physical impact to the asset.		
FRS 084	Non-designated	Farmstead: Grange Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 021	Non-designated	Possible oyster pits/'borrow' pits, unknown date	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 056	Non-designated	Roman agricultural activity and low level prehistoric activity at Friston Hall Farm Agricultural Reservoir, Saxmundham Road, Friston	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 061	Non-designated	Suffolk square pillbox	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
FRS 014	Non-designated	Possible curvilinear enclosure, unknown date	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 022	Non-designated	Possible relict sea bank, unknown date	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 006	Non-designated	Hazlewood Marshes	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 015	Non-designated	Ring ditch and possible round barrow site, unknown date	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 078	Non-designated	Farmstead: Bull's Hall Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				effects through change to setting and there would be no physical impact to the asset.		
FRS 080	Non-designated	Farmstead: Friston Hall	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 065	Non-designated	Milestone on the A1094	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 060	Non-designated	Suffolk square pillbox	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 082	Non-designated	Farmstead: Rushmere Lodge Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
FRS 045	Non-designated	Low Road	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 020	Non-designated	Post-medieval sand pit	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 005	Non-designated	Friston post mill	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 101	Non-designated	OUTLINE RECORD: East Anglia One North/Two (Head) EXC Site 18	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 066	Non-designated	Milestone on the A1094	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
FRS 102	Non-designated	OUTLINE RECORD: East Anglia One North/Two (Head) EXC Site 20	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 088	Non-designated	OUTLINE RECORD: East Anglia One North/Two Offshore Windfarms western end of corridor (HEAD) GEO (HEAD) EVAL	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 004	Non-designated	The Decoy; Decoy Wood	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
FRS 063	Non-designated	Pillbox	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
FRS 106	Non-designated	Possible enclosure East of Park Farm, Aldeburgh Road.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
KND 029	Non-designated	OUTLINE RECORD: East Anglia One North/Two Offshore Windfarm Substation Site (HEAD) Geo (HEAD) EVAL (SPR + HEAD) Test Pits	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
KND 010	Non-designated	Grove Wood / Old World Wood	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
KND 015	Non-designated	Littlemoor Farm, Fristonmoor; Buxlow	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
KND 047	Non-designated	Outline Record - Geophysical survey	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
		identified anomalies of enclosures and linear features Lion link (WA) GEO (CA) MON		defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.		
KND 054	Non-designated	OUTLINE RECORD: East Anglia One North/Two (Head) EXC Site 14	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
KND 032	Non-designated	Farmstead: Little Moor Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
KND 031	Non-designated	Farmstead: High House Farm (Fristonmoor)	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
KND 037	Non-designated	Farmstead: Peartree Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
KND 011	Non-designated	Little Moor Farm; Buxlow Parsonage	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
KND 002	Non-designated	Findspot of a Bronze-Age flint axe.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
KND 027	Non-designated	Findspot of a Roman bronze head-stud brooch	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
KND 014	Non-designated	Fristonmoor; Buxlow	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
KND 041	Non-designated	OUTLINE RECORD: East Anglia One North/Two Offshore Windfarm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
		Substation Site (HEAD) Geo		there would be no physical impact to the asset.		
KND 023	Non-designated	7 Roman coins and 1 med coin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
KND 056	Non-designated	OUTLINE RECORD: East Anglia One North/Two (Head) EXC Site 16	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
KND 017	Non-designated	Cross with ring ditch, probably from a former post mill, visible as cropmarks.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
KND 048	Non-designated	Position for a Second World War Machine Gun Post west of Coldfair Green, Knodishall	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
KND 035	Non-designated	Farmstead: Meadow Farm (Workhouse Farm)	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
KND 007	Non-designated	Half of a ring ditch or circular enclosure of unknown date, visible as a cropmark.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
KND 018	Non-designated	Knodishall Coldfair Green historic settlement; St Andrews Green; Coldford Green (1783)	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
KND 005	Non-designated	Findspot of the cutting edge of a Neolithic flint axe.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
KND 033	Non-designated	Farmstead: Clouting's Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
KND 034	Non-designated	Farmstead: Pattle's Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
KND 047	Non-designated	Outline Record - Geophysical survey identified anomalies of enclosures and linear features Lion link (WA) GEO (CA) MON	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
KND 025	Non-designated	Farmstead: Knodishall Hall	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
KND 003	Non-designated	Knodishall Common; Coldfair Green	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
KND 008	Non-designated	Church of St Lawrence	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SNF 013	Non-designated	Small rectangular enclosure, possibly open ended to NE.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SNF 001	Non-designated	Large simple rectangular inhabited moat at Hill Farm.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SNF 027	Non-designated	Farmstead: Hill Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SNF 012	Non-designated	The Street	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
SNF 012	Non-designated	The Street	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SNF 011	Non-designated	Mill Mount	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SNF 027	Non-designated	Farmstead: Hill Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SNF 018	Non-designated	The Old Tannery, 8-10 Church Hill	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SNF 024	Non-designated	Field Barn: Leekhill Barn	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				effects through change to setting and there would be no physical impact to the asset.		
SNF 026	Non-designated	Farmstead: Redhouse Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SNF 015	Non-designated	Human skeletal remains. (Un)	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SNF 014	Non-designated	Sternfield historic settlement core	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SNF 023	Non-designated	Farmstead: Glebe Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
SNF 010	Non-designated	Church of St Mary Magdalene	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SNF 028	Non-designated	Faint cropmark of a possible Late Prehistoric rectilinear enclosure	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SNF 003	Non-designated	Marsh Farm, Sternfield, (Palaeolithic)	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SNF 022	Non-designated	Farmstead: Sternfield Hall	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SUF 067	Non-designated	East Suffolk railway line	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
SUF 067	Non-designated	East Suffolk railway line	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SUF 067	Non-designated	East Suffolk railway line	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SXM 050	Non-designated	Saxmundham Southern Gateway	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SXM 083	Non-designated	Outline Record - Land at Saxmundham, Saxmundham (CA) MON	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SXM 082	Non-designated	OUTLINE RECORD - Sea Link (HEAD	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
		ARCH) Geo (OA) EVAL		effects through change to setting and there would be no physical impact to the asset.		
SXM 050	Non-designated	Saxmundham Southern Gateway	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SXM 075	Non-designated	Farmstead: Trust Farm (Town Farm)	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SXM 077	Non-designated	Farmstead: Hurts Hall	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SXM 017	Non-designated	OUTLINE RECORD: HURTS HALL & PARK (Medieval + Post-Medieval)	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
SXM 021	Non-designated	Hall Farm, Saxmundham	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SXM 036	Non-designated	Late Neolithic to Early Bronze Age date occupation on Land at Church Hill, Saxmundham	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SXM 043	Non-designated	Land East of Warren Hill, Saxmundham	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SXM 022	Non-designated	Bronze Age and Roman pits and ditches identified during evaluation trenching at Church Hill	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SXM 008	Non-designated	Church of St John the Baptist	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
SXM 020	Non-designated	Saxmundham	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SXM 060	Non-designated	Medieval circular lead seal matrix	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SXM 080	Non-designated	Site of a Royal Observer Corps monitoring post	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SXM 073	Non-designated	Field Barn: Gleve Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SXM 054	Non-designated	Anomalies of post-medieval features	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
		on Land south of Saxmundham		effects through change to setting and there would be no physical impact to the asset.		
SXM 086	Non-designated	OUTLINE RECORD - Test pitting and Borehole, Lion Link (CA) MON GEO	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SXM 049	Non-designated	Land North-east of Street Farm, Saxmundham	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SXM 054	Non-designated	Anomalies of post-medieval features on Land south of Saxmundham	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SXM 016	Non-designated	Church Bridge	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
SXM 054	Non-designated	Anomalies of post-medieval features on Land south of Saxmundham	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SXM 005	Non-designated	Park House (IA)	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SXM 005	Non-designated	Park House (Rom)	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SXM 032	Non-designated	19th century pit identified during evaluation at The Chestnuts, Saxmundham	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SXM 074	Non-designated	Farmstead: Street Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
SXM 001	Non-designated	Rom lamp in red ware, at a depth of 3 feet, 20 feet behind Ashfords in open garden, found 1967.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SXM 051	Non-designated	Bronze Age to Post-Medieval remains, North-East of Beech Road	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SXM 054	Non-designated	Anomalies of post-medieval features on Land south of Saxmundham	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
SXM 078	Non-designated	Farmstead: Howard's Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
SXM 043	Non-designated	Land East of Warren Hill, Saxmundham	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
AECOMS001	Non-designated	Telegraph House, Aldeburgh.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
AECOMS002	Non-designated	Keeper's Cottages, Great Wood.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
AECOMS003	Non-designated	Milestone south of Saxmundham.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Table F.3 Kent Onshore Scheme designated assets within the 2km Study Area for assessment of effects through change to setting which were scoped out of full assessment in the Cultural Heritage ES Chapter

Asset ID (NHLE)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
1016850	Scheduled Monument	Monastic grange and pre-Conquest nunnery at Minster Abbey	Scoped Out	Lack of potential for significant impacts due to distance and the asset's location within the built environment of Minster Conservation Area with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
N/A	Conservation Area	Minster Conservation Area	Scoped Out	Lack of potential for significant impacts due to distance and because the conservation area is the historic core of the settlement and it is surrounded on all sides by later 20th century development which screens views south towards the Proposed Development.	No impact. **Neutral** (not significant)	No harm
1224116	Grade I Listed	Church of St Mary	Scoped Out	Lack of potential for significant impacts due to distance and the asset's location within the built environment of Minster Conservation Area with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1223807	Grade I Listed	Minster Abbey	Scoped Out	Lack of potential for significant impacts due to distance and the asset's location within the built environment of Minster Conservation Area with screening provided by intervening built form.	No impact. **Neutral** (not significant)	No harm
1224593	Grade II* Listed	Wayborough Manor	Scoped Out	Lack of potential for significant impacts due to distance, existing screening	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				through vegetation and intervening built form.		
1266813	Grade II Listed	Barn About 30m South East of Sevenscore House	Scoped Out	Lack of potential for significant impacts due to distance, existing screening from large farm buildings and severance of the connection between the buildings and farmland caused by the railway line within the asset's setting.	No impact. **Neutral** (not significant)	No harm
1224327	Grade II Listed	Sevenscore House	Scoped Out	Lack of potential for significant impacts due to distance, existing screening from large farm buildings and severance of the connection between the buildings and farmland caused by the railway line within the asset's setting.	No impact. **Neutral** (not significant)	No harm
1266833	Grade II Listed	Farm Office About 10m East of Sevenscore House	Scoped Out	Lack of potential for significant impacts due to distance, existing screening from large farm buildings and severance of the connection between the buildings and farmland caused by the railway line within the asset's setting.	No impact. **Neutral** (not significant)	No harm
1224214	Grade II Listed	Little Durlock	Scoped Out	Lack of potential for significant impacts due to distance and the asset's location within the built environment of Minster with screening provided by intervening built form	No impact. **Neutral** (not significant)	No harm
1223818	Grade II Listed	Durlock Lodge	Scoped Out	Lack of potential for significant impacts due to distance and the asset's location within the built environment of Minster	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				Conservation Area with screening provided by intervening built form		
1223817	Grade II Listed	Garden Cottage and Garden Wall	Scoped Out	Lack of potential for significant impacts due to distance and the asset's location within the built environment of Minster Conservation Area with screening provided by intervening built form	No impact. **Neutral** (not significant)	No harm
1223810	Grade II Listed	Gates and Walls to Minster Abbey	Scoped Out	Lack of potential for significant impacts due to distance and the asset's location within the built environment of Minster Conservation Area with screening provided by intervening built form	No impact. **Neutral** (not significant)	No harm
1266990	Grade II Listed	Wall And Gate Lodge East of Minster Abbey	Scoped Out	Lack of potential for significant impacts due to distance and the asset's location within the built environment of Minster Conservation Area with screening provided by intervening built form	No impact. **Neutral** (not significant)	No harm
1413803	Grade II Listed	World War II Anti-Tank Pimples and Cylinders and Associated Pillbox at Pegwell Bay	Scoped Out	Lack of potential for significant impacts due to distance and existing screening and severance from road and rail infrastructure.	No impact. **Neutral** (not significant)	No harm
1266958	Grade II Listed	Railed Tomb Chests and Memorial Cross About 5m South of	Scoped Out	Lack of potential for significant impacts due to distance and the asset's location within the built environment of Minster	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
		Nave of Saint Mary's Church		Conservation Area with screening provided by intervening built form		
1266931	Grade II Listed	Number 2, The White Horse, Including Lamp Bracket and Hand Pump	Scoped Out	Lack of potential for significant impacts due to distance and the asset's location within the built environment of Minster Conservation Area with screening provided by intervening built form	No impact. **Neutral** (not significant)	No harm
1267022	Grade II Listed	Laundry About 15m West of Minster Abbey	Scoped Out	Lack of potential for significant impacts due to distance and the asset's location within the built environment of Minster Conservation Area with screening provided by intervening built form	No impact. **Neutral** (not significant)	No harm
1223813	Grade II Listed	Group of Chest Tombs North of Church of Saint Mary	Scoped Out	Lack of potential for significant impacts due to distance and the asset's location within the built environment of Minster Conservation Area with screening provided by intervening built form	No impact. **Neutral** (not significant)	No harm
1267112	Grade II Listed	1 and 3, Church Street	Scoped Out	Lack of potential for significant impacts due to distance and the asset's location within the built environment of Minster Conservation Area with screening provided by intervening built form	No impact. **Neutral** (not significant)	No harm
1223815	Grade II Listed	Gate and Railings Adjoining and West of	Scoped Out	Lack of potential for significant impacts due to distance and the asset's location within the built environment of Minster	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
		The White Horse		Conservation Area with screening provided by intervening built form		
1223808	Grade II Listed	Barn about 30 Metres North East Of Minster Abbey	Scoped Out	Lack of potential for significant impacts due to distance and the asset's location within the built environment of Minster Conservation Area with screening provided by intervening built form	No impact. **Neutral** (not significant)	No harm
1223812	Grade II Listed	5 and 7, Church Street	Scoped Out	Lack of potential for significant impacts due to distance and the asset's location within the built environment of Minster Conservation Area with screening provided by intervening built form	No impact. **Neutral** (not significant)	No harm
1245059	Grade II Listed	Cast Iron Lamp Standard Outside No.7 Church Street	Scoped Out	Lack of potential for significant impacts due to distance and the asset's location within the built environment of Minster Conservation Area with screening provided by intervening built form	No impact. **Neutral** (not significant)	No harm
1223814	Grade II Listed	The Old School	Scoped Out	Lack of potential for significant impacts due to distance and the asset's location within the built environment of Minster Conservation Area with screening provided by intervening built form	No impact. **Neutral** (not significant)	No harm
1223811	Grade II Listed	Church Cottage	Scoped Out	Lack of potential for significant impacts due to distance and the asset's location within the built environment of Minster Conservation Area with screening provided by intervening built form	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
1267000	Grade II Listed	No 11 and The Old Jezard's Bakery	Scoped Out	Lack of potential for significant impacts due to distance and the asset's location within the built environment of Minster Conservation Area with screening provided by intervening built form	No impact. **Neutral** (not significant)	No harm
1224335	Grade II Listed	Thanet House	Scoped Out	Lack of potential for significant impacts due to distance and the asset's location within the built environment of Minster Conservation Area with screening provided by intervening built form	No impact. **Neutral** (not significant)	No harm
1224100	Grade II Listed	The Public Library (Walsingham House)	Scoped Out	Lack of potential for significant impacts due to distance and the asset's location within the built environment of Minster Conservation Area with screening provided by intervening built form	No impact. **Neutral** (not significant)	No harm
1245058	Grade II Listed	Cast Iron Lamp Standard	Scoped Out	Lack of potential for significant impacts due to distance and the asset's location within the built environment of Minster Conservation Area with screening provided by intervening built form	No impact. **Neutral** (not significant)	No harm
1224326	Grade II Listed	The Old Vicarage	Scoped Out	Lack of potential for significant impacts due to distance and the asset's location within the built environment of Minster with screening provided by intervening built form	No impact. **Neutral** (not significant)	No harm
1045842	Grade II Listed	Richborough Farm Richborough	Scoped Out	Lack of potential for significant impacts due to distance, existing screening from large farm buildings and lack of	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
		Farm Cottage		functional setting relationship with land within the Order Limits		
1223820	Grade II Listed	The Bell Inn	Scoped Out	Lack of potential for significant impacts due to distance and the asset's location within the built environment of Minster Conservation Area with screening provided by intervening built form	No impact. **Neutral** (not significant)	No harm
1245057	Grade II Listed	Cast Iron Lamp Standard Opposite Entrance to Car Park	Scoped Out	Lack of potential for significant impacts due to distance and the asset's location within the built environment of Minster Conservation Area with screening provided by intervening built form	No impact. **Neutral** (not significant)	No harm
1267113	Grade II Listed	Inglewood	Scoped Out	Lack of potential for significant impacts due to distance and the asset's location within the built environment of Minster Conservation Area with screening provided by intervening built form	No impact. **Neutral** (not significant)	No harm
1051611	Grade II Listed	Guston Court	Scoped Out	Lack of potential for significant impacts due to distance and lack of a functional setting relationship between the asset and the land within the Order Limits	No impact. **Neutral** (not significant)	No harm
1363231	Grade II Listed	Stables About 5m South West Of Guston Court	Scoped Out	Lack of potential for significant impacts due to distance and lack of a functional setting relationship between the asset and the land within the Order Limits	No impact. **Neutral** (not significant)	No harm
1224338	Grade II Listed	Watchester Farmhouse	Scoped Out	Lack of potential for significant impacts due to distance and the asset's location	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				within the built environment of Minster with screening provided by intervening built form		
1224295	Grade II Listed	14, 16 and 18, High Street	Scoped Out	Lack of potential for significant impacts due to distance and the asset's location within the built environment of Minster Conservation Area with screening provided by intervening built form	No impact. **Neutral** (not significant)	No harm
1070222	Grade II Listed	King's End Farmhouse	Scoped Out	Lack of potential for significant impacts due to distance, existing screening from large farm buildings and lack of functional setting relationship with land within the Order Limits	No impact. **Neutral** (not significant)	No harm
1224339	Grade II Listed	Rose Cottage and Pansy Cottage	Scoped Out	Lack of potential for significant impacts due to distance and lack of a functional setting relationship between the asset and the land within the Order Limits	No impact. **Neutral** (not significant)	No harm
1224545	Grade II Listed	Tudor Cottage	Scoped Out	Lack of potential for significant impacts due to distance and lack of a functional setting relationship between the asset and the land within the Order Limits	No impact. **Neutral** (not significant)	No harm
1045868	Grade II Listed	Castle Farm	Scoped Out	Lack of potential for significant impacts due to distance, existing screening from large farm buildings and lack of functional setting relationship with land within the Order Limits	No impact. **Neutral** (not significant)	No harm
1266551	Grade II Listed	Saint Augustine's Cross	Scoped Out	Lack of potential for significant impacts due to distance and existing screening	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				and severance from road and rail infrastructure.		
1223819	Grade II Listed	Old Oak Cottage Restaurant	Scoped Out	Lack of potential for significant impacts due to distance and the asset's location within the built environment of Minster with screening provided by intervening built form	No impact. **Neutral** (not significant)	No harm
1223821	Grade II Listed	The Elms, 42 High Street	Scoped Out	Lack of potential for significant impacts due to distance and the asset's location within the built environment of Minster with screening provided by intervening built form	No impact. **Neutral** (not significant)	No harm
1224293	Grade II Listed	Hawthorne Lodge	Scoped Out	Lack of potential for significant impacts due to distance and the asset's location within the built environment of Minster with screening provided by intervening built form	No impact. **Neutral** (not significant)	No harm
1070248	Grade II Listed	Mulberry House	Scoped Out	Lack of potential for significant impacts due to distance and lack of a functional setting relationship between the asset and the land within the Order Limits	No impact. **Neutral** (not significant)	No harm

Table F.4 Kent Onshore Scheme designated and non-designated Assets within the 500m Study Area for establishing the cultural heritage baseline which were scoped out of full assessment in the Cultural Heritage ES Chapter. Note this excludes designated assets that also fall within the 2km Study Area for assessment of effects through change to setting as those assets are discussed in Table F.3 above

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
1004228	Scheduled Monument	Anglo-Saxon cemetery S of Ozengell Grange	Scoped Out	Lack of potential for impact. Asset located outside the 2km Study Area for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
1363256	Grade I Listed	Richborough Castle	Scoped Out	Lack of potential for impact. Asset located outside the 2km Study Area for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
1429581	Grade II Listed	Eastern of two Concrete Second World War 4-inch gun emplacements	Scoped Out	Lack of potential for impact. Asset located outside the 2km Study Area for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
1085409	Grade II Listed	53 and 55, Foad's Lane	Scoped Out	Lack of potential for impact. Asset located outside the 2km Study Area for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 354	Non-designated	Neolithic polished stone axe, and fragments of further	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
		polished axes Ebbsfleet Farm Cottages		effects through change to setting and there would be no physical impact to the asset.		
MKE86927	Non-designated	Outfarm on Ash Level	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 219	Non-designated	A Scottish twopence of Charles I, Weatherlees Hill Waste Treatment Works	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SE 714	Non-designated	Pegwell Bay Hoverport	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE86976	Non-designated	Outfarm adjacent to Halfway House	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
TR 36 SW 125	Non-designated	Romano British Landscape, inhumation burial and possible WW11 anti-aircraft station	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 358	Non-designated	Bronze Age to Roman activity Cottington Hill, discovered during East Kent Access Route excavations 2009-2011	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 243	Non-designated	Early Denarial silver early penny ('sceat'), Cliffsend, Ramsgate	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 244	Non-designated	A plated imitation? Anglo-Saxon silver early penny ('sceat'), Cliffsend, Ramsgate	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
AECOMK001	Non-designated	Farmstead named as Brook on the Tithe Plan and the First Edition	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
		Ordnance Survey mapping. Now cleared.		there would be no physical impact to the asset.		
TR 36 SW 25; TR 36 SW 26; TR 36 SW 31; TR 36 SW 59; TR 36 SW 60	Non-designated	Roman statuette of Diana, lead sling bullet, early-medieval beads, a bronze socketed axe, and a bronze axe, Minster.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 28	Non-designated	Site of C16th beacon, Minster	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE73940; MKE74355; TR 36 SW 14	Non-designated	Medieval copper alloy brooch; Iron Age Gold Coin; Iron Age Coin, Sevenscore, Minster.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 69	Non-designated	Multi period site on Cottington Hill, Minster parish	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
MKE86924	Non-designated	Outfarm on Minster Marsh	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 218	Non-designated	A silver Roman coin, Weatherlees Hill Waste Treatment Works	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE97070	Non-designated	hoard	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE114034	Non-designated	Roman Silver coin hoard	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 214	Non-designated	Early/Middle Iron Age site, Weatherlees Hill Waste Treatment Works	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
MWX43370	Non-designated	Possible flood bank, Minster Marshes	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 117	Non-designated	Roman structural remains, Weatherlees Waste Treatment Work	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE86925	Non-designated	Sheep pens on Minster Marsh	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 80	Non-designated	Late Iron Age coin, Cottington Hill, Minster	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE86895	Non-designated	Marsh Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				effects through change to setting and there would be no physical impact to the asset.		
MKE86974	Non-designated	Ebbsfleet Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 NW 1336	Non-designated	'Anlage unbekannter Art'	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 320	Non-designated	Ring ditch c. 30 m in diameter	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 358	Non-designated	Bronze Age to Roman activity Cottington Hill, discovered during East Kent Access Route excavations 2009-2011	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
TR 36 SW 62	Non-designated	Modern trench, Ebbsfleet, Minster parish	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE86923	Non-designated	Sheepwash on Minster Marsh	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 12	Non-designated	Roman bronze toga pin (fibula), Ebbsfleet, Minster parish	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 216	Non-designated	Medieval pit, Weatherlees Waste Treatment Works	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SE 764	Non-designated	'Klein-Kampfanlage'	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
MKE88973	Non-designated	Halfway House	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 227	Non-designated	Medieval field system, Weatherlees Wastewater Treatment works	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 11	Non-designated	Bronze Age founder's hoard, Ebbsfleet Farm, Minster parish	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SE 716	Non-designated	Early medieval shell midden, Pegwell Bay	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 215	Non-designated	Animal burial, Weatherlees Hill	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
		Waste Treatment Works		effects through change to setting and there would be no physical impact to the asset.		
TR 36 SE 483	Non-designated	Pillbox	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE74261	Non-designated	Roman copper alloy spoon	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SE 31	Non-designated	Slit trench cropmark, Ramsgate	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 124	Non-designated	Romano-British drainage ditches, hearth and two inhumations	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
TR 36 SW 139	Non-designated	PILLBOX	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MWX43358	Non-designated	Hay stack stance, Ash Levels	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 71	Non-designated	Early medieval/medieval pit, Cottington Hill, Minster parish	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 78	Non-designated	Gaulish Iron Age coins, Cottington Hill, Minster	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE74428	Non-designated	Iron Age copper alloy coin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
MKE86975	Non-designated	Stonelees	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 225	Non-designated	Late Bronze Age/Early Iron Age activity, Weatherlees Wastewater Treatment works	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 348	Non-designated	Late iron age/early Roman ditches found at Weatherlees WWTW Pond	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SE 21	Non-designated	Ring ditch cropmarks, Ramsgate	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE73938; MKE74286	Non-designated	Iron Age copper alloy coin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				effects through change to setting and there would be no physical impact to the asset.		
TR 36 SW 211	Non-designated	Ring ditch, Weatherlees Hill Waster Treatment Works	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 456	Non-designated	Late Bronze Age hoards discovered on the Ebbsfleet peninsula, Thanet	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 226	Non-designated	Late Bronze Age/Early Iron Age activity, Weatherlees Wastewater Treatment works	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 1229	Non-designated	'Scheinwerfer-Batterie'	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
TR 36 SW 307	Non-designated	Circular cropmark, possibly a barrow, immediately north of Ebbsfleet Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 217	Non-designated	Four Medieval ditches and eight Medieval pits, Weatherlees Waste Treatment Works	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE86932	Non-designated	King's End Farm (King's Head Farm)	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE86960	Non-designated	Outfarm on Ash Level	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 9	Non-designated	Saxon landing site, Ebbsfleet, Minster parish	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
TR 36 SW 127	Non-designated	Prehistoric, Romano-British and Medieval enclosure and boundary ditches and two middens with Bronze Age pottery	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SE 736	Non-designated	Ditch visible as a cropmark topping a shallow rise	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE73972	Non-designated	Roman copper alloy buckle	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE86933	Non-designated	Castle Farm (Richborough Castle Farm)	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
TR 36 SW 364	Non-designated	Saxon settlement, discovered during East Kent Access Route excavations 2009-2011, zone 9	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MWX43362	Non-designated	Hay stack stance, Ash Levels	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 351	Non-designated	Late iron age/early Roman ditches near Weatherlees Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 109	Non-designated	Multiperiod occupation, Ebbsfleet farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 212	Non-designated	Late Bronze Age Hoard, Ebbsfleet Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
TR 36 SW 294	Non-designated	Undated features, near Castle Farm, Richborough	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE108903	Non-designated	Roman silver spoon	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE73920; MKE73921; MKE73922; MKE74029; MKE74101; MKE74102; MKE74131; MKE74300; MKE74543; MKE74544; MKE74545	Non-designated	Iron Age copper alloy coin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 1123	Non-designated	Parallel north-east to south-west cropmark features, north-west of	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
		Weatherless Water Treatment Works, visible in 1946 aerial photographs		there would be no physical impact to the asset.		
TR 36 SW 295	Non-designated	Medieval features, near Castle Farm, Richborough	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 325	Non-designated	Palaeochannels and drainage ditches visible as cropmarks and on aerial photographs between Ebbsfleet and St Augustine's Golf Course	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SE 572	Non-designated	Pillbox	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE74434	Non-designated	Iron Age copper alloy coin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
TR 36 SW 6	Non-designated	Abbot's Wall, Monkton, Minster and Sandwich	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 309	Non-designated	The Boarded Groin medieval land reclamation earthwork, Ebbsfleet.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 234	Non-designated	Prehistoric flints, Kings End Cottage	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE73843; MKE74492	Non-designated	Iron Age silver coin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MWX43365	Non-designated	Hay stack stance, Ash Levels	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				effects through change to setting and there would be no physical impact to the asset.		
TR 36 SW 233	Non-designated	Roman pottery and tile, Kings End Cottage	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE74461	Non-designated	Iron Age gold coin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 36	Non-designated	Possible cremation burial site, Minster Sewage Works, Minster	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SE 761	Non-designated	'Klein-Kampfanlage'	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
TR 36 SW 128	Non-designated	Two Possible pits located during a geophysical survey west of Richborough Fort in 2007	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MWX43748	Non-designated	Brick works, Pegwell	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SE 827	Non-designated	?Iron Age pottery and undated fire-cracked flint, Cliffsend	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 322	Non-designated	Parallel linear features running north-east to south-west south of St Augustine's Golf Course	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SE 320	Non-designated	Roman inhumation, Cliffsend	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
MKE74000	Non-designated	Medieval copper alloy brooch	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SE 659	Non-designated	Roman features, Cliffsend	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 133	Non-designated	A gully, possibly prehistoric, located at Castle Farm, Richborough	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 72	Non-designated	Dock remains, Minster	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
TR 36 SE 37	Non-designated	Romano-British coins brooch and key	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MWX43848	Non-designated	St Augustine's Coastguard Station, Richborough Port	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SE 25	Non-designated	Area cropmark features, Ramsgate	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 316	Non-designated	Reputed site of St Augustine's Oak, 30 m south-east of St Augustine's Cross.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 344	Non-designated	Neolithic flint including leaf-shaped arrowheads found during East	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
		Kent Access Route excavations		there would be no physical impact to the asset.		
TR 36 SW 301	Non-designated	Cropmark formed by remains of earlier lane	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE74426	Non-designated	Iron Age silver coin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE74453	Non-designated	Iron Age copper alloy coin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 13	Non-designated	Bronze Age axe, Minster	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 96	Non-designated	Undated human remains,	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
		Conyngham Road, Minster		effects through change to setting and there would be no physical impact to the asset.		
MKE73867	Non-designated	Iron Age copper alloy coin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE74553	Non-designated	Iron Age copper alloy coin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 21	Non-designated	Early Medieval axe	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 27	Non-designated	Possible building and burials, Clapper Hill, Minster	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
TR 36 SW 327	Non-designated	Complex palaeochannels north of Weatherlees Water Treatment Works	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 52	Non-designated	Undated field system, ash.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 140	Non-designated	Coastal battery, Pegwell Bay	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 310	Non-designated	Redundant drainage ditches visible on historic mapping and aerial photographs	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 299	Non-designated	Possible early medieval/medieval farmstead	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
TR 36 SW 1230	Non-designated	'Klein-Kampfanlage'	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MWX43480	Non-designated	Boundary features and possible hollow-way, Richborough	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE74435	Non-designated	Iron Age copper alloy coin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 410	Non-designated	Roman Activity Area, East of Trench, New Toilet Block, Richborough castle	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 284	Non-designated	Pegwell Coast Battery Observation	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
		Post and Fougasse site		effects through change to setting and there would be no physical impact to the asset.		
MKE74235	Non-designated	Roman copper alloy hair pin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SE 760	Non-designated	'Klein-Kampfanlage'	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 NE 2408	Non-designated	"The Manor House", Lord of the Manor, Manston	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE113214; MKE113223; MKE113226	Non-designated	Hoard	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
TR 36 SW 116	Non-designated	Probable medieval ditch-enclosed farmstead, near Weatherless Water Treatment Works, Minster parish	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE86926	Non-designated	Sheepwash on Ash Level	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 39; TR 36 SW 43	Non-designated	Iron Age occupation and Romano-British rectangular temple	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SE 686	Non-designated	Anglo Saxon inhumation burial, Chalk Hill, Ramsgate	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 35 NW 909	Non-designated	2nd century carved marble head, possibly Commodus	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
TR 36 SW 362	Non-designated	Late bronze age well with possible wattle lining, discovered during East Kent Access Route excavations 2009-2011, zone 9	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 362	Non-designated	Late bronze age well with possible wattle lining, discovered during East Kent Access Route excavations 2009-2011, zone 9	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE86930	Non-designated	Bride Farm (Brides Farm)	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE73974	Non-designated	Medieval lead weight	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
TR 36 SW 202	Non-designated	Rectangular crop mark	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 1	Non-designated	Early medieval inhumation burial, Minster-in-Thanet	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 89	Non-designated	Site of Minster railway station	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE74262	Non-designated	Bronze Age copper alloy hoard	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE122313	Non-designated	Iron Age Copper alloy Coin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
TR 36 SW 93	Non-designated	Late Iron Age/Romano-British site, Weatherlees Hill, Minster	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 123	Non-designated	Romano-British ditches, sunken featured building, two cemetries and pit containing prehistoric pottery	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 306	Non-designated	Large sub-circular cropmark visible on 1990 aerial photograph, probably representing an infilled pit	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 47	Non-designated	Medieval finds	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
TR 36 SW 339	Non-designated	Cropmark of a probable small pit, just west of intersection of Cottington Road and railway	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE86931	Non-designated	Richborough Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 324	Non-designated	Evidence of indistrial activity (quarrying?) and tramways visible on 1946 aerial photograph	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 328	Non-designated	Partial cropmark of a probable ring-ditch	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE73923; MKE73924; MKE74146; MKE74549; MKE74550	Non-designated	Iron Age copper alloy coin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
MWX43388	Non-designated	Possibe pillbox, St Augustine's Golf Course	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE87024	Non-designated	Great Cliffsend Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 63	Non-designated	Sub-circular mound earthwork/cropmark , Minster Marshes	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE65810; MKE65812; MKE65813; MKE65814; MKE65815; MKE65819; MKE65820; MKE65821; MKE65828;	Non-designated	Iron Age copper alloy coin (hoard or grouping at single location)	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
MKE65831; MKE65833; MKE65834; MKE65862; MKE65864; MKE65865; MKE66162; TR 36 SW 53						
TR 36 SW 141	Non-designated	Pillbox (Type FW3/24	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 305	Non-designated	Large sub-circular cropmark visible on 1990 aerial photograph, probably representing an infilled pit	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE87047	Non-designated	Litte Cliffsend Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
TR 36 SE 20	Non-designated	Cropmark ring ditches, Ramsgate, Thanet	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 87	Non-designated	Minster medieval town	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 239	Non-designated	Roman pottery findspot, Watchester Lane	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MWX43345	Non-designated	Enclosure, Ash Levels	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SE 463	Non-designated	Pillbox	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
TR 36 SE 734	Non-designated	Cropmark shows rectangular enclosure with causeway entrance	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 10	Non-designated	St Augustine'S Well	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE97017	Non-designated	Post Medieval Copper alloy seal matrix	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE122344	Non-designated	Early Medieval Silver Coin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MWX43349	Non-designated	Hay stack stance, Ash Levels	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				effects through change to setting and there would be no physical impact to the asset.		
TR 36 SW 408	Non-designated	Probable Second World War concrete slab, part of an anti-aircraft battery, Cliffs End Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 24	Non-designated	Iron Age burials (found 1959)	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 432	Non-designated	Former Methodist Chapel, High Street, Minster, Thanet	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SE 464	Non-designated	Pillbox	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
TR 36 SW 433	Non-designated	St Mildred's Church, St Mildred's Road, Minster, Thanet	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 437	Non-designated	Second World War anti-tank obstacle visible on 1946 vertical aerial photograph	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 438	Non-designated	Second World War anti-tank obstacle visible on 1946 vertical aerial photograph	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 66	Non-designated	Sub circular mound earthwork/cropmark, Minster	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SE 754	Non-designated	Western 4-inch gun emplacement, Little Cliffsend Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
TR 36 SW 137	Non-designated	Pillbox	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 479	Non-designated	Remains of a posible post medieval wash house, Mildreds Road, Minster	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 178	Non-designated	Former site of a barn about 50 metres south east of Sevenscore House	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 481	Non-designated	Remains of St Mildred's Priory Tower at Minster Abbey, Minster-in-Thanet	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 38	Non-designated	Site of a 15th century house,	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
		Durlock Grange, Minster		effects through change to setting and there would be no physical impact to the asset.		
TR 36 SW 368	Non-designated	Iron Age ditches discovered during the East Kent Access Route excavations (2009-2011)	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SE 687	Non-designated	Two undated pits/post holes, Chalk Hill	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SE 26	Non-designated	Medieval rems	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE73875	Non-designated	Iron Age copper alloy ring	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
MKE63738-MKE63770	Non-designated	Roman copper and silver coins	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MWX43350	Non-designated	Hay stack stance, Ash Levels	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 NE 717	Non-designated	Possible early bronze age ring-ditch, Lord of the Manor	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 365	Non-designated	Large palaeochannel discovered during the East Kent Access Route excavations (2009-2011)	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 434	Non-designated	Second World War anti tank barrier formed by a line of concrete posts	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
MKE122283	Non-designated	Medieval Silver Coin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 35 NW 94	Non-designated	Disused Railway Viaduct, Sandwich	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MWX43363	Non-designated	Hay stack stance, Ash Levels	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE73983; MKE74117; MKE74155; MKE74156; MKE74424; MKE74425; MKE74450; MKE74519	Non-designated	Iron Age copper alloy coin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
MKE80175; MKE80176	Non-designated	Roman copper alloy unidentified object and Early Medieval copper alloy brooch	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE74003; MKE74271	Non-designated	Iron Age copper alloy coin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE74252; MKE74253; MKE74254; MKE74255; MKE74256	Non-designated	Bronze Age ingots	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 477	Non-designated	Possible neolithic pit, neolithic pottery and mesolithic and neolithic flints at Cliffs End Farm, Ramsgate.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 436	Non-designated	Second World War anti-tank obstacle visible on 1946 vertical aerial photograph	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
TR 36 SE 753	Non-designated	Eastern of two Concrete Second World War 4-inch gun emplacements, Little Cliffsend Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE86973	Non-designated	Sevenscore	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 293	Non-designated	An undated gully, near Castle Farm, Richborough	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MWX43332	Non-designated	Enclosure, Minster Marshes	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SE 35	Non-designated	Medieval well shaft	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				effects through change to setting and there would be no physical impact to the asset.		
TR 36 SW 232	Non-designated	Medieval ditch and pit, Cliffs End Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 304	Non-designated	Cropmark of sub-rectilinear ditched enclosure , c. 50 x 35 m, east of Cliffsend Farm Cottages	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 317	Non-designated	6 possible pits defined as cropmarks, located between Thorne Farm and St Augustine's Golf Course	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 65	Non-designated	Sub-circular mound earthwork/cropmark , near Minster Sewage Works	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
MKE63548 to MKE63568	Non-designated	Roman silver and copper alloy coins	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 35 NW 113	Non-designated	World War II defences/earthwork	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE63771 to MKE63820	Non-designated	Roman silver and copper alloy coins. Post Medieval coins.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 5	Non-designated	14th century sea wall, Minster, Ramsgate and Sandwich parishes	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE63893	Non-designated	Roman copper alloy fixture and fitting	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
TR 36 SE 688	Non-designated	Remains of an undated ditch, Chalk Hill	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SE 48; MKE74466	Non-designated	Iron Age coin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 64	Non-designated	Sub-circular mound earthwork/cropmarks, near Minster Sewage Works	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE73946; MKE73947' MKE73948 MKE73949; MKE73950; MKE74042; MKE74167; MKE74168; MKE74169;	Non-designated	Iron Age copper alloy coin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
MKE74170; MKE74171; MKE74179; MKE74181; MKE74278; MKE74401						
TR 36 SW 210	Non-designated	Late Bronze Age and Iron Age pottery, Oaklands Nursery site	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE86920	Non-designated	Minster Abbey	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 319	Non-designated	Complex palaeochannels south of Weatherlees Water Treatment Works	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE113974	Non-designated	Early Medieval copper alloy bridle bit	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
TR 36 SE 36	Non-designated	Medieval well shaft	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SE 720	Non-designated	An undated feature with a shell midden, Cliffs End	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SE 17	Non-designated	Enclosure cropmark and sub circular feature, Ramsgate	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE113026; MKE113989; MKE113990	Non-designated	Mesolithic flint lithic implement ; Iron Age ceramic vessel; Post Medieval ceramic lamp	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
TR 36 SW 206	Non-designated	Cropmark of a rectilinear enclosure to the north of Ash	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE88751	Non-designated	Cliffsend Farm (Bethlehem Farm)	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE63521 to MKE63547; MKE63628 to MKE63635; MKE63821 to MKE63827; MKE63859 to MKE63871	Non-designated	Various Roman base silver and copper alloy coins, as well as other later tokens.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE86899	Non-designated	Outfarm in Minster	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 435	Non-designated	Second World War anti-tank obstacle	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
		visible on 1946 aerial photograph.		effects through change to setting and there would be no physical impact to the asset.		
TR 36 SW 54	Non-designated	Circular feature	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE80149; MKE80159	Non-designated	copper alloy mount and copper alloy spoon	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE74094	Non-designated	Iron Age silver coin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 197	Non-designated	Train Ferry Dock, Richborough Port	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
MKE86921	Non-designated	Durlock Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 405	Non-designated	Roman ditches discovered during the East Kent Access Route excavations (2009-2011)	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 99	Non-designated	Undated archaeological features, Beech Grove, Ramsgate	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE63569 to MKE63586MKE63872 to MKE63892	Non-designated	Roman base silver coin and copper alloy coins. Roman copper alloy unidentified object.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 138	Non-designated	Pillbox	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
MKE73958; MKE73959	Non-designated	Iron Age copper alloy bow brooch ; Medieval copper alloy weight	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 32	Non-designated	Windmill, Ash	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 326	Non-designated	Cropmark indicating a ditch or gully that appears to define a trapezoidal enclosure located north of Cliffsend Farm Cottages	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE119447	Non-designated	Roman Silver Coin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
MKE80152	Non-designated	copper alloy mount	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE108965	Non-designated	Early Medieval copper alloy stirrup	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE74413	Non-designated	Iron Age copper alloy coin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE74432	Non-designated	Iron Age silver coin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE63028	Non-designated	Roman silver coin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
MKE87025	Non-designated	Farmstead at Cliffesend	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE73869; MKE74479	Non-designated	Iron Age copper alloy coin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 393	Non-designated	Late bronze age and early iron age ditches and D-shaped double-ditched enclosure discovered during the East Kent Access Route excavations (2009-2011)	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 122	Non-designated	Haven	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
TR 36 SW 113	Non-designated	Decoy pond, Ash Levels	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SE 336	Non-designated	Possible location of Grubenhaus, Pegwell, near Ramsgate	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 107	Non-designated	Site of former Saltworks, Ebbsfleet, Ramsgate	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE74162; MKE74163	Non-designated	Two Early Medieval pottery vessels	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SE 733	Non-designated	Amorphous cropmark of	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
		possible infilled chalk pit		effects through change to setting and there would be no physical impact to the asset.		
MKE119232	Non-designated	Post Medieval Silver Coin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 237	Non-designated	Bronze Age features, Cliffs End	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 34	Non-designated	Possible early-medieval inhumation cemetery, Minster	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE122299	Non-designated	Roman Copper alloy Coin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
TR 36 SE 683	Non-designated	Late Bronze Age/Early Iron Age pits and ditch/possible enclosure, Chalk Hill	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SE 27	Non-designated	Romano-British remains	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE122314	Non-designated	Early Medieval Copper alloy Stirrup	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SE 685	Non-designated	Late Iron Age feature, Chalk Hill	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 366	Non-designated	Mesolithic tranchet axe discovered during the East Kent Access Route	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
		excavations (2009-2011)		there would be no physical impact to the asset.		
MKE65518 to MKE65521; MKE65524; MKE65524; MKE65525; MKE65527; MKE65528; MKE65529; MKE65531 to MKE65538; MKE65642	Non-designated	Various finds including Roman copper alloy coins; Roman copper alloy hair pin; Roman broochs; Early Medieval harness fittings; Post Medieval copper alloy mount; copper alloy jetton; Medieval copper alloy purse; Medieval copper alloy mount; lead seal matrix	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 283	Non-designated	A hearth or fired clay surface, 33 High Street, Minster	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE73854 to MKE73866MKE74529 to MKE74533MKE74535 to MKE74542	Non-designated	Iron Age copper alloy coin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
TR 36 SW 401	Non-designated	Two small pits, each containing a middle bronze age pot, discovered during the East Kent Access Route excavations (2009-2011)	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE113221; MKE113224; MKE113230	Non-designated	hoard	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE65816; MKE65817; MKE65846; MKE65961; MKE65963; TR 36 SW 17; TR 36 SW 18; TR 36 SW 23; TR 36 SW 29; TR 36 SW 30	Non-designated	Flint Axe; Barbed and tanged arrowhead; Iron Age copper alloy coin; Two Greek Coins; Two fibulae and string of beads Richborough	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE86896	Non-designated	Watchester Farm	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
MKE74001MKE74002MKE74270MKE74284	Non-designated	Iron Age gold coin, as well as other copper alloy coins and a silver coin.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE66095	Non-designated	Iron Age copper alloy coin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 NE 2166	Non-designated	Second World War roadblock.	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 240	Non-designated	Timber, possibly from a wreck, Sandwich Bay	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 90	Non-designated	Site of Richborough Port station (uncertain location), Minster parish	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				there would be no physical impact to the asset.		
MKE113203	Non-designated	ceramic vessel	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE113220	Non-designated	hoard	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SE 22	Non-designated	Ring ditch cropmarks, Ramsgate	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MWX43352	Non-designated	Hay stack stance, Ash Levels	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SE 42	Non-designated	Probable Bronze Age barrow, Little	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
		Cliffs End, Ramsgate		effects through change to setting and there would be no physical impact to the asset.		
TR 36 SW 1331	Non-designated	'Anlage unbekannter Art'	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE120151	Non-designated	Medieval Lead Seal Matrix	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE86891	Non-designated	Mulberry House (Fleet Farm)	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE118913	Non-designated	Medieval Silver Coin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
MKE119409	Non-designated	Medieval Copper alloy Seal Matrix	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 SW 402	Non-designated	Middle bronze age to early iron age field system discovered during the East Kent Access Route excavations (2009-2011)	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE119432	Non-designated	Medieval Silver Coin	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE120158	Non-designated	Post Medieval Copper alloy Strap Fitting	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MWX43482	Non-designated	Ridge and furrow, north of Richborough fort	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of	No impact. **Neutral** (not significant)	No harm

Asset ID (NHLE / HER)	Designation/ Grade	Name	Scoped In / Out	Rationale for Scoping out	Assessed Level of Effect (significance)	Assessed degree of Harm
				effects through change to setting and there would be no physical impact to the asset.		
MKE122269	Non-designated	Iron Age Copper alloy Brooch	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE122270	Non-designated	Iron Age Copper alloy Brooch	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
MKE122271	Non-designated	Medieval Lead Seal Matrix	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm
TR 36 NE 56	Non-designated	Barrow/ring ditch cropmark features, Nethercourt, Ramsgate	Scoped Out	Lack of potential for impact. Asset is non-designated so does not meet the defined criteria for assessment of effects through change to setting and there would be no physical impact to the asset.	No impact. **Neutral** (not significant)	No harm

Appendix G The Sizewell C Project Environmental Statement Chapter 9 Socio-economics



The Sizewell C Project

6.3 Volume 2 Main Development Site

Chapter 9 Socio-economics

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Appendix 9C: Technical Note 3: Workforce Spatial Distribution.

Appendix 9D: Technical Note 4: Accommodation Datasets and Assumptions.

Appendix 9E: Technical Note 5: Sport and Leisure Audit and Estimated Demand.

Appendix 9F: Sizewell C: Suffolk Coast Visitors Survey.

9 Socio-economics

9.1 Introduction

9.1.1 This chapter of **Volume 2** of the **Environmental Statement** (**ES**) (Doc Ref. 6.3) presents an assessment of the socio-economic effects arising from the construction and operation of the Sizewell C power station at the main development site, and the associated development sites (referred to throughout this volume as 'the proposed development'). This includes an assessment of potential impacts, the significance of effects, the requirements for mitigation and the residual effects. The assessment is project-wide in nature – it considers the overall socio-economic effects of the Sizewell C Project's components on sensitive receptors such as the labour market, housing market and public services.

9.1.2 Descriptions of the existing site and proposals for the main development site are provided in **Chapters 1-4** of this volume of the **ES**. Descriptions of the existing sites and proposals for associated development sites are provided in **Chapters 1-2** of **Volumes 3-8** (Doc Ref. 6.4-6.9) of the **ES**. A description of the anticipated activities for the decommissioning phase, including a summary of the types of environmental effects likely to occur is provided in **Chapter 5** of this volume. A glossary of terms and list of abbreviations used in this chapter is provided in **Appendix 1A** of **Volume 1** of the **ES** (Doc Ref. 6.2).

9.1.3 The scope of the socio-economic assessment considers the following construction and operational phase impacts.

a) Construction impacts

- Economic impacts:
  - labour market impacts due to change in the level of construction employment generated in the economy;
  - employment impacts due to a change in the overall level of employment; and
  - business and supply chain impacts as a result of contracts and spending related to the Sizewell C Project.
- Accommodation impacts:
  - impacts on overall supply of homes as a result of increased demand generated by the temporary construction workforce;

  - tourist sector accommodation impacts;
  - private rented sector (PRS) impacts; and
  - owner-occupied sector impacts.

- Population dynamics: impacts on the existing population due to an increase in population generated by the construction workforce.

- Public services impacts of increased demand generated by the construction workforce and their families for the following services:

  - childcare and education services – early years, primary school and secondary school places;
  - social services;
  - other county and district level services;
  - sports and leisure facilities; and
  - emergency services.

b) Operational impacts

- employment: impact of additional employment in a high value added sector; and

- wider economic impacts: effects on skills, education, spending, and supply chain.

9.1.4 A standalone ES was prepared for the Sizewell B relocated facilities works for submission with the hybrid application under the Town and Country Planning Act 1990 (East Suffolk Council application ref. DC/19/1637/FUL). The Sizewell B relocated facilities ES (included in **Appendix 2A** of **Volume 1** of the **ES**) scoped out the assessment of socio-economic effects, as no potential for likely significant effects from the Sizewell B relocated facilities proposals on their own were identified. However, the assessment presented within this chapter also accounts for the effects of the Sizewell B relocated facilities project, as it forms part of the Sizewell C Project.

9.2 Structure of this chapter

9.2.1 The chapter is structured as follows:

- **Section 9.3** sets out the legislation, policy and other documentation that has informed the assessment. This includes national policy, including relevant national policy statements (NPS) that help set the

parameters to the assessment, and highlights areas of local policy that are considerations for the potential effects on communities within the study areas.

- **Section 9.4** sets out the methodology applied to the assessment, including: a summary of the responses to consultation that have informed the approach; the study areas; the datasets that have informed the baseline assessment; and the methodology applied to determine the assessment of the significance of the socio-economic effects.

- **Section 9.5** details the baseline conditions across the assessment study areas, against which the impacts will be assessed, including the population, economic and labour market baseline, accommodation baseline and community facilities baseline.

- **Section 9.6** describes the Sizewell C Project's embedded design and mitigation measures relevant to the assessment of socio-economic effects.

- **Section 9.7** sets out the assessment of effects during the construction and operational phases.

- **Section 9.8** describes the proposed mitigation and monitoring to address the potential adverse effects, and enhance the beneficial effects identified at **section 9.7**.

- **Section 9.9** concludes by setting out the likely residual effects of the Sizewell C Project, taking into account mitigation and monitoring described at **section 9.8.**

9.2.2 As detailed in **section 9.4** of this chapter, the approach to the socio-economic assessment has been informed by engagement with Suffolk County Council (SCC), and East Suffolk Council (ESC) (note ESC was formed following the merger of the former Suffolk Coastal District (SCDC) and Waveney District Councils (WDC)), as well as service providers and local stakeholders, and community groups. The assessment of effects has therefore been established through an iterative process of engagement and refinement.

9.2.3 This assessment has been informed by data from other assessments including:

- **Chapter 10** of **Volume 2** of the **ES**: Transport.

- **Chapter 28** of **Volume 2** of the **ES:** Health and Wellbeing.

9.2.4 This assessment has been informed by data presented in the following technical notes appended to the chapter:

- **Appendix 9A:** Technical Note 1: Workforce Profile.
- **Appendix 9B:** Technical Note 2: Demographic Benchmarks and Workforce Characteristics.
- **Appendix 9C:** Technical Note 3: Workforce Spatial Distribution.
- **Appendix 9D:** Technical Note 4: Accommodation Datasets and Assumptions.
- **Appendix 9E:** Technical Note 5: Sport and Leisure Audit and Estimated Demand.
- **Appendix 9F:** Sizewell C: Suffolk Coast Visitors Survey.

9.3 Legislation, policy and guidance

9.3.1 An overview of legislation, policy and guidance specifically of relevance to this socio-economic assessment is set out in **Appendix 6E** of **Volume 1** of the **ES.**

9.3.2 As stated in **Chapter 3** of **Volume 1** of the **ES**, the overarching NPS for Energy (Ref 9.1) when combined with the NPS for Nuclear Power Generation (Ref 9.2) provides the primary basis for decisions by the Secretary of State on applications for nuclear power generation developments such as this.

9.3.3 The NPSs for Energy Infrastructure set out government energy policy; the need for new infrastructure; and guidance in determining an application for a Development Consent Order (DCO). The NPSs include specific criteria and issues which should be covered by applicants' assessments of the effects of their scheme, and how the Planning Inspectorate should consider these impacts. They include specific references to socio-economic effects.

9.3.4 Notwithstanding this, the Secretary of State may consider other matters that are both important and relevant to decision-making. This could include national, regional and, local policy documents.

9.3.5 Further, the Planning Act 2008 provides that in making a decision on a nationally significant infrastructure project, regard must be made to any

local impact report prepared by relevant local authorities. It is anticipated that the local impact report would rely in part on national, regional and local policy to provide context. On this basis, and on the basis that such policy may contain information or be supported by evidence that is of relevance to this assessment, regard has been given to these documents (where relevant to the technical assessment).

a) Summary

9.3.6 A full summary of legislation, guidance and policy relevant to this assessment is included in **Appendix 6E** of **Volume 1** of the **ES.**

9.3.7 The policy review demonstrates there are a large number of policies at the national, regional and local levels relevant to the socio-economic assessment of the Sizewell C Project.

9.3.8 In order to meet the requirements of the Overarching National Policy Statement for Energy (NPS EN-1) (Ref 9.1) (paragraph 5.12.4), the review of legislation, policy and guidance seeks to capture the key policy areas covered which need to be addressed in the assessment.

9.3.9 This can be split into three categories:

- Process and Criteria Policies: are those which set out how the assessment should be undertaken, the weight given to different issues in the assessment, and how impacts should be addressed.
- Assessment of Impact and Mitigation: are those areas identified by policy makers in which the proposals at Sizewell C might have an impact, which, if negative, might require mitigation.
- Enhancement and Legacy: are those areas identified, predominantly in local policy, where potential positive impacts of the Sizewell C Project might be delivered in a way which could be enhanced to achieve wider policy objectives.

9.3.10 The distinction between the second and third categories is important in order to identify areas in which the applicant might be expected to minimise or mitigate impacts as a requirement, and those in which longer term partnership working might provide enhanced outcomes.

9.3.11 The following policy documents are considered in the context of the development of the baseline, assessment of effects, and design of mitigation for this assessment (these are set out in detail in **Appendix 6E** of **Volume 1** of the **ES**):

- Overarching National Policy Statement for Energy (NPS EN-1).
- National Policy Statement (NPS) for Nuclear Power Generation (NPS EN-6) (Ref 9.2).
- National Planning Policy Framework (NPPF) 2019 (Ref 9.3).
- Industrial Strategy, building a Britain fit for the future (November, 2017) (Ref 9.4).
- Industrial Strategy Nuclear Sector Deal (June 2018) (Ref 9.5).
- HM Government, Integrated Communities Strategy Green Paper (March 2018) (Ref 9.6).
- Local Industrial Strategy for Norfolk and Suffolk, New Anglia Local Enterprise Partnership (LEP) (2019) (Ref 9.7).
- The East Norfolk and Suffolk Economic Strategy, New Anglia LEP (November 2017) (Ref 9.8).
- Suffolk Growth Strategy, SCC (Ref 9.9).
- Transforming Suffolk, Suffolk's Community Strategy 2008-2028, Suffolk Strategic Partnership (June 2008) (Ref 9.10).
- Suffolk Coastal Final Draft Local Plan (January 2019) (Ref 9.11).
- Suffolk Coastal District Local Plan Core Strategy and Development Management Policies, SCDC (July 2013) (Ref 9.12).
- SCDC Leisure Strategy 2014-2024, SCDC (Ref 9.13).
- East Suffolk Means Business, East Suffolk Business Plan (2015-2023) (Ref 9.14).
- East Suffolk Economic Growth Plan, 2018-2023 (Ref 9.15).
- East Suffolk Tourism Strategy 2017-2022, ESC (Ref 9.16).
- East Suffolk Housing Strategy 2017-2023, ESC (Ref 9.17).

- Waveney Local Plan, East Suffolk Council, (Adopted March 2019) (Ref 9.18).

- Leiston Neighbourhood Plan 2015-2029, Leiston Neighbourhood Forum, (March 2017) (Ref 9.19).

9.4 Methodology

a) Scope of the assessment

9.4.1 The generic Environmental Impact Assessment (EIA) approach and methodology is detailed in **Chapter 6** of **Volume 1** of the **ES** (Doc Ref. 6.2).

9.4.2 This section provides an overview of the specific details of the socio-economic methodology applied to the assessment of the Sizewell C Project, and a summary of the general approach to provide appropriate context for the assessment that follows. The scope of assessment considers the impacts of the construction and operation phases of the Sizewell C Project.

9.4.3 **Appendix 6E** of **Volume 1** of the **ES** sets out details of the methodology.

9.4.4 The scope of this assessment has been established through a formal EIA scoping process undertaken with the Planning Inspectorate. A request for an EIA scoping opinion was initially issued to the Planning Inspectorate in 2014, with an updated request issued in 2019.

9.4.5 Comments raised in the EIA scoping opinion received in 2014 and 2019 have been taken into account in the development of the assessment methodology. These are detailed in **Appendices 6A** and **6C** of **Volume 1** of the **ES**.

b) Consultation and engagement

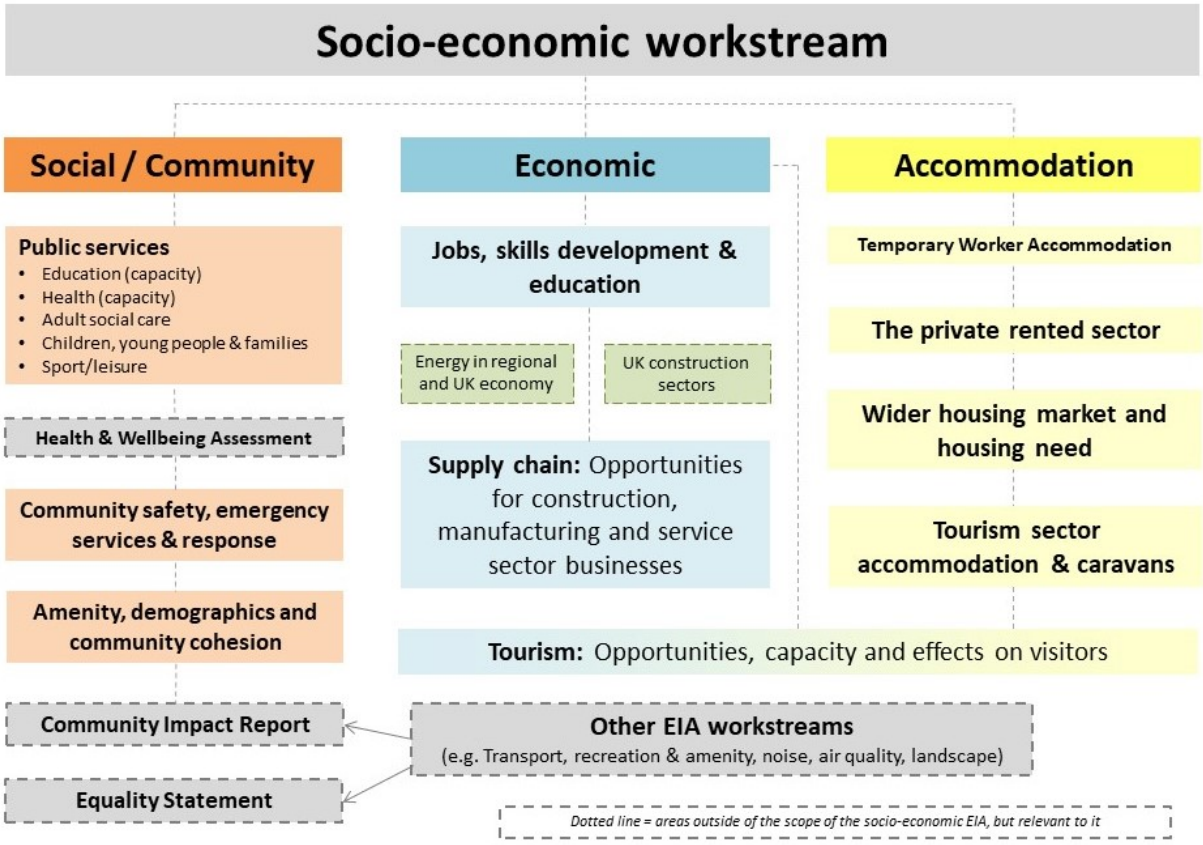
9.4.6 The scope of the assessment has also been informed by ongoing consultation and engagement with statutory consultees throughout the design and assessment process.

9.4.7 The **Consultation Report** (Doc Ref. 5.1) describes the full process which SZC Co. has carried out, the requirements for which are set out in primary and secondary legislation, including meetings held with ESC and SCC throughout the EIA process to discuss the scope of the assessment. A summary of the comments raised and SZC Co.'s responses are detailed in **Annexes A** to **H** to the **Consultation Report**.

9.4.8 The **Consultation Report** also identifies responses to comments made by individuals, statutory bodies and other organisations, and includes a socio-economic section, cross referenced with this chapter.

9.4.9 A series of formal socio-economic working groups, incorporating representatives from ESC and SCC and SZC Co. were established from 2013. The working groups have considered the Sizewell C Project assumptions and methodology adopted for the assessment, the approach to assessing effects and identifying critical issues, and the development of analysis leading to mitigation. Membership of the working groups has expanded to include other relevant stakeholders, including but not limited to local tourism and skills/educational organisations, the emergency services, and the NHS as the assessment has progressed. **Plate 9.1** sets out the approach to issues within the wider socio-economic workstream, which has influenced the working groups' membership and scope.

Plate 9.1: Components of the socio-economic workstream



9.4.10 A series of technical notes were prepared as part of this engagement and formal consultation process, and these are appended. The methodology, baseline and development of project assumptions is summarised in the following bullet points:

- **Appendix 9A** of this volume – this note sets out how the workforce is anticipated to change throughout the Sizewell C Project in terms of its size, components (e.g. skill levels), and the extent to which the workforce is home-based (HB) or non-home-based (NHB). It is based on information from Hinkley Point C, Sizewell B, and other projects, as well as early contractor involvement.

- **Appendix 9B** of this volume – this note sets out the anticipated demographic profile and other population characteristics of the workforce, based on 2011 Census data and other research from national industry bodies.

- **Appendix 9C** of this volume – this note describes how the workforce is anticipated to distribute geographically at the peak of construction activity, drawing on information from other technical notes in this list, and the Gravity Model (a 'distance decay' model based on workers' propensity to travel to work, informed by value of time estimates and the location of available accommodation).

- **Appendix 9D** of this volume – this note sets out the Sizewell C Project's assumptions about which accommodation sectors the NHB workforce is likely to live in, based on demand and supply aspects using research and public datasets, and experience from other projects.

- **Appendix 9E** of this volume – this note sets out the baseline for sport and leisure provision across the study area and describes the methodology and assessment for potential temporary demand for facilities from the NHB workforce, using guidance and methodology from Sport England.

c) Study areas

9.4.11 The spatial extent of the socio-economic assessment includes the main development site, all associated development sites, and the surrounding area, with administrative geographies defined by each socio-economic topic.

9.4.12 The precise areas used are partly influenced by data availability and, in some cases, also reflect the boundaries of relevant service planning areas, e.g. for school or health facilities.

9.4.13 The spatial scope of the socio-economic baseline studies therefore varies by impact category. Full details of the approach to defining study areas are

set out in **Appendix 6E** of **Volume 1** of the **ES**, and summarised in the following paragraphs.

9.4.14 **Figure 9.1** shows the following study areas in relation to the main development site:

- local wards (Leiston, Aldeburgh, Saxmundham, Aldeburgh and Yoxford);
- the ward-based 60-minute travel area (used for NHB workers);
- local authority areas within the 60-minute travel area; and
- the (90-minute) construction daily commuting zone (CDCZ) (used for HB workers).

9.4.15 Administrative geography is the primary scale at which baseline data from public datasets can be collected – this includes (from smallest/most local to largest/widest):

- Output Areas, Super Output Areas and Wards – used to define local areas where effects may occur at a sub-local authority scale such as localised housing or population changes.
- District and county level – these areas form the basis of the assessment of impacts on the local labour market (wider economic impacts), housing market, and public services.
- Regional level – this area forms the basis of sub-national economic and labour market effects in particular.
- National level – depending on the dataset, this could refer to the United Kingdom, Great Britain, or England, and is used to demonstrate the scale of effects, benchmarks, or changes from a wider average.

i. Workforce effects

9.4.16 Socio-economic effects are primarily related to the size, characteristics, and distribution of the construction workforce and whether that workforce is HB or NHB. As such, there are two ward-based assessment scales regularly used in this assessment. These are based on the Gravity Model, which includes inputs from the socio-economic assessments on the workforce profile, skills profile of the resident workforce, and accommodation location

and availability. It then, based on travel times, allocates the expected distribution of the construction workforce across defined travel areas:

- 60-minute travel time: This is a collection of wards within a defined 60-minute travel area from the main development site. It represents the estimated extent of daily travel to the construction site by NHB workers.

- CDCZ: The CDCZ is defined as the wards within an approximately 90-minute commute time of the main development site. The CDCZ is used primarily to define the local (HB) labour market for the construction phase. The definition of the CDCZ involves consideration of a range of factors which affect workers' willingness to commute, including time, distance, and travel allowances; plus findings from other studies of the mobility of UK construction workers.

9.4.17 Where data is not available at the ward-scale, best-fit local authority boundaries have been used.

9.4.18 A full description of detailed inputs to the determination of the 60-minute travel area and CDCZ is included in **Appendix 9A** of this volume, with specific elements covered in **Appendix 9C** and **Appendix 9D** of this volume, as well as in the **Transport Assessment** (Doc Ref 8.5).

ii. Accommodation study areas

9.4.19 Accommodation data is generally produced across all administrative geographies, though more recent and different datasets are available at a local authority scale.

9.4.20 Generally, accommodation effects are relevant to the local authority (district) scale as this is the level at which housing services and support for housing vulnerability is statutorily provided.

9.4.21 Accommodation effects are also influenced by the distribution of the workforce across the 60-minute travel area which allows for some analysis at local authority scale, and ward-based assessment of localised effects.

9.4.22 It is also relevant to have regard to other spatial scales including the Strategic Housing Market Area. The NPPF (Ref 9.3) requires local authorities to assess housing needs at this level, rather than at an individual local authority level, to ensure a sound needs assessment is provided. The Strategic Housing Market Area areas within the 60-minute travel area are therefore relevant when considering the accommodation impacts of the Sizewell C Project. There are two Strategic Housing Market Area areas within the 60-minute travel area – Ipswich (including Ipswich and Babergh,

Mid-Suffolk, and the former SCDC local authority areas), and Waveney (the former WDC local authority area only) zones.

iii. Economic study areas

9.4.23 Economic data is generally produced across all administrative geographies, though more recent and different datasets are available at a local authority scale.

9.4.24 Generally, economic effects are relevant to wider scales as this is the level at which labour markets operate and at which business services, skills provision, and education are planned for.

9.4.25 Economic effects are also influenced by the distribution of the workforce across the 60-minute travel area (in terms of the economic effects of NHB workers), and the CDCZ (in terms of employment supported for HB workers).

9.4.26 It is also relevant to consider potential effects with regard to other spatial scales such as the LEP. The New Anglia Local Enterprise Partnership (NALEP) is one of 38 LEPs across the country which are spatially defined partnerships between local authorities, public sector organisations, and business. LEPs aim to lead economic growth and job creation. NALEP covers the two counties of Norfolk and Suffolk, and sets economic objectives across this spatial area.

iv. Public services study areas

9.4.27 Public services are provided at different scales depending on the type of service. For this assessment, study areas include:

- District (ESC) scale – for the provision of local services including leisure and regulatory and environmental services.
- County (SCC) scale – for the provision of local services including education and social services and some emergency service provision (organisations providing services at this scale include SCC, Suffolk Constabulary and Suffolk Fire and Rescue Service).

9.4.28 There are also local study areas depending on the organisation of services and reporting of public information, for example, neighbourhood policing areas which are generally groups of wards.

v. Other relevant study areas

9.4.29 It is also relevant to consider potential effects with regard to other spatial scales:

- Effects on tourism may be relevant to consider at a range of scales depending on the nature of effects and the location of tourist sector accommodation and designations.

- Effects related to the operational workforce would be determined by the likely spatial distribution of the workforce, and the subsequent effect on the local and regional economies.

d) Baseline assessment

9.4.30 Baseline information has been identified through (see **Appendix 6E** of **Volume 1** of the **ES** for further details):

- Analysis of publicly-available demographic and economic datasets including nationally recognised data, and survey information obtained from the Office for National Statistics (ONS), and other Government departments including the Ministry of Housing, Communities and Local Government.

- Work undertaken through various accompanying technical notes, included as **Appendices 9A**–**9E** of this volume.

- Work on the Gravity Model which has been used to assess the spatial distribution of the workforce, undertaken jointly with the transport workstream. A full description of the model and its inputs is set out in the **Transport Assessment** (Doc Ref. 8.5).

- Consultation with appropriate statutory bodies.

- Review and audit of public services and community facilities, including education, and healthcare from relevant public data sources including The NHS Website and Annual School Census.

e) Assessment approach

9.4.31 The potential for significant socio-economic effects is primarily linked to the workforce profile, which sets out the change in employment required as a result of construction activity across the duration of the construction phase.

9.4.32 As such, assessments are presented, where appropriate, at the peak of construction workforce demand, representing the potential reasonable worst case effect on, for example, demand for accommodation and public services.

9.4.33 It is recognised that some effects may occur at different stages of the construction phase, that mitigation may require a lead-in time to ensure that it is effective, and that effects may be determined by the change in workforce over time compared to the components of the Sizewell C Project, such as project accommodation provision. Therefore, where appropriate, assessments are made in the context of annual change over the duration of the construction phase.

9.4.34 There would also be effects during the operational phase when construction is complete, for the lifetime of the Sizewell C Project, and these are assessed from completion of the construction phase.

f) Assessment criteria

9.4.35 As described in **Chapter 6** of **Volume 1** of the **ES**, the EIA methodology considers whether impacts of the proposed development would have an effect on any resources or receptors. Assessments consider broadly the magnitude of impacts and value/sensitivity of resources/receptors that could be affected in order to classify effects.

9.4.36 **Appendix 6E** of **Volume 1** of the **ES** sets out the approach to value, sensitivity and magnitude that combine to form the assessment of significance for socio-economic effects.

9.4.37 **Table 9.1** identifies those impacts where significance can be defined with reference to the baseline and quantitative indicators. Other qualitative assessments are based on professional judgement. They seek, so far as is possible, to identify quantitative criteria as to the level of change in relation to the current capacity of the area (for example for schools and accommodation), or in the context of current annual rates of turnover and change in population. This recognises the dynamic nature of the environment with which the Sizewell C Project would interact.

Table 9.1: Approach to assessment of significance for socio-economic effects

Impact	Beneficial/Adverse	Major	Moderate	Minor	Negligible
Economic Effects – Construction					
Home-based (HB) recruitment.	Adverse	No adverse effects are considered in terms of employment generation – all effects are considered to be beneficial in this regard (potential secondary effects on labour market churn are also considered).			
	Beneficial	HB employment equivalent to >10% of existing construction employment.	HB employment equivalent to 5% to 10% of existing construction employment.	HB employment equivalent to <5% of existing construction employment.	HB employment equivalent to <1% of existing construction employment.
Effects on unemployment and economic inactivity.	Adverse	No adverse effects are considered in terms of the effects of the Sizewell C Project on unemployment and economic activity – all effects are considered to be beneficial in this regard.			
	Beneficial	HB workforce drawn from unemployment represents >5% of current registered unemployed.	HB workforce drawn from unemployment represents 3% to 5% of current registered unemployed.	HB workforce drawn from unemployment represents <3% of current registered unemployed.	No workforce drawn from current unemployment/economic inactivity.
Effects on labour market churn and 'displacement'.	Adverse	Assessed qualitatively in the context of existing labour market churn in the construction sector.			
	Beneficial				
Business and supply chain.	Adverse	No adverse effects are considered in terms of the effects of the Sizewell C Project on business and the supply chain – all effects are considered to be beneficial in this regard.			
	Beneficial	Assessed qualitatively based on the potential for contract value to be secured.			
Wages/spending and additionality.	Adverse	No adverse effects are considered in terms of the effects of the Sizewell C Project on wages/spending and additionality – all effects are considered to be beneficial in this regard.			

Impact	Beneficial/Adverse	Major	Moderate	Minor	Negligible
	Beneficial	Assessed qualitatively based on the potential for net additional contribution to the economy of earning and expenditure.			
Effects on tourism economy.	Adverse	Assessed qualitatively based on the identification of potential perceived sensitivities to changes in visitor behaviour in the context of the existing visitor environment and characteristics of the Suffolk coast, and evidence of perceived effects versus observed effects elsewhere.			
	Beneficial				
Effects on agricultural economy.	Adverse	Agricultural land lost represents > 10% of agricultural land in Suffolk.	Agricultural land lost represents 5–10% of agricultural land in Suffolk.	Agricultural land lost represents 1–5% of agricultural land in Suffolk.	Agricultural land lost represents < 1% of agricultural land in Suffolk.
	Beneficial	Beneficial effects on the regional agricultural economy are not likely to arise as a result of the Sizewell C Project resulting in either no change or overall loss to the quantum of land in this sector, and have therefore not been considered in this assessment.			
Effects of transport on business.	Adverse	Assessed qualitatively based on a review of overall effects of the Sizewell C Project on the transport network, and the ability for potentially affected businesses to claim statutory compensation should they perceive they qualify for it.			
	Beneficial				
Accommodation Effects – Construction					
Tourist sector.	Adverse	Workforce demand exceeds 50% of available and affordable capacity at peak season.	Workforce demand exceeds 25% of available and affordable capacity at peak season.	Workforce demand exceeds 10% of available and affordable capacity at peak season.	Workforce demand is less than 10% of available and affordable capacity at peak season.
	Beneficial	Beneficial effects may occur where construction workforce has the potential to use otherwise vacant accommodation, particularly off—peak. This has been considered qualitatively, as it is likely to fluctuate between seasons, and is considered at the 60-minute area scale only.			
Private rented sector (PRS).	Adverse	Workforce demand exceeds 20% of overall stock or 100% of frictional vacancy needed for	Workforce exceeds 10% of overall stock or 50% of frictional vacancy needed for PRS to	Workforce demand is less than 50% of frictional vacancy needed for PRS to operate.	Workforce demand is less than 10% frictional vacancy needed for PRS to operate.

Impact	Beneficial/Adverse	Major	Moderate	Minor	Negligible
		PRS to operate.	operate.		
	Beneficial	Beneficial effects on the PRS are not considered in this assessment. The Sizewell C Project only has the potential to cause adverse effects due to the nature of demand for private rented accommodation. However, there may be long-term beneficial effects associated with mitigation strategies that leave legacy benefits in terms of the overall supply and quality of accommodation in the sector.			
Owner-occupied sector.	Adverse	> 50% of annual turnover of owner-occupied sector.	25–50% of annual turnover.	10–25% of annual turnover.	< 10% of annual turnover.
	Beneficial	Beneficial effects on the owner-occupied sector are not considered in this assessment, as the Sizewell C Project only has the potential to cause adverse effects due to the nature of demand for owner occupied accommodation.			
Population Dynamics – Construction					
Population change and dynamics.	--	Effect of new NHB workers represents >50% of annual average new residents.	Effect of new NHB workers represents 20% to up to 50% of annual average new residents.	Effect of new NHB workers represents 10% to up to 20% of annual average new residents.	Effect of new NHB workers represents less than 10% of annual average new residents.
Public Services – Construction					
Childcare and education.	Adverse	Effect of new population if additional means exceeding current capacity, where baseline levels were not already at or exceeding capacity.	Effect of new population if additional takes surplus capacity to within 5% of total capacity, or exceeds existing capacity by between 5% and 10% where baseline levels	Effect of new population if additional takes surplus capacity to within 10% of total capacity, or exceeds existing capacity by up to 5% where baseline levels were already at or exceeding	Effect of new population if additional means no change to within 10% of surplus capacity, or no change from baseline significance.

Impact	Beneficial/Adverse	Major	Moderate	Minor	Negligible
			were already at or exceeding capacity.	capacity.	
	Beneficial	Beneficial effects on the childcare and education sector are not likely to occur as a result of the Sizewell C Project, which will not lead to an alleviation of need for these services as a result of physical interventions or implementation strategies, and have therefore not been identified in this assessment.			
Social services.	Adverse	Assessed qualitatively – drawing on information from scheme design and implementation strategies such as the **Community Safety Management Plan** (Doc Ref. 8.16), Worker Code of Conduct**, Employment, Skills and Education Strategy** provided in **Appendix A** of the **Economic Statement** (Doc Ref. 8.9) and **Accommodation Strategy** (Doc Ref. 8.10) supplemented by review of potential risks/issues identified through engagement related to project-wide effects.			
	Beneficial	Beneficial effects on the social care sector are not likely to occur as a result of the Sizewell C Project, which will not lead to an alleviation of need for these services as a result of physical interventions or implementation strategies, and have therefore not been identified in this assessment.			
Other county-level services.	Adverse	Assessed qualitatively based on the potential for NHB construction workers to create net additional demand for services in the context of their demographic characteristics, accommodation choices, locations and duration of residence.			
	Beneficial	Beneficial effects on other county level services are not likely to occur as a result of the Sizewell C Project, which will not lead to an alleviation of need for these services as a result of physical interventions or implementation strategies, and have therefore not been identified in this assessment.			
Formal sports and leisure.	Adverse	Unmet demand for additional formal sports and leisure facilities as a result of the construction workforce equivalent to whole facilities being needed, or a contribution to new facilities (considered qualitatively, informed by published standards of demand).			No, or imperceptible impact on demand for or supply of formal sports and leisure provision.
	Beneficial	The Sizewell C Project will deliver sports facilities that both meet the needs of workers and provide additional	The Sizewell C Project will deliver sports facilities that both meet the needs of workers and provide	The Sizewell C Project will deliver sports facilities that meet the needs of workers and help to attract a high-quality	No, or imperceptible impact on demand for or supply of formal sports and leisure provision.

Impact	Beneficial/Adverse	Major	Moderate	Minor	Negligible
		community resource in an area or sector of existing deficiency.	additional community resource.	workforce.	
Regulatory and environmental services.	Adverse	Proportion of NHB workforce in non-council-tax accommodation represents >10% increase in population at District level.	Proportion of NHB workforce in non-council-tax accommodation represents 5% to 10% increase in population at District level.	Proportion of NHB workforce in non-council-tax accommodation represents 2% to 5% increase in population at District level.	Proportion of NHB workforce in non-council-tax accommodation represents <2% increase in population at District level.
	Beneficial	Beneficial effects on regulatory and environmental services are not likely to occur as a result of the Sizewell C Project, which will not lead to an alleviation of need for these services as a result of physical interventions or implementation strategies, and have therefore not been identified in this assessment.			
Crime and policing.	Adverse	Potential estimated increase of more than 20% in crime rates per 1,000 population.	Potential estimated increase of between 10% and 20% in crime rates per 1,000 population.	Potential estimated increase of between 1% and 10% in crime rates per 1,000 population.	Potential estimated increase of up to 1% in crime rates per 1,000 population.
	Beneficial	Assessed qualitatively – drawing on information from scheme design and implementation strategies such as the **Community Safety Management Plan** (Doc Ref. 8.16), supplemented by review of potential risks/issues identified through engagement related to project-wide effects.			
Fire service.	Adverse	Assessed qualitatively – drawing on information from **Transport Assessment** (Doc Ref. 8.5) and scheme design and implementation, supplemented by review of potential risks/issues identified through engagement related to project-wide effects.			
	Beneficial	Assessed qualitatively – drawing on information from **Transport Assessment** (Doc Ref. 8.5) and scheme design and implementation that could improve service provision in the long-term.			

Impact	Beneficial/Adverse	Major	Moderate	Minor	Negligible
Community cohesion and integration.	Adverse	Assessed qualitatively using national government definitions of community cohesion, integration, and sustainability.			
	Beneficial				
Operational Effects					
Local direct employment.	Adverse	No adverse effects are considered in terms of employment generation – all effects are considered to be beneficial in this regard.			
	Beneficial	Employment equivalent to >20% of existing employment in energy generation sector.	Employment equivalent to 10% to 20% of existing employment in energy generation sector.	Employment equivalent to 1% to 10% of existing employment in energy generation sector.	Employment equivalent to <1% of existing employment in energy generation sector.
Local indirect employment/economic effects.	Adverse	No adverse effects are considered in terms of local indirect employment generation and economic effects – all effects are considered to be beneficial in this regard.			
	Beneficial	Assessed qualitatively based on the potential for net additional contribution to the economy of earning and expenditure.			
Business and supply chain.	Adverse	No adverse effects are considered in terms of business and supply chain effects – all effects are considered to be beneficial in this regard.			
	Beneficial	Assessed qualitatively based on the potential for contract value to be secured locally.			
PRS	Adverse	Workforce demand exceeds 20% of overall stock or 100% of frictional vacancy needed for PRS to operate.	Workforce exceeds 10% of overall stock or 50% of frictional vacancy needed for PRS to operate.	Workforce demand is less than 50% of frictional vacancy needed for PRS to operate.	Workforce demand is less than 10% frictional vacancy needed for PRS to operate.
	Beneficial	Beneficial effects on the PRS are not considered in this assessment, as the Sizewell C Project only has the potential to cause adverse effects due to the nature of demand for private rented accommodation during the operational phase.			

Impact	Beneficial/Adverse	Major	Moderate	Minor	Negligible
Owner-occupied sector.	Adverse	> 50% of annual turnover of owner-occupied sector.	25–50% of annual turnover.	10–25% of annual turnover.	> 10% of annual turnover.
	Beneficial	Beneficial effects on the owner-occupied sector are not considered in this assessment, as the Sizewell C Project only has the potential to cause adverse effects due to the nature of demand for owner occupied accommodation.			
Net additional demand for public services.	Adverse	Assessed qualitatively considering the net additionality of operational workforce and their contribution to service delivery through general taxation.			
	Beneficial	Beneficial effects on public services are not likely to occur as a result of the Sizewell C Project, which will not lead to an alleviation of need for these services as a result of physical interventions or implementation strategies, and have therefore not been identified in this assessment.			
Population change, community cohesion and integration.	Adverse	Assessed qualitatively using national government definitions of community cohesion, integration and sustainability, and considering the annual rate of additional residents as a result of the NHB portion of the operational workforce.			
	Beneficial				

9.4.38 Following the classification of an effect as presented in **Table 9.1**, a clear statement is made as to whether the effect is 'significant' or 'not significant'. As a general rule, major and moderate effects are considered to be significant and minor and negligible effects are considered to be not significant. However, professional judgement is also applied where appropriate.

g) Assessment methodology

9.4.39 The assessment of likely significant socio-economic effects within the study areas has been undertaken by reference to the likely changes from the baseline conditions, and the effects of those changes as a result of the Sizewell C Project.

9.4.40 The assessment has considered the following potential effects.

i. Economic effects

9.4.41 The economic effects of the Sizewell C Project are primarily driven by the demand for goods from the supply chain and for services in terms of contracts and labour recruitment to deliver the Sizewell C Project. These are informed by:

- the overall value of the Sizewell C Project; and
- the mix of contract packages required over the construction phase in terms of supply chain and employment.

9.4.42 Labour market effects are considered in terms of the demand for local employment, and the benefits that demand brings to existing labour markets and in terms of the amount of NHB labour brought into the region for the Sizewell C Project. These influence the economy in terms of skills demands, productivity, effects on unemployment and economic inactivity, expenditure and additionality effects[1].

9.4.43 Jobs supported by the Sizewell C Project directly would result in changes to employment levels in the local employment structure. These would depend on both the demands of the Sizewell C Project at different points in the construction phase, and associated policies, but there is likely to be a major increase in local employment/opportunities. There would also be a multiplier effect with indirect (e.g. local supplier firms) and induced (e.g.

[1] Net positive difference that results from economic development intervention. The extent to which an activity (and associated outputs, outcomes and impacts) is larger in scale, at a higher quality, takes place more quickly, takes place at a different location, or takes place at all as a result of intervention. Additionality measures the net result, taking account of deadweight, leakage, displacement, substitution and economic multipliers.

local service jobs) effects from the Sizewell C Project. There may also be some labour market churn as some employees move into roles on or associated with the Sizewell C Project from other local employers.

9.4.44 Primarily, employment effects are considered in terms of their value relative to the existing construction economy and labour market, levels of unemployment and economic inactivity and labour market churn, and output/productivity.

9.4.45 This chapter also considers the wider economic effects of the Sizewell C Project including the proportion and estimated value of local supply chain benefits and secondary benefits from employee spending.

9.4.46 In addition, the chapter looks at effects on other sectors – primarily:

- tourism: considering potential sensitivities that may affect peoples' perceptions of the area with the potential to lead to changes in visitor behaviour; and

- agriculture: in terms of loss of land, and therefore agricultural activity supporting jobs. Effects on severance or changes to landholdings affecting businesses (accounting for any proposed mitigation that SZC Co. would undertake) is assessed in **Chapter 17** of this volume (Doc Ref. 6.3) for the main development site and **Chapter 10** of **Volumes 3-9,** (Doc. Ref. 6.4-6.10) for associated developments.

ii. Accommodation effects

9.4.47 The effects of the Sizewell C Project on accommodation and housing markets are driven by the number and location of NHB workers associated with the project, and the types of accommodation they are likely to stay in. The assessment considers the effects on:

- Owner-occupied accommodation: potential for increased demand for family-type owner-occupied homes in the local area from long-term construction workforce and operational workers.

- Private rented accommodation: potential for increased demand for private rented accommodation from the NHB workforce, and particularly where there may be effects related to the lower 30th percentile of the sector where tenants may be in housing need, or in receipt of housing benefits, or otherwise vulnerable to ending of tenancy.

- Tourist accommodation: potential for increased demand for tourist accommodation from NHB workforce.

iii. Public services, community and demographics

9.4.48 The effects of the Sizewell C Project on the population, community facilities, and public services are driven by the number and location of NHB workers throughout the construction phase (as set out in the workforce profile), and their demographic and characteristics. This influences how they may be anticipated to create additional demand for services/facilities. The assessment considers:

- Population/demographic change: changes in the local population level and structure. For example, there is likely to be a large NHB and male population during the construction phase, a proportion of whom could be accompanied by families; there would be smaller numbers with a longer term presence during the operational phase.

- Impact on local social conditions and associated services: project-related demographic changes have the potential to adversely impact on local social conditions and associated services. For example, a non-home-based construction workforce may have the potential to lead to a change in demand for local healthcare facilities, school and policing services which could create possible issues for the local population (e.g. impact on school places, crime in the community; traffic flows/noise).

- Other less tangible socio-cultural change: changes in the level and structure of employment and demographic changes could have the potential to affect quality of life, community character/cohesion and integration. Parts of the local community may be differently affected by the development, or there could be a shift in the character of some communities (especially those close to the main development site or on key transport routes to the Sizewell C Project).

h) Assumptions and limitations

9.4.49 Project assumptions and limitations have been set out in:

- **Appendix 6E** of **Volume 1** of the **ES**; and

- technical notes appended to this chapter – **Appendices 9A**–**9E.**

9.4.50 In summary, these assumptions and limitations include:

- assumptions about the duration and phasing of the Sizewell C Project and its associated development, acknowledging internal and external uncertainties such as the political and economic climate;
- the size, profile, and characteristics of the construction workforce;
- the recruitment of the workforce and the extent to which it would be HB and NHB;
- the accommodation likely to be used by the NHB workforce;
- the operational workforce; and
- limitations related to datasets (representing a 'snapshot' in time) and the approach to dynamism of the baseline.

i. Core assumptions

9.4.51 The Sizewell C Project's transport and socio-economic effects are influenced by two core assumptions about the construction workforce:

- the number of workers required over time, by skill/role, and the extent to which they can be sourced from existing labour markets (HB) or would temporarily move to the area (NHB); and
- the spatial distribution of workers (by accommodation type) across the area.

9.4.52 The first assumption is driven by the Workforce Profile – details of which are set out in **Appendix 9A** of this volume and summarised in **Figure 9.2** and **Figure 9.3**.

9.4.53 This sets out that this assessment uses a workforce profile peaking at 7,900 workers – this is a precautionary approach to ensure that appropriate mitigation can be applied.

9.4.54 Both core assumptions are driven by the gravity model and accommodation assumptions – details of which are set out in **Appendix 9A, Appendix 9C** and **Appendix 9D** of this volume.

9.4.55 Throughout this assessment, the effects of these combined assumptions are considered in terms of their influence on the significance of effects on the economy and labour market, accommodation and public services.

ii. Definitions

9.4.56 Throughout this assessment reference is made to a number of different terms relating to the Sizewell C Project's workforce, defined in order to adequately inform the assessment of effects. The following terms are defined here:

- Workers: In line with standard practice, a 'worker' is defined using the 'five day rule' – meaning people who spend at least five days working on the site in a given month. This enables the distinction of workers who may generate the potential for socio-economic effects e.g. on housing or public services from visitors. This therefore does not include 'visitors' to the site (see below). There may be up to 7,900 workers at peak.

- Visitors: Occasional visitors to the site for work, not meeting the definition of a worker (see above) and therefore not likely to generate the potential for socio-economic effects – though likely to contribute to transport effects.

- Associated development workers: This refers to the operational staff at associated development sites – up to 600 at peak including operation of the facilities within the on-site accommodation campus.

- Employment years: It is not possible to identify in detail the length of each contract for each skill type required. One way of representing the employment – and headline economic effects – supported by the construction phase of the Sizewell C Project is to consider how many years of employment would be needed overall across the workforce profile. Overall, based on standard working hours, the Sizewell C Project would support around 40,000 years of employment throughout the construction phase of the Sizewell C Project. This does not mean that there would be 40,000 'jobs' – contracts will be of varying lengths. SZC Co. will seek to re-utilise people through different roles in order to promote sustainable careers and efficient working.

- Non-home-based workers: Workers who retain a home address outside of the 60-minute area, but move to the area temporarily (likely returning home between working periods) in a range of short-medium term accommodation.

- Home-based workers: Workers who already live within 90-minutes of the site.

- Workers on-site: For clarity, this assessment does not consider the total number of workers on-site at any given time. While this is an important distinction for transport assessments, the definition of 'workers' above is more relevant for considering impacts on socio-economic receptors.

9.5 Baseline environment

9.5.1 This section describes the socio-economic baseline for the Sizewell C Project, including a summary of key characteristics of the local area's socio-economic baseline, including demographic, economy and employment, accommodation, education, health and leisure facilities.

a) Current baseline

i. Population and population density

9.5.2 The six local authorities closest to the site (East Suffolk, Great Yarmouth, Ipswich, Babergh, Mid Suffolk and South Norfolk) (the 'immediate districts') have a combined population of 817,100 (ONS, mid-year population estimates, 2018). East Suffolk's population comprises just under one third of the total (248,200).

9.5.3 The largest settlements in the immediate districts are Ipswich and Felixstowe to the south of the area, and Lowestoft and Great Yarmouth to the north.

9.5.4 Of the six immediate districts, four are predominantly rural, and the area as a whole has a low population density (2.1 residents per hectare (ha)). Across the 60-minute travel area (which does not extend to the urban areas of Ipswich and Great Yarmouth), population density is very low at 1.6 residents per ha).

9.5.5 In the five wards surrounding the main development site there are 19,470 residents living at a low density of 1.2 people per ha.

9.5.6 **Table 9.2** summarises the total population and population density in the immediate districts, the 60-minute travel area and the CDCZ, and in the wards surrounding the site.

Table 9.2: Population and population density

Area	Population Estimates 2018	Area Size (ha)	Population Density
Local Wards			
Leiston	6,515	2,512	2.6

Area	Population Estimates 2018	Area Size (ha)	Population Density
Saxmundham	5,765	3,030	1.9
Snape	1,982	3,871	0.5
Yoxford	2,022	5,473	0.4
Aldeburgh	3,183	1,764	1.8
Districts			
Great Yarmouth	99,370	17,419	5.7
South Norfolk	138,017	90,771	1.5
East Suffolk	248,249	126,125	2.0
*Suffolk Coastal**	129,938	*89,156*	1.5
*Waveney**	118,311	*36,968*	3.2
Mid Suffolk	102,493	87,107	1.2
Ipswich	137,532	3,941	34.9
Babergh	91,401	59,378	1.5
Study Area.			
60-minute travel area	320,861	206,159	1.6
CDCZ (90-minute travel area)	1,776,727	792,074	2.2
Wider Scales.			
Norfolk	903,680	537,056	1.7
Suffolk	758,556	380,018	2.0
East	6,201,214	1,910,838	3.2
England	55,977,178	13,027,843	4.3

Source: ONS, mid-year population estimates, 2019

** Suffolk Coastal and Waveney have since combined to form East Suffolk District*

ii. Age and gender profile

9.5.7 The immediate districts have higher proportions of older people, and lower proportions of working age people, compared with the national average. This disparity is particularly striking in East Suffolk district where 27% of residents are aged 65 and over compared to a regional average of 19% and 18% nationally. This is outlined in **Table 9.3**.

9.5.8 This trend is reflected across the 60-minute travel area where 27.1% of residents are aged 65 and over, and 55.9% are working age (aged 16–64). Across the CDCZ, which incorporates a number of larger urban areas, the proportion of working-age residents is closer to the national average (59.4% of CDCZ residents compared to 62.6% national average).

9.5.9 The gender split across the 60-minute and CDCZ areas is in line with averages for the East of England and nationally – with slightly higher proportions of females (51%) compared to males (49%) across all areas. This is broadly the case across the immediate districts, although there are some variations at lower spatial scales.

Table 9.3: Age profile

Area	% Children (0–15)	% Working Age (16–64)	% Older People (Age 65+)	Gender (M:F)
Local Wards				
Leiston	16.5%	57.7%	25.8%	49:51
Saxmundham	19.4%	54.6%	26.0%	47:53
Snape	14.0%	53.2%	32.8%	47:53
Yoxford	11.6%	47.6%	40.8%	48:52
Aldeburgh	10.0%	44.9%	45.1%	45:55
Districts				
Great Yarmouth	17.8%	58.0%	24.2%	49:51
South Norfolk	18.1%	58.0%	24.0%	49:51
East Suffolk	16.9%	55.9%	27.1%	49:51
*Suffolk Coastal**	16.7%	56.0%	27.3%	49:51
*Waveney**	17.2%	55.9%	26.9%	48:52
Mid Suffolk	16.9%	58.8%	24.3%	49:51
Ipswich	20.3%	63.2%	16.4%	50:50
Babergh	17.0%	57.0%	26.0%	49:51
Study Area				
60-Minute Travel Area	17.0%	56.4%	26.6%	49:51
CDCZ (90-Minute Travel Area)	17.6%	59.4%	23.0%	49:51
Wider Scales				
Norfolk	16.9%	58.8%	24.3%	49:51
Suffolk	18.1%	58.7%	23.2%	49:51
East	19.4%	61.0%	19.6%	49:51
England	19.2%	62.6%	18.2%	49:51

Source: ONS, mid-year population estimates, 2019.

iii. Recent population growth

9.5.10 The population of the immediate districts increased by an estimated 27,500, or 3.5%, over the five years between mid-2013 (ONS, 2014) and mid-2018 (ONS, 2014). This rate of population growth is below the East of England (4.2%) and national (3.9%) averages shown in **Table 9.4**. Within this area, population growth has been highest in South Norfolk (an increase of 10,300 or 8.1%). The population of East Suffolk grew by 6,800 (2.8%) over the same period. Recent population growth in the five wards surrounding the main development site was approximately 1,100 or 6.0%.

Table 9.4: Population growth, 2013–18

Area	2013 Population	2018 Population	Growth
Local Wards			
Leiston	6,331	6,515	2.9%
Saxmundham	4,988	5,765	15.6%
Snape	1,888	1,982	5.0%
Yoxford	1,986	2,022	1.8%
Aldeburgh	3,176	3,183	0.2%
Districts			
Great Yarmouth	97,736	99,370	1.7%
South Norfolk	127,682	138,017	8.1%
East Suffolk	241,426	248,249	2.8%
*Suffolk Coastal**	125,212	129,938	3.8%
*Waveney**	116,214	118,311	1.8%
Mid Suffolk	98,431	102,493	4.1%
Ipswich	135,604	137,532	1.4%
Babergh	88,704	91,401	3.0%
Other Scales			
60-minute travel area	311,564	320,861	3.0%
CDCZ (90-minute travel area)	1,703,064	1,776,727	4.3%
Wider Scales			
Norfolk	870,296	903,680	3.8%
Suffolk	735,844	758,556	3.1%
East	5,951,934	6,201,214	4.2%
England	53,865,817	55,977,178	3.9%

Source: ONS, mid-year population estimates, 2014 and 2019.

iv. Migration

9.5.11 The latest statistics on internal migration flows at local authority area level are shown in **Table 9.5** for mid-2017 to mid-2018 (ONS, 2019 – local area migration indicators). This shows an annual net inflow of around 4,764 people into the immediate districts, including 2,176 into East Suffolk district.

Table 9.5: Internal migration flows (within the UK): immediate districts

Area	Migration into Area	Migration from Area	Migration Net Flow
Districts			
Great Yarmouth	4,286	4,132	150
South Norfolk	9,899	7,369	2,530
East Suffolk	12,416	9,980	2,440
*Suffolk Coastal**	*7,129*	*5,690*	*1,439*
*Waveney**	*5,287*	*4,290*	*997*
Mid Suffolk	6,063	5,219	840
Ipswich	6,593	7,822	-1,230
Babergh	5,430	4,730	700
Wider Scales			
Norfolk	31,566	26,131	5,440
Suffolk	26,814	23,359	3,460
East	176,465	167,656	8,810
England	99,676	118,100	-18,424

Source: ONS local area migration indicators, 2019.

9.5.12 The population at all scales is dynamic and mobile. Approximately 11% of people move either within, to or from the District area each year, compared to 12% across England (Census, 2011).

9.5.13 National Insurance number registrations for foreign national adults in the immediate districts rose by 17% between 2014 and 2019 (Department for Work and Pensions (DWP), 2019). However, the rise was focused in Ipswich where there was a 66% increase in registrations; there was also a small (3%) rise in South Norfolk, while all other districts saw a fall in registrations – as shown in **Table 9.6.**

9.5.14 These numbers do not track whether migrants become permanent residents or the duration of their stay. Many would be temporary seasonal

workers. However, in the context of the annual migration figures described above they still form a minority of migration to the area.

Table 9.6: National insurance number registrations for foreign national adults

Area	Year to March 2014	Year to March 2019	% Change
East Suffolk	660	650	-2%
*Suffolk Coastal**	*368*	*471*	*28%*
*Waveney**	*292*	*179*	*-39%*
Great Yarmouth	852	656	-23%
Ipswich	1,436	2,386	66%
Mid Suffolk	168	148	-12%
Babergh	295	206	-30%
South Norfolk	336	346	3%

Source: DWP, 2014; DWP, 2019.

v. Baseline dynamics

9.5.15 A baseline study has been conducted to identify the turnover in population and jobs at a local scale using Census Moving Groups (2011) analysis for population turnover and by applying average job turnover for the UK (Organisation for Economic Co-operation and Development, 2015) to the surveyed jobs (Business Register and Employment Survey, 2019). Turnover is shown in **Table 9.7**.

Table 9.7: Population and jobs turnover

Area	% New Residents in 2011	Total New Residents 2011	Jobs Turnover Estimate at 15–20% (per year)
Local Wards.			
Leiston	5.8%	370	390–520
Saxmundham	8.8%	432	280–380
Snape	9.0%	172	50–60
Yoxford	9.7%	185	110–150
Aldeburgh	9.1%	293	210–280
Districts			
East Suffolk	4.2%	10,068	13,710–18,280
*Suffolk Coastal**	*6.3%*	*7,849*	7,670 – 10,230
*Waveney**	*6.2%*	*7,120*	6,040 – 8,050

Area	% New Residents in 2011	Total New Residents 2011	Jobs Turnover Estimate at 15–20% (per year)
Ipswich	5.6%	7,513	10,750–14,340
Great Yarmouth	3.3%	3,241	5,560–7,420
South Norfolk	5.7%	7,016	8,070–10,760
Mid Suffolk	5.4%	5,242	5,390–7,190
Babergh	5.3%	4,688	4,840–6,460
Other Scales			
60-minute travel area	8.2%	25,179	15,960–21,280
CDCZ (90-minute travel area)	10.1%	170,437	109,204–145,610

Source: Census Moving Groups 2011; BRES, 2019.

9.5.16 The high level of dynamism could be linked to the strength of tourist and agricultural economies in the area, which rely extensively on a seasonal and migratory workforce.

9.5.17 This dynamism means the local area is able to cope with outages every 18 months or so at the existing Sizewell B station. Outages can have a substantial NHB workforce of in the region of 850 workers (out of approximately 1,000 total outage workers). These are absorbed by the local accommodation market without significant difficulties.

vi. Employment

9.5.18 The latest employment estimates for the immediate districts are for 2018, published in 2019 (BRES, 2019). At that time, there were an estimated 321,000 employee jobs across the immediate districts, although total employment including self-employed jobs was somewhat higher, at an estimated 337,000. Just over one quarter of employee jobs (around 91,500) were located in East Suffolk. Employee jobs across the 60-minute travel area are estimated at 106,000. Across the CDCZ there are an estimated 728,000 employee jobs, which represent approximately one quarter of all employee jobs across the East of England (2.8 million jobs).

9.5.19 The main concentrations of employment within the immediate districts are located in the main urban centres of Ipswich, Great Yarmouth, Felixstowe and Lowestoft, as shown in **Table 9.8**.

Table 9.8: Employment estimates

Area	Employee Jobs (2019)	Total Employment (2019)
Local Wards		
Leiston	2,500	2,500
Saxmundham	2,000	2,000
Snape	300	350
Yoxford	700	800
Aldeburgh	1,500	1,500
Districts		
Great Yarmouth	37,000	38,000
South Norfolk	54,000	57,000
East Suffolk	91,500	96,000
*Suffolk Coastal**	51,000	54,000
*Waveney**	40,500	42,000
Mid Suffolk	36,000	38,000
Ipswich	71,500	73,000
Babergh	32,500	34,000
Other Scales		
60-minute travel area	106,000	111,000
CDCZ (90-minute travel area)	728,000	753,000
Wider Scales		
Norfolk	368,000	388,000
Suffolk	323,000	339,000
East	2,781,000	2,880,000
England	25,976,000	26,842,000

Source: BRES, 2019.

9.5.20 BRES estimates, shown in **Table 9.9**, indicate relatively strong employee jobs growth in the East of England over the last six years (15.0% growth) and England as a whole (11.7% growth). Growth across the 60-minute travel area (11.5%) and the CDCZ (10.6%) has been below the national average. In East Suffolk there has been an increase of 5,000 (5.8%) in the number of employee jobs. In the wards surrounding the site, the proportional change in numbers of jobs has been more volatile, reflecting the much smaller number of jobs in these areas. Taking the five wards together, there has been an overall increase in the number of employee jobs of 900 jobs (14.8% change).

Table 9.9: Estimated employee job growth

Area	Employee Jobs (2012)	Employee Jobs (2018)	% Change
Local Wards			
Leiston	2,500	2,500	0.0%
Saxmundham	1,500	2,000	33.3%
Snape	400	300	-25.0%
Yoxford	450	700	55.6%
Aldeburgh	1,250	1,500	20.0%
District			
Great Yarmouth.	37,000	37,000	0.0%
South Norfolk.	47,000	54,000	14.9%
East Suffolk.	86,000	91,000	5.8%
Suffolk Coastal.*	*47,000*	*51,000*	*8.5%*
*Waveney**	*39,000*	*40,000*	*2.6%*
Mid Suffolk.	33,000	35,000	6.1%
Ipswich	65,000	72,000	10.8%
Babergh	30,000	32,000	6.7%
Other Scales			
60-minute travel area	96,000	107,000	11.5%
CDCZ (90-minute travel area)	658,000	728,000	10.6%
Wider Scales			
Norfolk	337,000	368,000	9.2%
Suffolk	295,000	323,000	9.5%
East	2,419,000	2,781,000	15.0%
England	23,256,000	25,976,000	11.7%

Source: BRES, 2013; BRES, 2019.

9.5.21 **Table 9.10** provides a more detailed breakdown of recent employment change in the immediate districts by broad industry sector. The figures include only employee jobs and exclude self-employed workers. Employment growth over the six years 2012-2018 was focused in the health (6,000 jobs); professional, scientific and technical (4,000 jobs); and arts, entertainment, recreation and other services (3,000 jobs) sectors. Employment losses were experienced in a number of sectors, including most significantly education (-1,000 jobs), and manufacturing (-2,000 jobs).

Table 9.10: Employment change by industry sector, immediate districts

Sector	Employee Estimates (2012)	Employee Estimates (2018)	Growth
Agriculture, forestry & fishing	5,000	5,000	0.0%
Mining, quarrying & utilities	5,000	7,000	40.0%
Manufacturing	31,000	29,000	-6.5%
Construction	15,000	17,000	13.3%
Motor trades	6,000	8,000	33.3%
Wholesale	10,000	11,000	10.0%
Retail	32,000	33,000	3.1%
Transport & storage (inc. postal)	20,000	21,000	5.0%
Accommodation & food services	23,000	26,000	13.0%
Information & communication	8,000	9,000	12.5%
Financial & insurance	7,000	8,000	14.3%
Property	3,500	3,500	0.0%
Professional, scientific & technical	17,000	21,000	23.5%
Business administration & support services	19,000	20,000	5.3%
Public administration & defence	13,000	13,000	0.0%
Education	27,000	26,000	-3.7%
Health	45,000	51,000	13.3%
Arts, entertainment, recreation & other services	11,000	14,000	27.3%

Source: BRES, 2013; BRES, 2019.

9.5.22 **Table 9.11** provides a sector breakdown of recent employment change in East Suffolk. The largest sectors in the area are retail (11,000 jobs), health (9,000 jobs), and manufacturing (10,000 jobs).

Table 9.11: Employment change by industry sector, East Suffolk

Sector	Employment Estimates (2013)	Employment Estimates (2019)	Growth
Agriculture, forestry & fishing	3,500	3,500	0.0%
Mining, quarrying & utilities	1,500	1,750	16.7%
Manufacturing	10,000	10,000	0.0%

Sector	Employment Estimates (2013)	Employment Estimates (2019)	Growth
Construction	4,000	4,500	12.5%
Motor trades	2,000	2,250	12.5%
Wholesale	2,500	2,500	0.0%
Retail	11,000	11,000	0.0%
Transport & storage (inc postal)	10,000	10,000	0.0%
Accommodation & food services	8,000	9,000	12.5%
Information & communication	4,000	4,000	0.0%
Financial & insurance	800	800	0.0%
Property	900	1,000	11.1%
Professional, scientific & technical	4,500	6,000	33.3%
Business administration & support services	5,000	4,000	-20.0%
Public administration & defence	3,500	3,500	0.0%
Education	8,000	8,000	0.0%
Health	9,000	9,000	0.0%
Arts, entertainment, recreation & other services	3,500	4,500	28.6%

Source: BRES, 2013; BRES, 2019.

9.5.23 The structure of employment in the immediate districts differs in a number of respects from the national average, with lower representation in professional, scientific and technical activities, business administration and support services, and education.

9.5.24 **Table 9.12** shows employment sectors under-represented in the local economy include information and communication (2.8% of jobs compared to 4.4% nationally), financial and insurance (2.5% compared to 3.5% nationally), professional, scientific and technical (6.5% compared to 9.0% nationally) and education (8.1% compared to 8.9% nationally).

9.5.25 Within this overall picture, there are differences in the importance of specific sectors between East Suffolk, and the immediate districts. East Suffolk has larger proportions of jobs in manufacturing (10.8% of jobs), retail (11.9%), transport and storage (10.8%), accommodation and food services (9.7%), and information and communication jobs (4.3%). East Suffolk has smaller proportions of jobs in financial and insurance (0.9%), business administration and support (4.3%), and health (9.7%).

Table 9.12: Employee jobs by industry sector

Sector	East Suffolk		Immediate Districts		England	
	Jobs	%	Jobs	%	Jobs	%
Agriculture, forestry & fishing (A).	1,750	1.9%	5,000	1.6%	157,000	0.6%
Mining, quarrying & utilities (B, D and E).	1,750	1.9%	7,000	2.2%	315,000	1.2%
Manufacturing (C).	10,000	10.8%	29,000	9.0%	2,082,000	8.0%
Construction (F).	4,000	4.3%	17,000	5.3%	1,202,000	4.6%
Motor trades (Part G).	2,250	2.4%	8,000	2.5%	470,000	1.8%
Wholesale (Part G).	2,500	2.7%	11,000	3.4%	1,084,000	4.2%
Retail (Part G).	11,000	11.9%	33,000	10.2%	2,429,000	9.4%
Transport & storage (inc postal) (H).	10,000	10.8%	21,000	6.5%	1,279,000	4.9%
Accommodation & food services (I).	9,000	9.7%	26,000	8.1%	1,936,000	7.5%
Information & communication (J).	4,000	4.3%	9,000	2.8%	1,150,000	4.4%
Financial & insurance (K).	800	0.9%	8,000	2.5%	902,000	3.5%
Property (L).	900	1.0%	3,500	1.1%	453,000	1.7%
Professional, scientific & technical (M).	6,000	6.5%	21,000	6.5%	2,325,000	9.0%
Business administration & support services (N).	4,000	4.3%	20,000	6.2%	2,388,000	9.2%
Public administration & defence (O).	3,500	3.8%	13,000	4.0%	1,030,000	4.0%
Education (P).	8,000	8.7%	26,000	8.1%	2,312,000	8.9%
Health (Q).	9,000	9.7%	51,000	15.8%	3,306,000	12.7%
Arts, entertainment, recreation & other services (R, S, T and U).	4,000	4.3%	14,000	4.3%	1,156,000	4.5%

Source: BRES, 2019.

9.5.26 Suffolk labour supply in the construction sector is in similar proportions to national and regional supply. There were around 17,000 employee jobs in the construction sector in the immediate districts in 2018, plus a further 5,500 employee jobs in the related activities of architecture, engineering and technical consultancy. These estimates exclude self-employed jobs.

9.5.27 It is important to distinguish between data which includes self-employment, and that which does not because self-employment is very important in the construction sector, due to contractors and sub-contractors not employing people directly. The breakdown of employment (not including self-employment) in construction and related activities (civil engineering and specialist construction activities) is presented in **Table 9.13**.

Table 9.13: Employment in construction and related activities

Area	Construction of Buildings (Standard Industrial Classification (SIC) 41)	Civil Engineering (SIC 42)	Specialised Construction Activities (SIC 43)
Districts			
East Suffolk	1,700	500	2,500
*Suffolk Coastal**	1,000	300	1,250
*Waveney**	700	200	1,250
Great Yarmouth	400	175	1,000
South Norfolk	800	700	1,750
Mid Suffolk	800	2,000	1,500
Ipswich	800	800	1,250
Babergh	600	225	1,000
Other Scales			
60-minute travel area	2,400	700	3,100
CDCZ (90-minute travel area)	11,400	5,600	20,000
Wider Scales			
Norfolk	6,000	2,500	12,000
Suffolk	5,000	3,500	9,000
East	52,000	23,000	90,000
England	406,000	180,000	693,000

Source: BRES, 2019.

9.5.28 Compared with the national average, the immediate districts have a lower proportion of residents in professional and associated professional and technical occupations (31% compared with a national average of 36%) (Annual Population Survey, 2019). However, the proportion of residents in skilled manual trades (12%) is slightly above the national average (10%). The proportion of residents employed in personal service, sales and customer service occupations (11%) is also higher than the national

average (9%). These trends are similar, but more pronounced in East Suffolk, as shown in **Table 9.14**.

Table 9.14: Residents in employment by occupation

Occupational Group	East Suffolk	Immediate Districts	England
Managers, directors and senior officials.	10.3%	11.1%	11.1%
Professional occupations.	15.6%	17.6%	20.9%
Associate prof & tech occupations.	12.1%	13.3%	15.0%
Administrative and secretarial occupations.	11.5%	11.2%	10.1%
Skilled trades occupations.	12.8%	11.9%	9.9%
Caring, leisure and other service occupations.	11.7%	11.0%	8.9%
Sales and customer service occupations.	8.8%	7.6%	7.4%
Process, plant and machine operatives.	5.3%	5.6%	6.3%
Elementary occupations.	11.8%	10.7%	10.4%

Source: APS, 2018.

vii. Business and enterprise

9.5.29 There were approximately 36,600 active businesses in the immediate districts in 2018 (Business Counts, 2018). This figure includes both VAT-registered and PAYE-based enterprises. Business density, at 77 businesses per 1,000 working-age adult residents, is similar to the national average (79) shown in **Table 9.15**. Recent growth in the number of businesses in the immediate districts (12% overall) was below the national average (21%). However the rate has varied across districts. Growth in Ipswich was highest (19%), while growth in Great Yarmouth (6%), Babergh (7%), and Mid Suffolk (8%) was significantly slower.

9.5.30 There were 3,225 new business registrations in the immediate districts during 2017. This represents an annual rate of 6.8 new registrations per 1,000 working-age residents, which is below the national average (9.9). The latest data on business survival rates in the immediate districts shows that the proportion of new businesses surviving for at least three years (63%) is higher than the national average (59%).

Table 9.15: Business stock, density and growth

Area	Active Businesses 2018	Businesses per 1,000 Working-Age Residents	Growth in Businesses 2013–18
Districts			
East Suffolk	11,150	79	1,230
Great Yarmouth	3,600	61	210
South Norfolk	6,370	85	890
Mid Suffolk	5,430	91	400
Ipswich	5,400	62	850
Babergh	4,620	87	320
Wider Scales			
England	2,697,200	79	462,900

Source: Business Counts 2013; Business Counts 2018.

viii. Economic activity, unemployment and worklessness

9.5.31 Employment rates across the immediate districts (77%) are generally higher than the average across England (75.4%), in line with the rate across the East of England (78.0%) (Annual Population Survey, 2019). However there is some variation in working age employment rates across the immediate districts, ranging from an estimated 65.1% in Great Yarmouth to 79.2% in South Norfolk as shown in **Table 9.16**. However, these district-level figures are based on relatively small samples and should be treated with caution.

Table 9.16: Working Age Employment Rates (16–64)

Area	Residents in Employment	Working-Age Residents	Employment Rate
Districts			
Great Yarmouth	36,400	55,900	65.1%
South Norfolk	60,400	76,300	79.2%
East Suffolk	105,000	134,800	77.9%
Suffolk Coastal	*57,600*	*70,300*	*81.9%*
Waveney	*47,400*	*64,500*	*73.5%*
Mid Suffolk	45,300	58,400	77.6%
Ipswich	68,300	87,400	78.1%
Babergh	40,700	51,700	78.7%

Area	Residents in Employment	Working-Age Residents	Employment Rate
Wider Scales			
Norfolk	395,000	523,800	75.4%
Suffolk	343,500	437,700	78.5%
East	2,932,300	3,759,800	78.0%
England	26,169,200	34,728,600	75.4%

Source: Annual Population Survey (ONS, 2019)

9.5.32 Claimant count data (2019) (Department for Work and Pensions, 2019) is an experimental dataset that measures the number of people claiming Jobseeker's Allowance plus those who claim Universal Credit, and are required to seek work and be available for work. It is not considered to be a national statistic.

9.5.33 Claimant count rates across the immediate districts vary in comparison with the national average (2.8%) shown in **Table 9.17**. Rates in South Norfolk (1.4%), Mid Suffolk (1.4%) and Babergh (1.7%) are lower than the national average, whereas rates are relatively high in Ipswich (3.4%), East Suffolk (2.4%) and Great Yarmouth (4.6%). There are currently 3,335 claimants across the 60-minute travel area (1.8% of working age residents), and 24,270 (2.3% of working age residents) across the CDCZ.

Table 9.17: Claimant count data, September 2019

Area	Unemployed Claimants	% Working Age Residents
Local Wards		
Leiston	75	2.0%
Saxmundham	65	2.2%
Snape	10	1.1%
Yoxford	15	1.8%
Aldeburgh	10	0.8%
Districts		
Great Yarmouth.	10	4.6%
South Norfolk.	1,150	1.4%
East Suffolk.	3,385	2.4%
Suffolk Coastal.	960	1.3%
Waveney	2,435	3.7%
Mid Suffolk.	860	1.4%
Ipswich	3,000	3.4%

Area	Unemployed Claimants	% Working Age Residents
Babergh	885	1.7%
Other Scales		
60-minute travel area	3,335	1.8%
CDCZ (90-minute travel area)	24,270	2.3%
Wider Scales		
Norfolk	11,510	2.2%
Suffolk	10,040	2.3%
East	80,920	2.1%
England	978,890	2.8%

Source: ONS 2019.

ix. Income

9.5.34 The Annual Survey of Hours and Earnings (ASHE, 2019) provides median gross earnings data for full-time workers at local authority level. Data is available for both residents of a spatial area, and workers employed in each area. Resident-based data is shown in **Table 9.18**, and workplace data is in **Table 9.19**.

9.5.35 In 2019, median gross annual earnings for workers and residents across the immediate districts were generally below the East of England and England medians (£31,878 for residents and £30,345 for workers across the East of England versus and £30,661 for residents and £30,667 for workers across England).

9.5.36 Across most of the immediate districts, growth in residents' earnings over the ten years from 2009–2019 was higher than the average growth across England (17.3%). Median workplace-based earnings were below the national average (17.3%) in Great Yarmouth (15.8%), South Norfolk (13.6%), Ipswich (14.5%) and Babergh (10.8%).

Table 9.18: Residents – median earnings (full-time workers)

Area	2009	2019	% Growth
Districts			
Great Yarmouth.	£21,569	£25,943	20.3%
South Norfolk.	£25,206	£30,396	20.6%
East Suffolk.	#	£29,666	#
Suffolk Coastal.	*£27,215*	#	#

Area	2009	2019	% Growth
Waveney	*£24,370*	#	#
Mid Suffolk.	£24,999	£29,401	17.6%
Ipswich	£22,606	£28,162	24.6%
Babergh	£25,659	£31,722	23.6%
Wider Scales			
East	£27,303	£31,878	16.8%
England	£26,145	£30,661	17.3%

 # - Figures suppressed within ASHE. Source: ASHE 2009; ASHE 2019

Table 9.19: Workplace – median earnings (full-time workers), 2018

Area	2009	2019	% Growth
Districts			
Great Yarmouth	£24,559	£28,439	15.8%
South Norfolk	£25,379	£28,818	13.6%
East Suffolk	#	£29,950	#
*Suffolk Coastal**	*£27,881*	#	#
*Waveney**	*£22,940*	#	#
Mid Suffolk	£22,143	£28,908	30.6%
Ipswich	£23,468	£26,867	14.5%
Babergh	£23,065	£25,567	10.8%
Wider Scales			
East	£25,500	£30,345	19.0%
England	£26,133	£30,667	17.3%

 # - Figures suppressed within ASHE. Source: ASHE, 2009; ASHE, 2019.

x. Skills and qualifications

9.5.37 The proportion of working age residents in the immediate districts with at least Level 2 qualifications (GCSE qualification at Grade C (or equivalent) or higher) (84%) is lower than the proportions across the East of England (86%) and England as a whole (87%) shown in **Table 9.20**. There are variations across the districts, with a relatively low proportion of Great Yarmouth residents with at least Level 2 qualifications (77%) and higher proportions in Mid Suffolk (91%) and South Norfolk (also 91%).

9.5.38 The proportion of working age residents in the immediate districts with at least Level 3 qualifications (A Level qualification (or equivalent) or higher)

(57%) is also lower than the proportions across the East of England (62%) and England (65%).

9.5.39 Across England, 44% of working-age residents have Level 4 (degree level (or equivalent) or higher) qualifications – this is higher than the proportions across the East of England (39%) and the immediate districts (34%).

9.5.40 Across all spatial scales, proportions of working-age residents with Level 2, 3, and 4 qualifications or higher has increased over the 10 years 2008–2018.

Table 9.20: Qualifications of working age residents (16–64), 2008 and 2018

Area	% Qualified at Level 2+ (2008)	% Qualified at Level 3+ (2008)	% Qualified at Level 4+ (2008)	% Qualified at Level 2+ (2018)	% Qualified at Level 3+ (2018)	% Qualified at Level 4+ (2018)
Districts						
Great Yarmouth	68%	35%	12%	77%	49%	12%
South Norfolk	79%	55%	27%	91%	64%	43%
East Suffolk	77%	49%	21%	85%	53%	35%
Suffolk Coasta.	*80%*	*52%*	*25%*	*85%*	*55%*	*40%*
Waveney	*73%*	*46%*	*16%*	*85%*	*50%*	*29%*
Mid Suffolk	73%	46%	24%	91%	68%	44%
Ipswich	70%	45%	17%	82%	55%	31%
Babergh	74%	44%	24%	84%	61%	34%
Other Scales						
East	76%	51%	28%	86%	62%	39%
England	78%	55%	32%	87%	67%	44%

Source: Annual Population Survey, 2008; APS 2018.

9.5.41 Data on GCSE exam attainment for the 2017/18 academic year is available at county level (Department for Education, 2018), as shown in **Table 9.21**. Attainment in Suffolk and Norfolk is generally below East of England averages in terms of the proportion of pupils gaining nine to five or nine to four passes in Maths and English. Attainment in Suffolk, Norfolk and the East of England is generally higher than the average across England as a whole, with the exception of the proportion of pupils in Norfolk gaining nine to five passes in Maths and English (39.3% compared to 39.9% across England as a whole).

Table 9.21: GCSE exam attainment levels

Area	% Pupils Gaining 9–5 Pass in Maths and English	% Pupils Gaining 9–4 Pass in Maths and English
Suffolk	41.1%	63.8%
Norfolk	39.3%	62.0%
East	43.6%	65.1%
England	39.9%	59.1%

Source: Department for Education, 2018.

xi. Tourist economy

9.5.42 SZC Co. has been working with stakeholders to understand the value and volume of tourism in the area. Tourism is notoriously difficult to define, and is inherently flexible – its economic effects are influenced by environmental and economic characteristics, seasonality and many other variables.

9.5.43 An Economic Impact Report has been produced for the Destination Management Organisation (DMO) by Destination Research (2018) (Ref 9.20) for the Suffolk Coast and Heaths Area of Outstanding Natural Beauty (AONB). It presents information on visitor numbers, expenditure, and an estimate of the number of jobs supported by this and indirect/induced expenditure in different sectors. The report finds that in 2017 the Suffolk Coast and Heaths AONB:

- attracted over 4.1 million trips, of which over 90% were day trips;
- generated over £164 million of direct spend, and over £45 million indirect/induced value; and
- supported 3,400 full-time equivalent jobs.

9.5.44 The same assessment was also undertaken at (Suffolk) county-level in 2017 which found that Suffolk (Ref 9.21):

- attracted over 35 million trips, of which 95% were day trips;
- generated over £1.4bn of direct spend, and over £595m indirect/induced value; and
- supported over 31,000 full-time equivalent jobs.

9.5.45 Public datasets may also be used to estimate the number of jobs in 'tourism' sectors (Ref 9.22). On this basis, Suffolk (county) has around

34,100 tourism-sector jobs (full and part time), making up 10.1% of all jobs in Suffolk in 2018. This is set out in **Table 9.22**.

Table 9.22: Jobs in tourist sectors

Area	Tourist Sector Jobs	All Jobs	% Tourist Sector Jobs
Local Wards			
Leiston	300	2,500	12.0%
Saxmundham	200	2,000	10.0%
Snape	100	350	28.6%
Yoxford	200	800	25.0%
Aldeburgh	600	1,500	40.0%
Districts			
Great Yarmouth	7,700	38,000	20.3%
South Norfolk	4,400	57,000	7.7%
East Suffolk	11,600	96,000	12.1%
*Suffolk Coastal**	6,100	54,000	11.3%
*Waveney**	5,500	42,000	13.1%
Mid Suffolk	2,800	38,000	7.4%
Ipswich	6,300	73,000	8.6%
Babergh	3,500	34,000	10.3%
Other Scales			
Norfolk	43,600	388,000	11.2%
Suffolk	34,100	339,000	10.1%
England	2,845,900	26,842,000	10.6%
Norfolk	43,600	388,000	11.2%

Source: BRES, 2019.

xii. Land use and agricultural economy

9.5.46 Agricultural land accounts for a total of approximately 330,000ha in Suffolk, and an estimated 10,000 jobs in 2018 (BRES, 2019).

Accommodation

9.5.47 A detailed review of accommodation stock, including overall stock, potential change in stock since the 2011 Census, occupancy, vacancy, turnover and capacity assessments are set out in **Appendix 9D** of this volume.

9.5.48 The following section summarises the potential capacity of accommodation, drawing on a more detailed assessment in **Appendix 9D** of this volume. This has involved careful consideration of the potential scale of accommodation available in four sectors:

- tourist accommodation;
- PRS;
- owner-occupied sector; and
- latent accommodation: accommodation that is either new or not currently included in records of tourist or private rented accommodation, because it has been out of use, or has not sought registration.

Tourist sector

Overall stock

9.5.49 There is a large supply of tourist sector accommodation across the 60-minute area, most of which is concentrated in urban areas or within coastal areas. The stock of accommodation in the area is diverse in terms of the type of service provided and the price per night/booking.

9.5.50 **Table 9.23** sets out the stock of tourist accommodation (by bedroom) using data provided by Visit East Anglia (2012) (Ref 9.23).

Table 9.23: Bedspaces in tourist accommodation

	Total	Serviced	Non-serviced		
		Hotels and Similar	Self-Catering	Caravan and Campsites	Other e.g. Holiday Parks, Hostels
Local Wards					
Leiston	**333**	29	9	295	–
Saxmundham	**423**	29	79	315	–
Snape	**411**	15	151	45	200
Yoxford	**605**	131	197	277	–
Aldeburgh	**1,691**	341	806	544	–
Districts					
Great Yarmouth	**19,003**	3,752	380	4,916	9,955
South Norfolk	**1,533**	949	332	176	76

	Total	Serviced	Non-serviced		
		Hotels and Similar	Self-Catering	Caravan and Campsites	Other e.g. Holiday Parks, Hostels
East Suffolk	**19,670**	2,526	3,644	4,151	9,350
*Suffolk Coastal**	***10,057***	*1,287*	*2,225*	*2,266*	*4,279*
*Waveney**	***9,613***	*1,239*	*1,419*	*1,885*	*5,071*
Mid Suffolk.	**1,393**	800	393	200	–
Ipswich	**986**	986	–	–	–
Babergh	**1,550**	1,167	350	33	–
Other Scales					
60-minute Area.	**26,276**	6,255	4,300	5,645	10,076

Source: Visit East Anglia, 2012.

9.5.51 Data is also produced at a local authority scale by Visit Britain as part of their Accommodation Stock Audit (latest data 2016) (Ref 9.24). While this cannot be used to inform the Gravity Model (which requires local-level data to run), it provides some context for the wider stock by sector. **Table 9.24** summarises the overall stock by sector (bedspaces) for Suffolk (county) and East Suffolk (district). It should be noted that due to different categorisation of accommodation, the two datasets are not directly comparable.

Table 9.24: Bedspaces in tourist sector accommodation

	Total	Serviced	Non-serviced		
		Hotels and Similar	Holiday Dwellings	Tourist Campsites	Other Collective Accommodation
East Suffolk (district)	**11,005**	4,168	4,262	2,512	63
Suffolk (county)	**20,620**	12,233	5,302	2,989	96

Source: Visit Britain, 2016.

Availability and affordability

9.5.52 Room occupancy rates for tourist accommodation are produced monthly by Visit England at a regional scale through the England Occupancy Survey (2019) (Ref 9.25). A review of this information for the East of England region from 2016–2019 suggests occupancy ranges from 63% in the Winter (January) to 85% in the peak of Summer (July/August). Occupancy tends to exceed 80% for four to five months of the year.

9.5.53 Applied to the above datasets, this suggests that:

- there may be between 1,600 (peak) up to 7,300 (off peak) unoccupied bedspaces in ESC depending on the data sources and assumptions; and

- there may be between 3,100 (peak) and 9,700 (off-peak) unoccupied bedspaces in the 60-minute area depending on the data sources and assumptions.

9.5.54 A significant amount of tourist accommodation would not be affordable to Sizewell C construction workers. By sector, SZC Co. has assumed that:

- 85% of serviced accommodation would not be affordable for workers;

- in most areas, 90% of self-catering accommodation would be affordable to workers (though SZC Co. note through engagement with The Suffolk Coast DMO that there is likely to be considerable local variation in price between areas); and

- while all caravan accommodation is likely to be affordable, planning restrictions for the year-round use of caravans for construction workers reduces the potential for availability – engagement with local authorities suggests this could reduce availability to workers by 50%.

9.5.55 **Table 9.25** applies these discounts to the overall stock identified in **Table 9.23**, with the effect of reducing the overall stock that is anticipated to be available and affordable to workers by over 60%.

Table 9.25: Bedspaces in tourist accommodation

Geography	Total	Serviced	Non-serviced		
		Hotels and Similar	Self-Catering	Caravan and Campsites	Other e.g. Holiday Parks, Hostels
Local Wards					
Leiston	160	4	8	148	–
Saxmundham	233	4	71	158	–
Snape	161	2	136	23	–
Yoxford	335	20	177	139	–
Aldeburgh	1,049	51	725	272	–
Districts					
Great Yarmouth	3,363	563	342	2,458	–
South Norfolk	529	142	299	88	–

Geography	Total	Serviced	Non-serviced		
		Hotels and Similar	Self-Catering	Caravan and Campsites	Other e.g. Holiday Parks, Hostels
East Suffolk	5,734	379	3,280	2,076	–
*Suffolk Coastal**	3,329	193	2,003	1,133	–
*Waveney**	2,405	186	1,277	943	–
Mid Suffolk.	574	120	354	100	–
Ipswich	148	148	–	–	–
Babergh	507	175	315	17	–
Other Scales					
60-minute area	7,631	938	3,870	2,823	–

Source: Visit East Anglia, 2012.

Private rented sector

9.5.56 The 2011 Census identifies that there are over 99,000 private rented bedrooms in the 60-minute area, within 42,000 homes. The distribution of these bedspaces across the area varies substantially, with more and a greater proportion (of all bedspaces) in urban areas.

9.5.57 **Table 9.26** sets out the total number of private rented bedspaces within the 60-minute area and East Suffolk district as at the 2011 Census.

Table 9.26: Homes and bedrooms in the private rented sector based on 2011 census data

Geography	Total Homes	Total Rooms
Local Wards		
Leiston	478	1,124
Saxmundham	289	728
Snape	132	351
Yoxford	132	326
Aldeburgh	216	543
Districts		
Great Yarmouth	7,605	17,101
South Norfolk	6,752	16,752
East Suffolk	16,295	38,755
*Suffolk Coastal**	*8,065*	*19,723*

Geography	Total Homes	Total Rooms
*Waveney**	*8,230*	*19,032*
Mid Suffolk.	5,157	12,930
Ipswich	12,092	26,732
Babergh	5,451	13,405
Other Scales		
60-minute area	42,030	99,033

Source: Census, 2011.

9.5.58 The PRS has changed substantially since 2011 Census data was collected. By applying the increases evidenced above from the English Housing Survey (Ref 9.26) and relevant Strategic Housing Market Assessments, it is reasonable to assume that the 2011 Census underestimates the stock of PRS homes and rooms across East Suffolk, and the 60-minute area by up to 11,600 and 29,700 bedrooms respectively.

Vacancy

9.5.59 The Ipswich Housing Market Area Strategic Housing Market Area Update (2019) (Ref 9.27) states that the vacancy rate in Suffolk Coastal is around 8.3%. This is defined using 2011 Census data for homes that are empty and those that are used as second homes. A vacancy rate of 6.9% is presented for Waveney within the Ipswich and Waveney Housing Market Areas Strategic Housing Market Assessment Volume 2 (2017) (Ref 9.28).

9.5.60 However, there is a significant difference between tenures especially where the market requires a certain level of vacancy to operate efficiently. Average (national) vacancy rates in the PRS over the last ten years, as recorded by the English Housing Survey, suggest vacancy rates of around 10.3% – this includes properties that are empty or available to let, or away from the market for the short, medium, or long-term.

Turnover/Churn

9.5.61 The English Housing Survey sets out that average annual churn rate in the PRS (households moving within, in or out of the sector in a given year) averages at 31.8% over the last ten years in England. This equates to 2.7% of all properties turning over in each month.

9.5.62 Evidence from the 2011 Census[2] indicates an annual churn of around 29% of private rented households in Suffolk Coastal and 27% in Waveney (those households in the districts in the PRS who moved in the last year), which appears about average for districts in the UK.

9.5.63 In Suffolk Coastal, around 8.2% of PRS households moved into dwellings in the district in 2011, and in Waveney around 6% of PRS households moved into dwellings in the district in 2011.

9.5.64 Average turnover of the PRS in East Suffolk wards in 2011 (Census) was around 35% (or 2.8% per month).

'Frictional Vacancy'

9.5.65 The level of vacancy can be combined with the average level of turnover to estimate the 'frictional vacancy'. This is the level of vacancy that the sector is assumed to need to operate effectively at any point in time. This is based on the assumption that frequent movements within and in/out of this sector need to be facilitated by a level of on-going vacancy. Overall, in East Suffolk, annual turnover is around 35%, and so monthly turnover is likely to be around 2.8% on average (see above). Vacancy in the PRS is estimated at between 6.9% and 10.3% (see above). Subtracting the monthly turnover rate from the overall vacancy gives an average frictional vacancy rate for East Suffolk of between 4.1% and 7.5%.

9.5.66 This level of frictional vacancy can be estimated at a local level (i.e. ward), and provides a benchmark for the level of on-going vacancy that the sector has at any point in time.

Owner-occupied sector

9.5.67 The 2011 Census identifies that there were 134,427 family homes (3+ bedrooms) in the owner-occupied sector across the 60-minute area in 2011. Since then the private housing sector has grown by approximately 4% in Suffolk, so this is considered an under-estimate.

9.5.68 **Table 9.27** sets out the total number of family-size (3+ bedroom) owner-occupied homes in 2011 (Census) across the relevant study areas:

[2] This data only refers to 'wholly moving households' i.e. one where all members of the household have moved from the same address. A partly moving household is where one or more members of the household have moved in the last year but not all members have moved from the same address. Partly moving households in the PRS sector accounted for an additional 8.7% of all PRS households. Overall, 4.4% of all households in Suffolk Coastal were formed in 2011 as a result of partially moving. These are additional to wholly moving households.

Table 9.27: Homes and rooms in family-size (3+ bedroom) owner-occupied homes

Geography	Total Homes
Local Wards	
Leiston	1,339
Saxmundham	1,107
Snape	518
Yoxford	520
Aldeburgh	952
Districts	
Great Yarmouth.	18,719
South Norfolk.	31,191
East Suffolk.	55,858
*Suffolk Coastal**	30,240
*Waveney**	25,618
Mid Suffolk.	23,527
Ipswich	25,869
Babergh	20,968
Other Scales	
60-minute area.	134,427

Source: Census, 2011.

Latent accommodation sector

9.5.69 Latent accommodation includes 'un-rated' tourist accommodation, rooms for let in private homes, currently empty homes, and accommodation new to the market each year.

9.5.70 Based on 2011 Census data for occupancy rating (using a conservative assessment – considering that any home with a '+2' occupancy rating has at least one spare bedroom), there were over 1,000 spare bedrooms in Leiston alone. **Table 9.28** sets out the number of empty bedrooms across the study areas in 2011 by tenure.

Table 9.28: Estimated unoccupied bedrooms by tenure based on occupancy rate

Geography	Owner-Occupied (Bedrooms)	Social Rented (Bedrooms)	Private Rented (Bedrooms)
Local Wards			
Leiston	830	37	81
Saxmundham	875	81	109
Snape	865	51	80
Yoxford	407	20	51
Aldeburgh	445	11	42
Districts			
Great Yarmouth	11,967	760	1,030
South Norfolk	22,228	594	1,787
East Suffolk	39,745	1,550	3,407
*Suffolk Coastal**	*22,372*	*678*	*1,929*
*Waveney**	*17,373*	*872*	*1,478*
Mid Suffolk	16,622	488	1,373
Ipswich	15,735	1,467	1,693
Babergh	15,100	629	1,304

Source: Census, 2011.

9.5.71 The Ministry of Housing, Communities and Local Government Live Table 615 (ONS, 2019) identifies that as at October 2018 there are 3,257 vacant properties in ESC (SCDC and WDC). Of these, 1,130 are 'long-term' vacants – meaning that these dwellings have been unoccupied and substantially unfurnished for over six months.

9.5.72 Waveney has 73 local authority-owned vacant properties, and across East Suffolk there are 56 general needs vacant properties owned by Private Registered Providers.

xiii. Education

9.5.73 This section discusses primary and secondary education services. Information is included on current pupil numbers in local schools and the numbers of surplus school places within the 60-minute travel area.

9.5.74 Information is also included at the end of the section on other education provision, including pre-school and nursery provision and post-16 education.

Primary education

9.5.75 **Table 9.29** sets out data on pupil numbers and school capacities for all maintained schools within the 60-minute travel area. In total there were 22,434 pupils on roll in 121 primary schools within this area in the school year 2018/19 (DfE, 2019). Based on Planned Admission Numbers, total capacity of these schools is 25,416 places. There were 3,123 surplus places in the area – equivalent to 12% of existing primary school capacity.

9.5.76 Data provided by SCC (October 2019) (Ref 9.29) sets out school capacity and surplus data forecast across Suffolk in 2023/24. **Table 9.29** also shows forecast surpluses in study areas within SCC (based on surplus compared to 100% capacity). Data is included for all schools other than Witnesham Primary School (East Suffolk) and Somersham Primary school (Mid Suffolk).

9.5.77 Comparing SCC 2023/24 forecasts to Annual School Census data shows growth in pupil numbers at Leiston ward primary schools of 142 pupils (102 due to demographic growth, and 40 related to housing growth). It is noted that this does not include additional capacity provided by planning obligations related to new housing development.

Table 9.29: Primary school capacity

Geography	Net Capacity (all year groups)	Pupils on Roll (January 2019)	Surplus Places	% Surplus Capacity	Net Capacity (SCC)	Forecast pupils on Roll 2023/24 (SCC)	Forecast Surplus Places 2023/24 (SCC)	Forecast % Surplus Capacity 2023/24 (SCC)
Local Wards								
Leiston	525	391	165	26%	560	533	27	5%
Saxmundham	483	445	38	8%	483	460	23	5%
Snape	175	145	30	17%	175	173	2	1%
Yoxford	175	104	71	41%	173	142	31	18%
Aldeburgh	105	103	2	0%	105	104	2	1%
Districts (geographic areas within 60-minute area)								
Great Yarmouth.	840	789	51	6%				
South Norfolk.	2,828	2,418	419	14%				
East Suffolk.	15,650	13,718	2,014	12%	15,876	13,954	1,922	12%
Mid Suffolk.	4,411	3,917	537	11%	4,363	4,291	72	2%
Ipswich	840	836	6	0%	832	861	-29	-3%
Babergh	182	173	9	5%	182	194	-12	-7%
Other Scales								
60-minute area.	25,416	22,434	3,123	12%				

Sources: Department for Education, 2019; SCC Directory of Schools in Suffolk for the 2020/21 school year (Ref 9.30); Norfolk County Council Primary and Infant Schools in Norfolk 2019/20 (Ref 9.31).

9.5.78 Surplus places are unevenly distributed across local primary schools. Some schools have significant numbers of surplus places; others are operating close to or above current capacity.

9.5.79 SCC's Education and Learning Infrastructure Plan (Version 3.0) (2017) (Ref 9.32) considers where there would be a need for more school places in Suffolk in the future. The document sets out expected growth in primary school numbers of 4% over the five years following the date the report was published (2017). Within this growth 'hotspots' are identified in Ipswich, north Lowestoft and Forest Heath.

9.5.80 Based on ONS 2014-based sub-national population projections, the report projects that the rise in demand for primary school places occurring at the time of reporting is expected to level out and then decline towards the mid-2020s.

9.5.81 The report lists a number of proposed school expansions and new schools to meet demand for spaces, including the following across the 60-minute area:

- Mid Suffolk – Potential expansion of Bosmere Primary, Chilton Primary, Trinity CEVA, and St Peter & St Paul, and potential new schools in Stowmarket (Cedars Park and Chilton Leys).

- East Suffolk – expansion of Sir Robert Hitchams CEVC Primary, Saxmundham Primary, Rendlesham Community Primary, Martlesham Primary, Cedarwood Primary, Oulton Broad Primary (if required), and potential new schools at Martlesham (Adastral Park), Felixstowe/Trimley St Martin and St Marys, Wood Meadow and Lake Lothing.

9.5.82 Norfolk County Council's Children's Services Committee published school place planning information in March 2019 (Ref 9.33) relating to the need to meet demand generated by Sustainable Urban Extensions across the County. Within the 60-minute travel area, the following primary school expansions and new schools are proposed to meet projected demand for places:

- South Norfolk – potential new two or three form entry primary school in Long Stratton.

Secondary education

9.5.83 **Table 9.30** sets out data on pupil numbers and school capacities for all secondary schools within the 60-minute travel area. There are 22 secondary schools within the 60-minute travel area. Total capacity in these

schools is 19,817 places (based on Suffolk and Norfolk County Councils School Admission Documents). Pupil numbers in these schools totalled 17,596 in January 2019 based on Department for Education Annual School Census data. There are 2,453 surplus places in the area, representing around 12% of existing capacity.

9.5.84 Data provided by SCC (October 2019) (Ref 9.29) sets out school capacity and surplus data forecast across Suffolk in 2023/24. **Table 9.30** shows forecast surpluses (based on surplus compared to 100% capacity, for study areas in SCC). It is noted that this does not include additional capacity provided by planning obligations related to new housing development.

Table 9.30: Secondary school capacity

Geography	Net Capacity (all year groups)	Pupils on Roll (January 2019)	Surplus Places	% Surplus Capacity	Net Capacity (SCC)	Forecast pupils on Roll 2023/24 (SCC)	Forecast Surplus Places 2023/24 (SCC)	Forecast % Surplus Capacity 2023/24 (SCC)
Local Wards								
Leiston	560	394	166	30%	617	545	72	12%
Saxmundham	600	474	126	27%	572	555	17	3%
Snape	--	--	--	--	--	--	--	--
Yoxford	--	--	--	--	--	--	--	--
Aldeburgh	--	--	--	--	--	--	--	--
Districts (geographic areas within 60-minute area)								
Great Yarmouth.	--	--	--	--	--	--	--	--
South Norfolk.	2,120	1,644	476	22%	--	--	--	--
East Suffolk.	10,766	9,648	1,118	11%	11,088	10,527	139	1%
Mid Suffolk.	3,961	3,426	535	16%	3,891	3,792	94	2%
Ipswich	2,470	2,317	153	6%	2,440	2,432	8	0%
Babergh	600	561	39	7%	600	672	-72	-12%
Other Scales								
60-minute area.	19,917	17,596	2,453	12%	--	--	--	--

Sources: Department for Education, 2019; SCC Directory of Schools in Suffolk for the 2020/21 school year; Norfolk County Council Secondary Schools in Norfolk 2019/20 (Ref 9.34).

9.5.85 Surplus secondary school places are unevenly distributed across the 60-minute area. There are two secondary schools within the local ward area –

Alde Valley School and SET Saxmundham Free School – both of which have a large number of surplus places (30% surplus capacity). Across the secondary schools in East Suffolk there is 11% surplus capacity (equivalent to 1,153 surplus places). There is less surplus secondary capacity in the geographic areas of Ipswich (6% surplus across Copleston High School and St Alban's Catholic High School), and Babergh (7% surplus at Holbrook Academy) that are within the 60-minute area.

Forecast pupil rolls & future development

9.5.86 SCC's Education and Learning Infrastructure Plan (Ref 9.32) considers where there would be a need for more school places in Suffolk in the future. The document sets out expected growth in secondary school numbers of 13% over the five years following the date the report was published (2017). Within this growth, 'hotspots' are identified in terms of areas expected to see the most pressure for additional secondary places – including areas within the 60-minute area – Babergh, the area south of Lowestoft, and Ipswich, particularly to the east of the town.

9.5.87 The report highlights that "*based on ONS 2016-based sub-national population projections, demand for secondary school places is expected to rise from 2016, and steadily thereafter for the next ten years*" and that "*as the ONS projections are trend-based, demand is likely to be higher, once population increases driven by new housing developments and migration are taken into account*" (Ref 9.32).

9.5.88 The report lists a number of proposed school expansions to meet demand for spaces, including the following across the 60-minute area:

- Babergh (Holbrook) – places at Holbrook Academy to be monitored, places limited and combined growth in the wider area may lead to the need to expand the school.
- Ipswich (East) – Copleston High School is expected to see a rise in pupil numbers and a project is underway to consider expansion options for the school.
- Mid Suffolk – potential increase in secondary provision in Debenham.
- East Suffolk – potential new secondary school or expansion of existing school at Martlesham (Adastral Park).

9.5.89 Norfolk County Council's Children's Services Committee published school place planning information in March 2019 (Ref 9.33) relating to the need to meet demand generated by Sustainable Urban Extensions across the

county. Within the 60-minute area, the following primary school expansions and new schools are proposed to meet projected demand for places:

- South Norfolk – potential expansion of Long Stratton High.

Pre-school provision

9.5.90 Local authorities have a statutory duty to secure sufficient childcare for children from birth to 14 (or 18 for disabled children), and produce reporting, measuring the demand for, and supply of, childcare, identifying gaps in the market and how to address any shortfall.

9.5.91 SCC's most recent Childcare Sufficiency Assessment for Suffolk was produced in 2019 (Ref 9.35). It assessed information about the current and projected supply and demand of childcare for particular age ranges of children, and the affordability, accessibility and quality of provision. This work is undertaken by gathering data on the number of places available, take up of places and population. This report sets out that:

- In total, there are 41,444 children under the age of five living in Suffolk. These children may require early years childcare.
- In total, there are 776 Office for Standards in Education, Children's Services and Skills (Ofsted) registered childcare providers in Suffolk. 598 are in receipt of early years education funding and 178 offer childcare funded directly from the parent/carer.
- Demand for funded two-year-old places is greater in areas where there are higher levels of deprivation.

9.5.92 The Childcare Sufficiency Assessment considers demand and supply on a 'cluster' basis. For the Framlingham and Leiston cluster (including Aldeburgh, Framlingham, Hacheston, Leiston, Peasenhall and Yoxford, Saxmundham and Wickham Market), there is currently a surplus of 66 available places (or 102 with migration taken into account), though overall for Suffolk there is a net deficit of over 3,000 places. A 'place' refers to a 15-hour (per week) slot.

9.5.93 Norfolk County Council's Childcare Sufficiency Assessment 2018 (Ref 9.36) sets out overall trends across the county, plus 36 detailed area profiles.

9.5.94 The following overall trends are identified:

- Although Norfolk's overall population is growing, the number of early years children is reducing.

- Across the county there is sufficient zero to five childcare to meet demand, but this varies by area.
- The quality of early years provision is high, and costs are below national averages.

9.5.95 The following Norfolk Children's Centre Areas fall within the 60-minute area:

- Village Green – there are sufficient two, three and four year old funded places across the area with 170 places available at any one time for 152 eligible children.
- Long Stratton – there are sufficient two, three and four year old funded places across the area with 253 places available at any one time for 193 eligible children.
- Diss – there are sufficient two, three and four year old funded places across the area with 362 places available at any one time for 225 eligible children.
- Acle Marshes – there are sufficient two, three and four year old funded places across the area with 473 places available at any one time for 269 eligible children.
- Harleston and Loddon – there are sufficient two, three and four year old funded places across the area with 490 places available at any one time for 295 eligible children.
- Seagulls and Gorleston and Hopton – there are sufficient two, three and four year old funded places across the area with 774 places available at any one time for 400 eligible children.

Post-16 provision

9.5.96 There are 30 maintained schools, academies and colleges across Suffolk, and 38 across Norfolk offering provision for 16-18 year olds.

9.5.97 The closest provider of 16–18 year old education to the site is Alde Valley School in Leiston.

xiv. Other community facilities

9.5.98 Within the 60-minute travel area there are 20 libraries operated by SCC and Norfolk County Councils, listed in **Table 9.31**. The closest libraries to the

site are in Leiston, Saxmundham and Aldeburgh. There are also libraries in Wickham Market and Framlingham.

9.5.99 There are a large number of village and community halls across the area. SCDC (now ESC) carried out an audit of community and village halls across the district in 2014 (SCDC Built Facilities Assessment, November 2014) (Ref 9.37). It found there are 113 village and community halls across the district, that current levels of provision are adequate to meet existing needs, and that the whole population of (what was) SCDC are within 10 minutes' drive of their nearest village or community hall (96.4% are within 10 minutes cycle, and 72.2% are within ten minutes' walk of their nearest community hall).

9.5.100 The closest halls to the site are in Leiston. These include:

- Home Guard Hall (Victory Road);
- Leiston Community Centre (King George's Avenue); and
- Women's Institute Hall (John Street).

Table 9.31: Libraries and community centres

Geography	Libraries	Community Centres
Local Wards		
Leiston	1	4
Saxmundham	1	3
Snape	--	4
Yoxford	--	5
Aldeburgh	1	3
Districts (geographic areas within 60-minute area)		
Great Yarmouth.	--	--
South Norfolk.	2	--
East Suffolk.	13	At least 113*
Mid Suffolk.	5	--
Ipswich	--	--
Babergh	--	--
Other Scales		
60-minute area.	20	At least 113*

Source: Suffolk and Norfolk County Councils, 2019.
**SCDC area only.*

xv. Sport and leisure facilities

9.5.101 **Appendix 9E** of this volume sets out a detailed baseline for sports and recreation facilities across the study area, and within local communities using published information from local authority assessments and Sport England databases.

9.5.102 It sets out the number, location and types of facilities, and estimates existing deficits, and surplus from modelling undertaken by the local authorities.

xvi. Crime and community safety

9.5.103 Suffolk experiences slightly lower rates of crime and disorder compared to the national average (71.5 recorded crimes per 1,000 people compared to 87 recorded crimes per 1,000 people in England) (Police.uk, 2019); (ONS Home Office Police Recorded Crime, 2019).

9.5.104 Crime and fear of crime are highest in the more urban areas within the county (with greater population) and often coincide with areas of relative deprivation.

9.5.105 Home Office statistics on numbers of recorded offences in the immediate counties and districts are presented in **Table 9.32** based on the number of recorded crimes during the 12-month period to December 2018.

9.5.106 There were 54,124 recorded offences in Suffolk during the 12 months to December 2018. Adjusting for the county's resident population (using ONS mid-2017 population estimates), this represents an annual crime rate of 71.5 offences per 1,000 population. This is below the regional (East of England) average of 75.9 crimes per 1,000 residents. Recorded crime rates are particularly low in (the former) SCDC (47.7 recorded crimes per 1,000 population), but are higher in WDC (82.5).

9.5.107 Data is also available on a neighbourhood-level for smaller areas for a 12-month period up to the end of July 2019. Neighbourhood policing areas are generally at a higher spatial scale than wards. This data has been analysed over 12 months to give estimates of comparative crime rates for the areas closest to the main development site.

Table 9.32: Recorded offences 12 Months to 2018

Geography	Recorded Crime	ONS Mid-year Population Estimates (2017)	Recorded Crime per 1,000 Population
Local Neighbourhoods			
Leiston[3]	1,364	26,398	51.6
Districts/Community Safety Partnerships (12 months to March 2018)			
East Suffolk	15,880	246,913	64.3
*Suffolk Coastal**	6,158	129,016	47.7
*Waveney**	9,722	117,897	82.5
Great Yarmouth	9,438	99,417	94.9
South Norfolk	5,268	135,471	38.9
Ipswich	16,089	138,480	116.2
Wider Scales (12 months to December 2018)			
Suffolk	54,124	757,000	71.5

Source: Home Office Police Recorded Crime by PFA (ONS, 2019) and Police.uk (accessed October 2019). Crime rates per 1,000 population are calculated using ONS mid-2017 population estimates. Number of recorded offences is for the 12 month period to 30 December 2018.

xvii. Deprivation and social inequality

9.5.108 The national Indices of Multiple Deprivation (ONS, 2019) highlight levels of deprivation across each local authority area, indicated relative to all other English local authorities. ESC is ranked the 143 most deprived of 317 local authorities in England. Average levels of deprivation are much higher in Great Yarmouth (20) and Ipswich (71), but lower in South Norfolk (235), Babergh (218) and Mid Suffolk (237).

9.5.109 **Figure 9.4** shows spatial areas of deprivation at Lower-level Super Output Area level – this highlights that areas in Ipswich, Lowestoft and Great Yarmouth are within the 10% and 20% most deprived areas in England.

9.5.110 A more detailed analysis of the sub-domains of the Indices of Multiple Deprivation – which explores different aspects of deprivation – identifies particular issues in relation to education, skills and training deprivation in East Suffolk, Great Yarmouth and Ipswich.

[3] Leiston Neighbourhood Policing area is approximately equivalent to the following 2011 Census ward areas: Leiston, Aldeburgh, Saxmundham, Snape, Earl Soham, Hacheston and Framlingham

Suffolk "hidden needs"

9.5.111 The Suffolk Community Foundation's report Hidden Needs in Suffolk: Five Years On (2011–2016) (Ref 9.38) reviews the degree of deprivation and disadvantage in both urban and rural areas in Suffolk, reassessing original analysis included in an earlier report published in 2011. It identifies that:

- over 83,000 people in Suffolk live in income deprivation and have limited access to necessities, suggesting that inequality is still a big problem in Suffolk, this figure having increased by 5,000 people over the last five years;
- the proportion of Suffolk's population over the age of 65 is steadily increasing at a faster rate than the national average, leading to reduced economic activity, which may have adverse effects on the county's economy;
- the impact of international immigration on population growth and age structure has been limited when compared to the effect immigration had when the first report was published;
- rural areas of Suffolk are known to experience less deprivation, but can often be underrepresented and played down by area statistics – people in rural areas are said to need 15 to 25% more income than their urban counterparts to enjoy the same standard of living, suggesting that individuals on equal incomes may experience more deprivation in rural areas compared to urban areas;
- in total 28% of all citizens living in income deprivation reside in rural areas. In addition to this, 36% of adults with disabilities or long-term illnesses and 37% of adults in Suffolk with no qualifications live in rural areas, fuelling inequality across the county;
- rural Suffolk is also subject to various geographical barriers to services such as large road distances from schools, supermarkets and GPs. Since 2008, there has also been a decline in rural access to banks, youth centres and bus services;
- rural Suffolk has also experienced deprivations in communication, with over 50% of parishes branding local broadband as *"poor",* limiting children's access to educational services and reducing the sustainability of local businesses;

- a Social Mobility Index introduced in 2016 suggests that social mobility tends to be high in the earlier years of provision, but mobility decreases as individuals approach adulthood. Ipswich and Waveney have been named in the bottom 10% of districts in England for social mobility while almost 70% of Suffolk neighbourhoods dropped position in the Indices of Multiple Deprivation rankings by at least a decile over the study period, suggesting that social mobility can be improved much further; and

- job opportunities in the entire Suffolk region are consistently better than the Eastern region (on average), leading to unemployment rates lower than national averages.

b) Future baseline

i. Population and household projections

9.5.112 The latest official 2016-based sub-national population projections for local authority areas were published by the ONS in May 2018. These provide trend-based projections for the twenty five year period from 2016 to 2041, although the focus here is on projected population change over the next ten years as this is more relevant to the Sizewell C Project timescales.

9.5.113 The latest projections for the immediate districts, the region and nationally are summarised in **Table 9.33.** Population growth over the next ten years in East Suffolk (4.3%) is expected to be slightly lower than the national average (5.9%), and significantly lower than the average growth expected across the East of England region (7.3%). In absolute terms, the population of the immediate districts is expected to grow by 44,600 people, equivalent to 4,460 people per annum. This overall increase is expected to be distributed as follows:

- East Suffolk – an overall increase of 10,410, or 1,040 per annum.

- Mid Suffolk – an overall increase of 5,920 or 590 per annum.

- South Norfolk – an overall increase of 14,260, or 1,430 per annum.

- Babergh – an overall increase of 4,190, or 420 per annum.

- Ipswich – an overall increase of 7,240, or 720 per annum.

- Great Yarmouth – an overall increase of 2,590, or 260 per annum.

Table 9.33: Sub-national population projections, 2016–26

Area	2016 Population	2026 Population	Growth
Districts			
Great Yarmouth.	98,992	101,580	2.6%
South Norfolk	132,965	147,222	10.7%
East Suffolk	245,003	255,416	4.3%
*Suffolk Coastal**	*127,836*	*133,519*	*4.4%*
*Waveney**	*117,167*	*121,897*	*4.0%*
Mid Suffolk	100,720	106,638	5.9%
Ipswich	138,515	145,753	5.2%
Babergh	90,250	94,435	4.6%
Wider Scales (12 months to December 2018)			
Norfolk	891,731	944,073	5.9%
Suffolk	751,175	788,350	4.9%
East	6,129,005	6,573,378	7.3%

Source : ONS, sub national population projections, 2018.

9.5.114 The sub-national projections indicate future changes in the age structure of the population, showing the most significant proportional growth would be in the numbers of people aged 65 and over at all spatial scales.

9.5.115 As described in **Table 9.34,** Across the immediate districts the following changes in the overall population by age group are expected:

- Children (aged 0–15 years) – numbers in this age group are expected to increase by 3,180, or 2.2% between 2016 and 2026. This is below the projected rate in the East of England (7.0%) and England as a whole (4.9%). In East Suffolk there is expected to be very little change in the number of 0–15 year olds (0.0% change).

- Working age population (16–64 year olds) – numbers are expected to increase by 3,210 or 0.7% between 2016 and 2026. This is below the projected rate in the East of England (3.3%) and England as a whole (2.3%). In East Suffolk there is expected to be a fall in the number of working age residents (-1.2%, equivalent to a fall of 1,670 working age residents).

- Above retirement age (aged 65 and over) – numbers are expected to increase by 38,220 or 20.2% in the immediate districts between 2016 and 2026. This is slightly above the projected rate in the East of

England (20.0%) and England as a whole (19.4%). In East Suffolk the increase is expected to be 18.6% (12,080 residents).

Table 9.34: Sub-national population projections by age group, 2016–26

Area	% Growth Ages 0–15	% Growth Ages 16–65	% Growth Ages 65+
Districts			
East Suffolk	0.0%	-1.2%	18.6%
*Suffolk Coastal**	*-1.3%*	*-2.4%*	*22.6%*
*Waveney**	*1.5%*	*0.1%*	*14.2%*
Great Yarmouth	0.4%	-2.0%	15.7%
South Norfolk	11.1%	6.4%	21.0%
Mid Suffolk	-2.1%	0.2%	25.9%
Ipswich	2.9%	2.0%	20.8%
Babergh	0.0%	-1.6%	22.0%
Wider Scales (12 months to December 2018)			
Norfolk	5.5%	1.6%	16.7%
Suffolk	2.0%	-0.1%	20.6%
East	7.0%	3.3%	20.0%
England	4.9%	2.3%	19.4%

Source : ONS, sub national population projections, 2018.

ii. Employment projections (sector)

9.5.116 Employment projections are developed regionally via the East of England Forecasting Model (Cambridgeshire Insights, 2018) (Ref 9.39). This model is designed to facilitate the setting of consistent housing and jobs targets and is grouped by area (district and county) and variable, as well as skills.

9.5.117 The East of England Forecasting Model baseline forecasts for sectoral growth in employment are set out below for Suffolk (county) and East Suffolk (district) in **Table 9.35** and **Table 9.36** respectively. It is noted that these forecasts do not explicitly include Sizewell C, but do account for part of Sizewell B's construction period as a result of drawing on past trends in employment in the area.

Table 9.35: East of England Forecasting Model sector employment forecasts for Suffolk county (2017)

Sector	2015	2020	2025	2030	2035	Change 2015–2035
Agriculture	7,000	8,100	7,900	7,600	7,400	300
Extraction	300	100	100	100	100	-200
Manufacturing	33,100	32,400	31,000	29,500	28,100	-5,000
Utilities/Waste	3,700	4,500	4,600	4,700	4,900	1,200
Construction	27,500	29,400	31,100	32,400	33,800	6,300
Wholesale and Retail	55,900	56,300	57,200	57,900	58,400	2,500
Transport	23,600	26,900	27,400	27,800	28,100	4,500
Accommodation, Food & Drink	25,100	25,700	26,700	27,900	29,100	4,000
Communications	6,700	6,700	6,700	6,700	6,800	100
IT	4,800	5,500	5,800	6,000	6,200	1,400
Finance and Property	14,800	13,500	14,000	14,400	14,600	-200
Professional and Scientific	21,700	22,000	23,200	24,400	25,500	3,800
Business and Employment	37,700	28,400	29,500	30,600	31,800	-5,900
Public Setor	85,600	91,300	94,600	97,700	101,000	15,400
Arts, Entertainment	10,400	11,300	11,600	11,900	12,200	1,800
Other Services	9,700	10,200	10,300	10,500	10,800	1,100

Source: Cambridgeshire Insights, 2018.

9.5.118 **Table 9.35** sets out that in Suffolk:

- The public sector is projected to grow substantially, along with construction and service activities; and
- Business and employment services are projected to decline, as is manufacturing.

Table 9.36: East of England Forecasting Model sector employment forecasts for East Suffolk district (2017)

Sector	2015	2020	2025	2030	2035	Change 2015–2035
Agriculture	2,200	2,600	2,500	2,400	2,400	100
Extraction	100	–	–	–	–	-100
Manufacturing	10,200	10,000	9,500	9,000	8,500	-1,600
Utilities/Waste	1,100	1,300	1,300	1,400	1,400	300
Construction	7,600	8,300	8,700	9,000	9,300	1,700
Wholesale and Retail	15,500	15,600	15,800	16,000	16,200	600
Transport	10,800	12,600	12,700	12,800	12,900	2,100
Accommodation, Food & Drink	9,300	9,500	9,900	10,300	10,800	1,400
Communications	4,700	4,700	4,700	4,800	4,900	200
IT	900	1,100	1,100	1,200	1,200	300
Finance and Property	2,100	2,000	2,000	2,100	2,100	100
Professional and Scientific	5,800	6,000	6,200	6,500	6,700	900
Business and Employment	7,000	6,500	6,600	6,700	6,800	-200
Public Sector	23,000	24,400	25,300	26,200	27,100	4,100
Arts, Entertainment	3,200	3,500	3,600	3,700	3,700	500
Other Services	2,900	3,000	3,000	3,100	3,100	300

Source: Cambridgeshire Insights, 2018.

9.5.119 **Table 9.36** sets out that in East Suffolk:

- the public sector is projected to grow substantially, along with construction and service activities and transport employment; and
- business and employment services are projected to decline slightly, as is manufacturing.

iii. Skills and training forecasts

9.5.120 The Construction Industry Training Board (CITB) and Experian generate research into the future for construction skills, employment and their drivers on a four-year basis (CITB, 2018) (Ref 9.40). The latest report considers the period from 2019 to 2023 and sets out that:

- With an annual average growth rate of 1.2% for construction output between 2019–23, the East of England is similar to the forecasted UK average growth rate of 1.3%.

- Construction employment in the region is also forecast to grow at an average rate of 0.4% per year, rising from nearly 245,000 workers at the end of 2018 to nearly 250,000 by 2023.

- The average annual recruitment rate in the East of England is forecast to be 2.0% of the base 2018 workforce, stronger than the UK figure of 1.2%. This means the region would be looking for an extra 4,910 workers each year.

- In terms of roles, at a national level the greatest demand is for construction process management, other construction professional and technical staff scaffolders, wood trades, logistics personnel and plant operatives. In the East of England, growth is expected to be strongest for managerial, professional and technical occupations.

- At present, the forecasts for the East of England do not include Sizewell C. However, it is notable that stalled new nuclear power generation projects in the north-west (Moorside) and Wales (Wylfa Newydd) have had significant effects on revising down growth in those regions from previous projections.

9.6 Environmental design and mitigation

a) Introduction

9.6.1 As detailed in **Volume 1**, **Chapter 6** of the **ES** (Doc Ref. 6.2), a number of primary and tertiary mitigation measures have been identified through the iterative EIA process and have been incorporated into the design and construction planning of the proposed development.

9.6.2 In parallel with the assessment process, SZC Co. has been working with the local authorities and other stakeholders to identify and plan for measures to avoid, and/or mitigate, any negative impacts from the development and to enhance positive effects during the construction phase and once Sizewell C is operational.

b) Primary mitigation

9.6.3 This is often referred to as 'embedded mitigation' and includes modifications to the location or design of the development made during the pre-application phase that are an inherent part of the Sizewell C Project,

become a fundamental part of the design for which consent is sought, and do not require additional action to be taken.

9.6.4 A number of primary mitigation measures have been embedded into the design, and for the assessment, this chapter assumes that they are in place to mitigate otherwise potentially significant effects. The assessment notes that these mitigation measures would require construction and implementation themselves, and accounts for that transition period. These are identified in **Chapters 2** and **3** of this volume, and are summarised in this section. The summary makes clear where and why these measures have been included and the way in which they have contributed to the management and reduction of environmental effects.

9.6.5 The following primary mitigation relevant to socio-economic effects has been consulted upon and embedded into the Sizewell C Project:

i. Temporary Accommodation Campus

9.6.6 A temporary accommodation campus for construction workers, including facilities such as a gym, restaurant, bar and informal recreation facilities, to be located on the main development site.

9.6.7 These design measures, including provision for emergency services presence, welfare, food/drink and recreation activities for workers at the accommodation campus, would contribute to reducing potential effects on public safety and emergency services.

ii. Temporary Caravan Park

9.6.8 A temporary caravan site for construction workers would be located on the Land to the East of Eastlands Industrial Estate, also part of the main development site.

9.6.9 Design measures associated with the caravan site would contribute to reducing potential effects on public safety and emergency services.

iii. Temporary Occupational Healthcare Service

9.6.10 A temporary on-site, 24/7 occupational health service for construction workers is described in detail in **Volume 2**, **Chapter 28** of the **ES** (Doc Ref. 6.2).

9.6.11 The provision of an on-site occupational healthcare service for workers at the main development site would include mental and sexual health services. The provision of this occupational healthcare service would be secured through an obligation in the Section 106 Agreement (see **draft**

Section 106 Head of Terms provided as **Appendix J** to the **Planning Statement** (Doc Ref. 8.4)).

iv. Permanent Off-site Sports Facilities

9.6.12 SZC Co. has committed to significant investment in local recreation, sport and leisure provision in Leiston in the form of a 3G pitch and two multi-use games areas (MUGAs) at Alde Valley School in Leiston, in recognition that:

- the workforce would likely raise demand for specific types of activity – such as football – of which there is a local deficiency in provision (of all-weather pitches); and
- investment in facilities would be likely to make a positive contribution to integration and the experience of the workforce and local community.

9.6.13 This facility would have shared use with the school and local community and would therefore have residual impacts on recreation, sport, and leisure services which would be major beneficial at all levels.

9.6.14 Measures would be built in to the design to reduce safeguarding risks, such as physical and temporal segregation of use by workers and the community, and the school, at shared recreational facilities in Leiston.

9.6.15 SZC Co. proposes to construct or provide a contribution to fund the construction of this facility which would be managed by ESC. The funding would include a contribution for the maintenance of the pitches during the construction phase when the facilities would be used by the Sizewell C construction workforce as well as provision of a sink fund. During the operational phase, it is proposed that any ongoing costs of the sports facilities would be borne by ESC or Alde Valley School. The provision of the off-site sports pitches will be secured through an obligation in the Section 106 Agreement (see **draft Section 106 Heads of Terms**).

v. Visitor centre

9.6.16 The existing Sizewell B visitor centre would be replaced with a permanent, modern educational facility for visitors, including school groups. It is proposed that the new visitor centre would be located at the north-east of the Coronation Wood development area, adjacent to the proposed Sizewell B training centre. It is anticipated that the proposed visitor centre would include exhibition spaces, an auditorium, media centre, viewing area, classrooms, and offices.

9.6.17 The visitor centre would be accessible by the general public with exhibition space and modern educational elements providing capacity for school groups. Its role would be to provide information to the general public and school groups about aspects including: the process for generating electricity, the benefits of low-carbon energy and sustainability more generally, and the new technology's role in the future of nuclear power in the UK. It would also illustrate the contribution of Sizewell C to carbon reduction and its role as part of the Suffolk Energy Coast and demonstrate the importance of the surrounding AONB.

c) Tertiary mitigation and enhancement

9.6.18 Some mitigation measures comprise standard management practice, and are therefore included as tertiary mitigation against which impacts are assessed. These measures are embedded processes/procedures, rather than physical design measures. For the purposes of the socio-economic assessment, processes and procedures specified for the Sizewell C Project are also proposed to provide enhancement for beneficial effects.

9.6.19 If, after accounting for these activities, significant adverse effects are still assessed as likely within **section 9.7** below, further mitigation measures are identified in **section 9.8** of this chapter.

9.6.20 These include employment and training activities to secure local recruitment set out in the **Employment, Skills and Education Strategy** provided in **Appendix A** of the **Economic Statement** (Doc Ref. 8.9), a Worker Code of Conduct to help govern worker behaviour, and a **Supply Chain Strategy** provided in **Appendix B** of the **Economic Statement** (Doc Ref. 8.9).

9.6.21 The implementation of the **Employment, Skills and Education Strategy** and **Supply Chain Strategy,** including the proposed tertiary mitigation, will be secured through obligations contained in a Section 106 Agreement (see the **draft Section 106 Heads of Terms** appended to the **Planning Statement** (Doc. Ref. 8.4)).

i. Employment, Skills and Education Strategy

9.6.22 SZC Co. has worked closely with stakeholders in the region to develop a strategy with a range of measures that combine to create an environment in which education, skills and workforce development can flourish, to the benefit of both the Sizewell C Project and the region.

9.6.23 The **Employment, Skills and Education Strategy** is included as **Appendix A** to the **Economic Statement** (Doc Ref 8.9). It sets out a strategic approach centred around four strategic priorities:

- Creating economic benefit and improving social mobility by:
  - leaving a legacy;
  - addressing key government and regional policy priorities; and
  - linking employment, skills and education to complementary activities for developing the supply chain as set out in **Appendix B** to the **Economic Statement** – **Supply Chain Strategy** (Doc Ref 8.9).
- Minimising workforce and project risk caused by a lack of availability, capability, capacity or competence in the UK or regional skills base.
- Setting realistic DCO commitments and leveraging significant additional value.
- Where appropriate, integrating strategic activity between Sizewell C and Hinkley Point C – and in the future Bradwell B – by leveraging the full benefit of 'fleet effect' for skills and workforce.

9.6.24 The **Employment, Skills and Education Strategy** provided in **Appendix A** of the **Economic Statement** sets out how learning from Hinkley Point C has helped provide more clarity about Sizewell C, and sets out a 'prospectus' of required roles and qualifications for Sizewell C in the future by phase of construction and type of role.

9.6.25 It then sets out a range of interventions and investments that the Sizewell C Project will make, to be secured through the Section 106 Agreement, including:

- A Sizewell C Jobs Service - SZC Co.'s focus on recruitment will be on targeting the right people into the right jobs through the enhancement of the Hinkley Point C Jobs Service. This will provide a service that is managed centrally but delivers locally though a small number of dedicated staff in Suffolk and through optimising external partnerships.
- Skills initiatives – including (where funding is referred to, this will be secured through the Section 106 Agreement):
  - a flexible Asset Skills Enhancement and Capability Fund with a strong, accountable governance structure including Tier 1 contractors and local stakeholders;

- a commitment to funding a Regional Skills Coordinator post to provide a focal point of coordination and skills planning between the Sizewell C Project and providers; and
- supporting contractors in exploring options for training and assessment facilities to enable the competence of workers to be assessed and to identify areas of additional training.

- Education initiatives – partnering with regional stakeholders to invest in a range of activities including:
  - supporting specific and existing educational initiatives in the region that are working well or are supporting young people in raising their aspirations for careers in energy, engineering or construction;
  - supporting and investing in specific interventions with a focus on career introduction and development;
  - starting early with 'aspiration raising' activities;
  - introducing actual opportunities to 'have a go' with an emphasis on the promotion of Sizewell C's critical skills that are in short supply;
  - creating an innovative and 'first of a kind' bursary scheme to support the creation of alternative pathways for those that haven't reached the required entry level, providing a 'second chance' for young people in Leiston, Lowestoft, Great Yarmouth and Ipswich; and
  - establishing a Young Sizewell C programme providing an insight programme to inspire and build awareness of opportunities among young people who are closest to the workplace and to help pipeline them into actual Sizewell C opportunities.

9.6.26 The **Employment, Skills and Education Strategy** will be linked with priority social services target groups, for example so that outreach programmes target children, NEETs, and other vulnerable groups

ii. Supply Chain Strategy

9.6.27 SZC Co. has set out to develop a strategy for its supply chain for Sizewell C that builds on the good progress made at Hinkley Point C and seeks to engage and promote business in the region to gain competency to compete for and win contracts.

9.6.28 The **Supply Chain Strategy** is included as **Appendix B** to the **Economic Statement** (Doc Ref 8.9). The core objective of the strategy is to

successfully deliver the construction and commissioning of the Sizewell C Project utilising the expertise and capability within the local and regional supply chain, where possible.

9.6.29 The strategy sets out how SZC Co. will aim to replicate the design of Hinkley Point C to benefit from being able to use the UK approved, frozen EPR™ design being built in Somerset, while taking into account local conditions in order to develop and implement Sizewell C. Replication does not mean that the entire Hinkley Point C supply chain and workforce will be transferred to Sizewell C, rather that core elements of the supply chain that are critical to replication of the power station are transferred.

9.6.30 SZC Co. therefore anticipates that Sizewell C will be able to deliver a similar level of economic benefits to Suffolk and the East of England, in terms of supply chain opportunities for local and regional businesses, as Hinkley Point C is delivering for Somerset and the South West.

9.6.31 An important role of the strategy is to contribute to the economy of the East of England and the UK more widely: Sizewell C will support the maintenance and development of the UK nuclear sector and wider construction innovations and skills.

9.6.32 The strategy identifies lessons learnt from previous experience, and sets out a range of initiatives, to be secured by the Section 106 Agreement, that will enable the region to capture economic benefits generated by the goods and services needed for the delivery of the Sizewell C Project. These include:

- A Sizewell C supply chain team, partnering with the Suffolk Chamber of Commerce. The team will assist local and regional businesses in winning contracts on the Sizewell C Project through management of a supply chain website with project information, details of work packages and professional standards, signposting to relevant support, details of events and examples of success.

- A Sizewell C Supply Chain Portal capturing details and core capabilities of regional businesses and mapping them against requirements of the Sizewell C Project, brokering business support and matching suppliers with SZC Co. and Tier 1 contractors.

- Contractor engagement including senior leadership commitments from Tier 1 contractors to engage with the local and regional supply chain, including attendance at ‘meet the buyer’ events.

- Monitoring and reporting in order to compare and contrast local and regional levels of engagement.

9.6.33 Sizewell C's strategy is to integrate employment, skills, and education with the supply chain development activity in order to help jobseekers find roles on the Sizewell C Project and to help backfill vacancies that may become harder-to-fill within the supply chain, using the Sizewell C Jobs Service.

9.6.34 The **Supply Chain Strategy** will be linked with priority social services target groups, for example so that outreach programmes target children, NEETs, and other vulnerable groups

iii. Code of Construction Practice and Worker Code of Conduct

9.6.35 Some tertiary measures have been developed for multiple purposes – for example to deliver safe, efficient construction activities, but also to promote community cohesion and minimise effects of the workforce on perceptions of public safety.

Code of Construction Practice (CoCP) (communication, community and stakeholder engagement)

9.6.36 The strategy for communication, community, and stakeholder engagement is set out in the **CoCP** (Doc Ref. 8.11). This would provide a point of contact between the community and the Sizewell C Project, both to disseminate information and to receive comments/complaints. Community liaison activities set out in the **CoCP** (Doc Ref. 8.11) would address issues relating to community cohesion and integration that may arise from members of the public.

Recruitment activities and Worker Code of Conduct

9.6.37 Security vetting would be embedded into any recruitment and contracting by SZC Co. and Tier 1 contractors.

9.6.38 A Worker Code of Conduct (see Hinkley Point C example appended to the **Community Safety Management Plan** (Doc Ref. 8.16)), would be put in place to set required standards on behaviour both on and off site.

9.6.39 The Worker Code of Conduct would be explained to workers at induction and reinforced in the course of the Sizewell C Project through ongoing training and awareness campaigns. Each worker would be required to sign a copy of the document at induction. Complaints would be monitored, as discussed in the **CoCP** (Doc Ref. 8.11), and action taken where necessary.

9.6.40 Whilst the absence of a contractual relationship means SZC Co. are not able to discipline workers directly, regular performance reviews with

contractors would provide a means of ensuring good worker behaviour and breach of the Worker Code of Conduct may mean dismissal of the worker from the Sizewell C Project.

iv. Transport measures

9.6.41 Mitigation related to road safety as set out in **Chapter 10 (Transport)** of this volume has also been considered as such mitigation would reduce effects on the emergency services.

9.6.42 Tertiary mitigation strategies such as the **Traffic Incident Management Plan** (Doc Ref. 8.6), **Construction Traffic Management Plan** (Doc Ref. 8.7), and the **Construction Worker Travel Plan** (Doc Ref. 8.8) will be secured through an obligation in the Section 106 Agreement (see **draft Section 106 Heads of Terms**). These implementation strategies would contribute to a reduction in significance of potential effects on emergency services, which rely on local roads to respond to incidents.

9.7 Assessment

a) Introduction

9.7.1 This section presents the findings of the socio-economic assessment for the construction, operation and removal and reinstatement (where relevant) phases of the proposed development.

b) Construction

i. Overview of construction phase effects

9.7.2 The socio-economic construction phase effects of the Sizewell C Project result from the workforce required to build Sizewell C, and the demand for goods and services to support the development.

9.7.3 **Section 9.4** of this chapter, along with the appended technical notes, summarises the Sizewell C Project assumptions in relation to:

- how many workers will be required and when (workforce profile);
- where workers are likely to be recruited from (HB and NHB recruitment);
- where NHB workers are likely to live, based on accommodation capacity assumptions and SZC Co.'s **Accommodation Strategy** (Doc Ref. 8.10), and the Gravity Model produced for the **Transport Assessment** (Doc Ref. 8.5); and

- the demographic characteristics of the workforce.

9.7.4 This section uses these assumptions to assess the effects of the proposals against the policy, baseline and significance criteria described above in relation to the following topics:

- Economic effects including labour market effects, business and supply chain effects, wages/spending and additionality, and effects on the tourism and agricultural economies.
- Accommodation effects.
- Population and demographics.
- Public services/community facilities including education and pre-school; social services; other county level services; formal sport and leisure; and regulatory and environmental services.
- Community safety and emergency services.
- Community cohesion and integration.

ii. Economic effects

9.7.5 The construction of Sizewell C could have a range of economic effects. In this section the areas of impact would focus on spatial levels identified in the baseline assessment.

Labour market effects

9.7.6 Assumptions about the labour force requirements for the construction of Sizewell C are set out in **Appendix 9A** of this volume.

9.7.7 The construction workforce profile provides an estimate of the number of roles required in any given month, by type of role, over the construction period. It shows the overall build-up and ramp-down of the construction workforce, and its components – civils construction, mechanical, electrical and heating, professional and management, site support/services, construction of associated development sites (mainly civils) and the operational workforce.

9.7.8 The workforce profile highlights that:

- in the early years, the workforce profile is mainly driven by the requirement for civils roles, supported by non-construction project management and professional roles and site support roles;

- during this time there is a component of the workforce constructing the associated development sites (including the new road schemes, park and ride facilities and the on-site accommodation campus);
- the civils workforce peaks at just above 3,600 workers in year five of the construction phase;
- the civils workforce then reduces, as 'J0'[4] is passed and at this stage there is an increase in mechanical, electrical and heating roles. During this stage, the operational workforce is also starting to build up;
- the peak of the construction workforce happens in year seven of the construction phase – at this stage the mechanical, electrical and heating workforce has peaked at around 3,300 roles;
- the peak of the workforce is relatively short – it is likely to exceed 7,000 workers for less than two years; and
- following the mechanical, electrical and heating peak, the workforce drops substantially and from year ten to completion is well below 2,000 workers – around this stage associated development sites are deconstructed and site restoration is undertaken, and the operational workforce reaches full capacity (at 900) – so the construction-related workforce accounts for around 1,000 workers at this stage.

9.7.9 This 'gross' peak employment total of 7,900 (plus 600 associated development staff) equates to around 1% of jobs in the 90-minute commuting area (CDCZ) for HB workers.

9.7.10 The build-up of the workforce equates to approximately 1,100 jobs per year for the first 7 years of the Sizewell C Project (up to peak construction). This equates to 0.2% of total jobs in the CDCZ. The addition of 1,100 jobs to the regional economy (on average) over this period compares to an average annual jobs growth of 4,900 in Suffolk and 67,500 in the East of England between 2012 and 2017.

Non-home-based recruitment

9.7.11 Because of the relatively high levels of labour demand, it is projected that a substantial proportion of the workforce would be recruited from outside the

[4] The date SZC Co. uses to denote the first pour of nuclear safety related concrete – a standard milestone in French nuclear construction.

90-minute area. This would vary by skill type and timing within the Sizewell C Project as described in **Appendix 9A** of this volume.

9.7.12 The NHB split is based on the Gravity Model assumptions, including assumptions about project accommodation set out in **Appendix 9D** of this volume.

Home-based recruitment

9.7.13 The Sizewell C Project is likely to generate the types of non-operational jobs for existing local residents at the overall peak of the construction period as shown in **Table 9.37.**

Table 9.37: Estimated construction and support jobs supported at peak likely to be taken by home-based workers

Occupation Type	Home-Based Workers at Peak	
	Workers	Sectors
Civil operatives.	460	Timber and formwork, concrete/cement/ /steelfixers, drivers, lifting operatives and supervisors, labourers, steelwork erectors, access and other plant operators, welders, civil works labourers and semi-skilled occupations.
Mechanical, electrical and heating operatives.	650	Semi-skilled mechanical, electrical and heating operatives, welders, pipefitters, cabling operatives, fitters, electricians, laggers, support services, instrumentation.
Professional and management.	150	Mainly professional, management-type jobs.
Site services/support.	550	Administrative, private security and service sector (e.g. catering, cleaning).
Associated developments.	600	Includes drivers, security, service-sector jobs, cleaning, maintenance and administrative jobs.
Total	**2,410**	**All construction-related workforce associated with the Sizewell C Project at peak.**

9.7.14 At peak, this means an additional 2,410 jobs for local residents across a range of occupations and skill levels in non-operational roles. In total, this equates to around 7% of total construction jobs in the 90-minute area, and is therefore assessed as a moderate beneficial effect which would be **significant** at this level.

9.7.15 Construction already accounts for over one billion pounds of output in Suffolk, contributing around 7% of the county's total output. In the construction sector in Suffolk, gross value added per worker per year stands at over £60,000 per full-time equivalent. Activity at Sizewell C

therefore equates to close to two and a half billion pounds over the course of the construction phase (based on around 40,000 person-years of employment required).

Impacts on the dynamic labour market

9.7.16 The labour market is dynamic: people move in and out of the labour market and move between jobs regularly. As demand for workers increases, jobs may be filled by people currently in employment moving jobs, people who are registered as unemployed, and people who do not form part of the labour market because they are classed as economically inactive.

9.7.17 There are generally two components of worklessness – economically active people who are unemployed (but are actively seeking work via claiming Job Seekers Allowance), and people who are economically inactive, but are ready to and want to work. The number of people who are economically inactive but who want to work is significantly greater than the numbers who are registered as unemployment benefit claimants. The Government's preferred definition of unemployment – the International Labour Organisation (ILO) measure – shows higher numbers of people unemployed than either the Job Seekers Allowance measure or the economically inactive who want to work.

9.7.18 The ILO definition of unemployment includes both those who are economically active, but unemployed and seeking work (for example, claiming Job Seekers Allowance), and people who are economically inactive but want to work and are work-ready (but are not actively seeking work). Taken together, these groups offer a considerable source of spare capacity for the labour market.

9.7.19 **Figure 9.5** identifies the extent of this labour pool in Suffolk, showing that currently there are 31,400 people in Suffolk who are unemployed but looking for work, or are economically inactive but want a job, and on average through the economic cycle there are between 35,000 and 40,000 (ONS Annual Population Survey, 2018).

9.7.20 These numbers are volatile, and there are significant annual changes in the level of economic inactivity, which is much more sensitive to changes in economic output than unemployment. It can therefore be seen that the number of people who are active in the labour market is not fixed – it expands and contracts according to economic environment, so when there are more jobs available, it can be expected that more people would be economically active.

9.7.21 Depending on the point in the economic cycle, between 40% and 52% of new jobs are filled by people who were not previously working (Ref 9.41). Some of these would be registered as unemployed, and some would not.

Some would need help to get into work, others would not. The corollary of this is that up to 60% of vacancies would be filled by people who change job.

9.7.22 This is the normal operation of the labour market, and the choices of individuals within it, and is not directly related to the impacts of the proposed development.

9.7.23 This is partly because the supply of labour is not fixed. When new jobs are created, it encourages more people to start work and enables those who are in work to increase their hours. It also allows people who currently have to travel out of the area to change jobs to something closer and more convenient.

9.7.24 Employment and economic activity should also be seen in the context of moves between jobs, sectors and locations. Whilst there is no single data source for average job tenure, a number of UK-based studies conducted based on the Labour Force Survey and the Organisation for Economic Co-operation and Development (OECD) produces an annual dataset (OECD, 2015). **Table 9.38** summarises these broad statistics on jobs tenure across all industries:

Table 9.38: Average job tenure in the UK

Job Tenure	<1 Year	1–3 Years	3–5 Years	5–10 Years	>10 Years
Percentage	17.6%	16.5%	13.3%	20.7%	31.9%

Source: OECD, 2015.

9.7.25 This means that of the 343,500 people working in Suffolk (APS, 2018), on average, more than 60,000 change job in any given year. The data also shows that around half of workers have a job tenure of less than five years. By extension, within the construction phase of Sizewell C, most workers would change jobs twice and most employers would need to fill each of their posts twice.

9.7.26 Average tenure is particularly short in construction given the transient and mobile nature of projects and the workers they employ. A survey by BMG Research for CITB in 2018/19 (Ref 9.42) identified that in the East of England:

- 27% of workers expect to be working on a site for less than three months;
- 18% of workers expect to be working on-site for between three and six months; and

- only 23% expect to be working on a site for more than one year.

9.7.27 Most construction projects in the UK and the East of England are relatively short-term in nature, with a constant churn of jobs and skilled workers operating in many different locations. Sizewell C would be fairly unusual, as it is a longer-term project with a very wide range of skills required over different stages of the build.

9.7.28 Whilst a temporary impact, Sizewell C's construction phase would be relatively long-term for a construction project, and notably longer than the average job tenure in the UK. A worker who might leave a permanent job to move to a temporary construction job on the Sizewell C Project would do so voluntarily – as is the normal operation of the labour market – and the training and work experience received would give them the opportunity to move onto other jobs, careers and projects.

9.7.29 SZC Co.'s contractors stand to benefit from recycling workers over that period due to lower costs in re-training, so it is likely that workers on the Sizewell C Project would be in a strong position to move to other work roles, gaining sustainable careers with transferable skills over a long time period. As such, SZC Co. has developed an **Employment, Skills and Education Strategy,** provided in **Appendix A** of the **Economic Statement** (Doc Ref. 8.9) to maximise local recruitment, and ensure the skills benefits can be retained locally. **Table 9.39** shows the proportion of total jobs and jobs in the construction sector in Suffolk that the total workforce at Sizewell C represents in each year of the Sizewell C Project.

Table 9.39: Sizewell C jobs as a % of all jobs and construction sector jobs

Year	SZC Jobs (Annual average)	SZC Construction Jobs[5]	Suffolk County			
			All Jobs (Forecast from 2022)	%	Construction Jobs (Forecast from 2022)	%
1	742	497	376,105	0.2%	30,215	2%
2	1,567	1,050	377,840	0.4%	30,487	3%
3	3,072	2,058	379,712	0.8%	30,782	7%
4	4,158	2,742	381,679	1.1%	31,109	9%
5	6,888	4,475	383,394	1.8%	31,375	14%
6	6,931	4,578	385,038	1.8%	31,596	14%

[5] "Construction" i.e. mechanical, electrical and heating and civils and associated development construction, not including non-construction roles at associated development sites such as catering or security.

Year	SZC Jobs (Annual average)	SZC Construction Jobs[5]	Suffolk County			
			All Jobs (Forecast from 2022)	%	Construction Jobs (Forecast from 2022)	%
7	7,796	5,067	386,763	2.0%	31,864	16%
8	6,742	4,100	388,438	1.7%	32,111	13%
9	4,506	2,582	390,243	1.2%	32,412	8%
10	2,116	895	391,728	0.5%	32,664	3%
11	1,727	558	393,534	0.4%	32,947	2%
12	1,284	257	395,268	0.3%	33,245	1%

Labour market churn and 'hard to fill' vacancies

9.7.30 There is the potential as part of this process that employees would be recruited from other local employers, thus causing vacancies that are harder to fill in the case of some occupations.

9.7.31 Experience at Sizewell B was that around 20% of locally recruited employees had previously been unemployed or economically inactive and around 30% (600 of 2,200) recruited in the peak recruitment year had come from other local employers. A survey of 160 local companies found that less than 10% of the companies thought the power station project made it more difficult to retain or recruit (replacement) staff (Ref 9.43).

9.7.32 Research by the Resolution Foundation (Ref 9.41) suggests that up to 60% of people starting new jobs have come from other jobs, with the remainder being entrants into the labour market. This is strongly linked to the economic cycle, and in the last recession in 2010 only 48% of jobs were filled by people already in work. This suggests that Sizewell C is likely to see a larger proportion of its local workforce drawn from people entering or re-entering the labour market.

9.7.33 If similar proportions to Sizewell B were to occur at the peak of the Sizewell C construction programme, then of the (up to) 2,410 new home-based roles (including at associated development sites but discounting operational staff) this would mean around 1,205 would move with the existing employer and 1,205 would be newly recruited (from either worklessness or another job).

9.7.34 Of those newly recruited up to c. 480 would be formerly unemployed or previously inactive workers and up to 725 would be workers from existing firms. This would equate to:

- around 2% of unemployed workers in the CDCZ area, or around 5% in Suffolk gaining work on the Sizewell C Project. This is assessed as a

moderate to major beneficial impact which would be **significant** at all spatial levels; and

- around 2% of the construction workforce in the CDCZ area, or 4% in Suffolk gaining work on the Sizewell C Project, which would be negligible and **not significant** in the context of the overall 'churn' within the construction and overall labour market in the area.

9.7.35 Labour market churn (as opposed to displacement[6]) (Ref 9.44) is a normal feature of the economy, particularly in the construction sector. Employers fill any emerging vacancies, across a range of skills. Even those jobs that are highly skilled can be filled by training people from the next level down, so these would generally be filled from elsewhere in the labour market. It is likely that the creation of employment at Sizewell C would increase labour market churn, but given the scale of the labour market and its flexibility, this change is considered to be **not significant.**

9.7.36 The Sizewell C Project would recruit HB workers from four different categories:

(a) locals without a job or with spare capacity for work;

(b) locals who change job;

(c) locals whose employer gets a contract on the Sizewell C Project; and

(d) locals who work elsewhere or are self-employed and/or work on very short-term contracts/tenures.

9.7.37 SZC Co. considers that the Sizewell C Project should aim to achieve a high level of local benefits by recruiting from categories (a), (b), (c), and (d) and that (b) is the area of concern for existing local businesses, local authorities, and NALEP as identified in the **Consultation Report** (Doc Ref. 5.1).

9.7.38 Category (a) has significant potential for recruitment based on existing and continual spare capacity in the labour market as set out above; and would be enhanced through SZC Co.'s package of measures to improve skills and education set out in its **Employment, Skills and Education Strategy,** provided in **Appendix A** of the **Economic Statement** (Doc Ref. 8.9).

9.7.39 Hinkley Point C's initiatives to support employment, recruitment, skills and training have proven to be successful – including (Ref 9.45):

[6] Displacement is defined in the HM Treasury Green Book as: "*the degree to which an increase in economic activity promoted by an intervention is offset by reductions in economic activity elsewhere*" (Ref 9.44).

- a cumulative total of 433 apprenticeships have been delivered (as at April 2019) compared to a project aspiration to create 400 new apprenticeships and facilitate 1,000 during the construction phase;

- 15,150 people have registered with the HPC Jobs Service (of which 48% are local residents) (as at January 2019) and 759 people have been placed in work through the HPC Job Service (as at April 2019) of which around 50% are local residents;

- 740 young people (as at April 2019) have registered with the Young HPC Programme; and

- by March 2018, 8,767 people in West Somerset had benefitted from the project's interventions for developing career choices and employment outreach such as aspiration building and skills development.

9.7.40 Category (c) has the opportunity to deliver benefits to existing businesses and their employees as a result of growing competencies and skills.

9.7.41 Evidence points strongly to a dynamic labour market that is flexible and responsive, rather than an over-heated labour market where extra demand would cause likely significant impacts.

9.7.42 As a result, significant adverse impacts are not anticipated, but SZC Co. is working to ensure this is the case through a range of employment, skills and supply chain support measures.

Business and supply chain

9.7.43 The development of Sizewell C would create supply chain opportunities, and represents a substantial part of the UK's national nuclear new build programme and wider infrastructure development.

9.7.44 The supply chain would operate on a number of levels:

- There would be several Tier 1 contractors appointed for the construction of the Sizewell C Project, national and international companies working independently, or through alliances who would be responsible for delivering one or more packages of works. A substantial proportion of construction expenditure would be on equipment and materials through this group.

- There would be a large number of Tier 2 sub-contractors and suppliers working for these contractors, ranging from providing

materials, equipment, very specialist skills, through to more general trades.

9.7.45 The technology suppliers/engineers and equipment and materials contracts (national and international level) would contribute to national policy ambitions set out in the UK's Industrial Strategy (Ref 9.46) to develop the UK's low carbon manufacturing capacity.

9.7.46 There are however, a number of local and regional firms that may benefit from these contracting opportunities. SZC Co. and its supply chain would also procure a large range of other (non-construction) services including, for example, professional and design services, facilities management (for campuses and park and rides), transport services, security and catering.

9.7.47 Construction contracts and sub-contracts, and particularly non-construction packages would have a much stronger local and regional element, with a substantial proportion of construction value retained in the local economy through wages to HB workers and expenditure by NHB workers.

9.7.48 At Hinkley Point C[7], EDF Energy and the Department for Business, Energy & Industrial Strategy set out that:

- Over £650 million had (at July 2018) been spent in the south-west (including South Wales).
- In addition to the £650 million of expenditure to date, contracts have been entered into for a further £700 million, including larger Tier 2 contracts.
- This brings a total of commitments, including spend to date, to over £1.3 billion. A project to capture spend below Tier 1 has since been rolled out.

9.7.49 Committed local and regional spend has increased since the publication of the BEIS report referenced above, and stood at £1.55 billion at the end of 2018. This committed regional spend equates to around 7% of total spend on the Hinkley Point C project, and is likely to grow further.

9.7.50 By comparison, information on local contract expenditure for the main civils contractor at the most recent comparative example of a new nuclear build elsewhere - Flamanville 3 in France - showed about 2% local expenditure out of €400 million total (2007–mid-2009), within 50km of that site, mainly in Cherbourg.

[7] BEIS (July 2018) Hinkley Point C Wider Benefits Realisation Plan.

9.7.51 At Sizewell B, the figure of contracts with local firms in the larger area of Suffolk and Norfolk was a little higher at about 4% (i.e. c. £80 million out of total contract value of about £2 billion) over the construction phase (1987-1995, not adjusted for inflation).

9.7.52 The total value of the Sizewell C project is estimated at £20 billion, made up from the sourcing of goods and materials, and cost of labour. It is anticipated that – if similar activities and local supply chain recruitment are achieved at Sizewell C as Hinkley Point C – there could be a 'local' retention of in excess of £1.5bn over the construction period, equivalent to an average of £125m per year.

9.7.53 This is considered a moderate beneficial effect at the regional level. This would be **significant**.

Wages/Spending and additionality

9.7.54 Assuming NHB workers spend all of their nightly subsistence allowance of £40, that would increase spending in the area by an average of £21.5 million per year, or nearly £260 million over the construction period.

9.7.55 The extra wages and spending from HB workers will depend on their previous circumstance, but if up to 50% were previously unemployed, this would represent an average boost to incomes each year of £15 million compared to receiving £10,000 per year in benefits. The boost to local spending would be less than that (after taxes and savings) but could still be £5 million per year or £60 million over the construction period.

9.7.56 Together these add up to just over £320 million of extra local spending during the construction phase.

9.7.57 The estimated net additional outcome at Sizewell B for additional workforce expenditure in the locality was around £80m. Uprating this, taking into account the construction costs for Sizewell C, would give a total of £190m or an average of £16m per year.

9.7.58 Local wages for HB workers and local spending on food and accommodation by NHB workers would equate to just under £1.1bn at an average of £91m per year over 12 years.

9.7.59 All of the impacts set out above would be additional to the local and regional economy, in that without the development of Sizewell C they would not occur - in economic terms there is no 'deadweight' (also known as non-additionality), i.e. there is no investment in a new nuclear plant in the area that would have happened anyway. Similarly, there is no 'displacement' or activity that moves to the site that would otherwise take place elsewhere.

9.7.60 As a result, the wages/spending and additionality effects of the Sizewell C Project are considered to be moderate beneficial and **significant** at the local and regional scale.

9.7.61 It is recognised that these benefits relate to the economy and workers within the economy, noting that there is potential for businesses to find that some vacancies become harder to fill. This effect is addressed earlier in this section.

9.7.62 Further information on the economic benefits of the Sizewell C Project is set out in the **Economic Statement** (Doc Ref. 8.9).

Effects on the tourism economy

9.7.63 The NPS EN-1 (Ref 9.1) states that the construction, operation and decommissioning of energy infrastructure may have socio-economic impacts and that:

> *"Where the project is likely to have socio-economic impacts at local or regional levels, the applicant should undertake and include in their application an assessment of these impacts as part of the Environmental Statement… which may include effects on tourism"* (paragraph 5.12.2-3) (Ref 9.1).

9.7.64 It also sets out that that:

> *"The Infrastructure Planning Commission may conclude that limited weight is to be given to assertions of socio-economic impacts that are not supported by evidence (particularly in view of the need for energy infrastructure as set out in this NPS)"* (paragraph 5.12.7) (Ref 9.1).

9.7.65 Some stakeholders have raised concerns that the Sizewell C Project's construction phase may lead to a reduction in visitor numbers and therefore their spending, affecting the overall output of the tourist economy and businesses within it.

9.7.66 Empirical evidence on this that meets the test in NPS EN-1 is difficult to extricate from the many other factors that influence tourism, and would be based on *ex-ante* perception which may not translate to actual effects.

9.7.67 Stakeholders have identified a number of risks, but there is limited empirical evidence to support the position that these would lead to likely significant effects. The following section reviews evidence from elsewhere, including how the DCO application for Hinkley Point C sought to deal with the issue.

Experience from Hinkley Point C

9.7.68 Prior to construction of the project, EDF Energy and three local authorities closest to Hinkley Point C commissioned a face-to-face survey of tourists in Somerset to understand the level of awareness of the proposals for the new nuclear power station, and to try and identify the scale of potential impacts that the project could have. At the time, the local authorities were concerned that there would be a translation from interviewees' perceptions about whether they would be more or less likely to visit the area during the construction phase, to actual quantified reductions in visitor nights and therefore expenditure.

9.7.69 However, it is very difficult to draw quantified conclusions from surveys where people are asked to estimate how they would react to a hypothetical situation. This is true generally (and evidenced by the poor predictive power of political polling) and specifically in the case of tourism. In this case, visitors were presented with (necessarily limited) descriptions of the impacts that Hinkley Point C might have, and asked what it would mean for their future visits. The survey results suggested that around 10% of future visitors would change their plans and not visit.

9.7.70 In reality, these potential changes to visitor activity have not materialised, suggesting that this is not an accurate or reliable approach to quantifying effects on the tourist economy.

9.7.71 EDF Energy and the Hinkley Point C Tourism Action Partnership (including local authorities and other tourist-sector stakeholders) in the south-west have been monitoring the effects of Hinkley Point C's construction on tourism activity, as required by the terms of that project. The latest Socio-economic Advisory Group report (SEAG, 2019) (Ref 9.47) for these potential effects sets out that anticipated negative effects have not materialised to date, local tourism business confidence (of continued visitor income) seems high, and mitigation measures provided by EDF Energy in advance have helped. These include:

- Using public relations support to deliver social media and press campaigns to promote Somerset and Exmoor as destinations.
- Providing support for tourism businesses with workshops and networking.
- Monitoring business performance and optimism.
- Supporting the DMO in Somerset and Exmoor with finance and expertise.

- Running an advertising campaign focused on target markets and off-peak seasons.

9.7.72 The Hinkley Point SEAG Tourism Dashboard (a reporting mechanism for monitoring of potential effects of the project on tourism agreed via DCO governance) states that:

> *"All metrics suggest continued growth and development and the tourism business survey shows no detrimental impact on visitor perceptions or business confidence as a result of Hinkley Point C".*

9.7.73 The same conclusion is reached in the report of Professor Glasson for the New Nuclear Local Authorities Group (Ref 9.47). This states that:

> *"Anticipated negative impacts have not materialised to date. Indeed confidence seems high. Mitigation measures, provided in advance, have helped; ……There is also the added bonus for some tourism accommodation providers of much fuller occupancy over the calendar year. Hinkley Point C itself is an added Somerset visitor attraction that is likely to become more popular"* (Ref 9.47).

9.7.74 Additionally, data on employment in tourism during the construction period of Hinkley Point C to date has showed that since development consent was granted in March 2013, tourist sector employment in Somerset has grown by 32% in Somerset and 20% in the districts closest to the Hinkley Point C site (West Somerset and Sedgemoor) (based on ONS BRES, 2013–18).

9.7.75 The sector has grown in Somerset at 3 times the rate of total employment growth during that period, and has consistently accounted for between 10% and 12% of all jobs in the County.

Experience from Sizewell B construction

9.7.76 Similar evidence of trends in tourism employment during the construction of Sizewell B also identified no impact on the tourist economy as a result of construction activities.

9.7.77 **Figure 9.6** shows a consistent time-series across public datasets for 'high-level' SIC definitions for *"hotels and restaurants"* and *"recreation and cultural"* SIC codes between 1984 and 2018 based on ONS longitudinal data. This shows the absolute number of jobs in these combined sectors in Suffolk Coastal, Mid Suffolk, Waveney, East of England and Great Britain with the Sizewell B construction period and peak, and national negative growth periods (recession) highlighted.

9.7.78 The shaded area on **Figure 9.6** is the construction period for Sizewell B. This highlights that there was only a marginal change in employment in the tourism economy relative to the total number of jobs in the local area, and that fluctuations are in line with average annual variations seen throughout the time series.

9.7.79 Additionally, in real terms the number of jobs in Suffolk Coastal increased significantly over this time, as did tourism-related jobs. Between 1987 and 1995 (the Sizewell B construction period), jobs in these sectors increased by around a third (630 jobs), while overall the total number of jobs grew by a fifth as set out in **Figure 9.7**.

Understanding potential sensitivities

9.7.80 SZC Co. recognises that while there is little or no empirical evidence from similar projects supporting direct effects of the Sizewell C Project on the tourist economy, there may be potential for:

- localised effects (the potential for very local effects on businesses and activities where there is the potential for a combination of effects);
- specific characteristics of the Suffolk coast that attract visitors to lead to greater sensitivities in terms of visitors' perceptions of the area in light of the Sizewell C Project; and
- perception-related effects as a result of sensitivities to different aspects of the Sizewell C Project (the potential for perception of changes to e.g. traffic, where this is already an influencer on propensity to visit).

9.7.81 SZC Co. set up a working group in 2015 to act as a forum presenting and reviewing baseline data collection, potential effects and develop mitigation with representatives from the local authorities (SCC and ESC), NALEP, Suffolk Coast DMO, Visit Suffolk, Visit East Anglia/East of England, Royal Society for the Protection of Birds (RSPB Minsmere) and National Trust Dunwich Heath were subsequently included in the group.

9.7.82 This process led to the development of a Tourism Survey – undertaken and produced by Ipsos MORI for SZC Co. as shown in **Appendix 9F** of this volume, with the following overarching aims:

- Target a national sample of those who have visited the Suffolk coast or who say they are likely to visit.

- Build an understanding of how construction might change visitor behaviour.
- Set out findings from exploratory qualitative research, and source ideas and suggestions for the potential use of a Tourism Fund (to be secured through the Section 106 agreement).
- Disaggregate data and look at the opinions of different types of visitors and what might influence their likelihood to visit.

9.7.83 The survey was undertaken via an online access panel, which included a screener survey to ensure a representative sample, and a short set of questions to establish eligibility resulting in an overall sample of 3,093 people completing a 20 minute survey.

9.7.84 The sample consisted of people who had visited the Suffolk coast before – mainly in the last 24 months – or who intended to visit in the future (in the next 24 months). The survey asked initial questions related to people's experience of the Suffolk coast including the things they like and dislike, the places they visit, and their visiting behaviour, before describing the Sizewell C Project, and asking a series of questions related to their prior knowledge of Sizewell C, attitudes to nuclear in general, and then perception of the Sizewell C Project in respect of their likelihood to visit more or less in the future, potential alternatives, and effects on the way they would visit.

9.7.85 The report provided in **Appendix 9F** of this volume finds, at a high level, that:

- 27% of respondents knew about the Sizewell C Project, of which 10% knew *'a fair amount or a lot'*. 72% had either never heard of the Sizewell C Project (50%) or knew almost nothing about it (22%);
- having been introduced to the Sizewell C Project via information as part of the survey, 55% said that it hadn't changed their views about whether to visit, 13% stated they were more likely to visit, and 29% stated they were less likely to visit, to varying degrees;
- 39% said they would be likely to visit less often during construction, 8% said they would be likely to visit more often, and 53% said that the construction of Sizewell C would not make a difference to how often they visit, or they didn't know how it would affect them;

- the majority of people reported that they would like to know more about the impacts of construction of the Sizewell C Project to plan future visits; and

- concerns raised included perceptions around traffic delays and availability of accommodation.

9.7.86 The survey and report do not quantify the economic effect of the Sizewell C Project on tourism – rather, the results provide information on the characteristics of people who think they are more or less likely to visit, after having considered a short summary of information about the Sizewell C Project's location and potential effects.

9.7.87 The results set out where people consider themselves less likely to visit the area around Sizewell C on the Suffolk coast, but do not consider how long these people may, or may not, stay. As set out in the report, potentially the most significant net effect is reported by those with the lowest likelihood to visit.

9.7.88 The results provide helpful information to determine the approach to managing risk via a Tourism Fund to be secured through the Section 106 agreement, as discussed in **section 9.8** of this chapter. For example, the information gained on who may consider themselves more likely not to visit and why, will enable effective mitigation to target those who report a likelihood to return less often or are less certain to return, and therefore reduce this perceived risk.

9.7.89 Those who state they are less likely to visit, or likely to visit less often in the future, are distinctive in some ways, for example:

- they are less likely to have visited recently;

- they are less likely to have visited the area immediately around Sizewell C;

- they are more likely to be unaware of Sizewell A, B or C (and have therefore gained the information about the Sizewell C Project from this survey); and

- they are more likely to be female than male.

Summary of potential effects on tourism and visitors

9.7.90 Overall, there is limited empirical evidence that the Sizewell C Project would lead to a quantifiable reduction in visitor numbers, a change in visitor

behaviour, expenditure or business viability in the sector over and above normal variation. The tourist economy is subject to substantial volatility year-on-year, and is affected by externalities beyond the effects of a single project such as Sizewell C.

9.7.91 There is no empirical evidence that the construction of Sizewell B had a substantial effect on the sector within the Suffolk coast area, or that – with a well-managed and effective mitigation package via a Tourism Fund – the construction of Hinkley Point C is having a substantial effect in Somerset.

9.7.92 However, engagement with local tourism stakeholders, review of environmental effects and mitigation identified across this **ES**, and SZC Co.'s understanding of perceived visitor sensitivities based on quantitative survey of previous and potential visitors has identified that without mitigation there is potential for:

- very local effects on businesses and activities where there is a combination of significant residual environmental effects; and
- perception-related effects as a result of sensitivities to different aspects of the Sizewell C Project (the potential for perception of changes to for example. traffic, where this is already an influencer on propensity to visit).

9.7.93 In particular, SZC Co.'s research has shown that visitors with lower levels of engagement and knowledge of nuclear generation at Sizewell or the Suffolk coast area state a higher risk of changes to visiting behaviour during the construction of the Sizewell C Project, and that this is mainly influenced by changes or perceived changes to transport at certain higher sensitivity travel times, as the nature of the market (often shorter breaks and more local c. 2 hour trips) means that good access to and around the area is important to visitors.

9.7.94 The **Transport Assessment** (Doc Ref 8.5) sets out that:

- During the early years of construction, in 2023, before any mitigation is completed, there would be impacts on the highway network particularly on the A12 and B1122. This would mean a change in journey time of up to 5% on some routes, at peak times. This is within the daily variation on these routes, so is unlikely to be noticeable.
- However, when the full highway mitigation package is in place even in the peak construction period, traffic volumes during the peak hours show only small impacts across the network, within the bounds of usual daily variation.

- Across the day, some roads would experience a notable increase in traffic volumes although road capacity would not be exceeded, and the junctions are shown to operate within capacity with the proposed mitigation in place.

- In some locations such as the B1122 through Theberton and Middleton Moor, and the A12 at Farnham and Stratford St. Andrew, significant traffic reductions are anticipated as a result of the proposed bypasses.

9.7.95 As such, in some locations, times and for some visitors, there is the risk of a **minor** to **moderate** adverse effect to arise on factors that contribute to tourist visitor sensitivity (including but not limited to traffic) that has the potential to be **significant** at the local level, without mitigation in the early years of construction.

9.7.96 As set out above, SZC Co. commissioned a survey to understand more about the perceptions of people who have previously visited or intend to visit the area, in order to gain an understanding of the demographic factors and sensitivities that should be tackled to prevent the risk of perceptions of reduced likelihood to visit materialising into an economic effect.

Effects on the agricultural economy

9.7.97 The proposed development would lead to the loss of farming activity, arable land and pasture both temporarily and permanently.

9.7.98 Some land take would occur during the construction period, with land required on a temporary (though long-term) basis to accommodate construction activities or temporary associated development and then restored post-construction.

9.7.99 As set out in **Volume 2, Chapter 17** of the **ES** (Doc Ref. 6.3) and **Chapter 10** of each of **Volumes 3** to **9** of the **ES** (Doc Ref. 6.4-6.10)**,** the Sizewell C Project (including main development site and associated developments) would permanently remove around 125.26ha of known agricultural land of which 84.3 hectares is considered 'best and most versatile' land.

9.7.100 Following the construction phase, land temporarily used for the main development site construction areas will be returned to arable agricultural land, grassland, woodland and scrub, hedgerow and wetland habitats.

9.7.101 Overall, the area of agricultural land permanently removed represents approximately 0.04% of the total c. 330,000ha of agricultural land (grades 1–5) across Suffolk as a whole (Natural England, 2019) (Ref 9.48). As a proportion of the total employment in the agricultural sector in Suffolk, this

would equate to an average loss of around 4 jobs in this sector based on average jobs per hectare in the sector in Suffolk.

9.7.102 Given the very low proportion of jobs that would be lost, the magnitude of the impacts would be very low (insignificant in terms of the sub-regional economy), and the sub-regional economy as a receptor would have very low sensitivity to the proposed changes, resulting in a negligible effect which would be **not significant** in terms of the local and regional economy.

9.7.103 Effects on individual land holdings, including changes to activity, loss of land and severance – and the compensation measures associated with them are set out in **Volume 2, Chapter 17** of the **ES**.

Effects of transport on business

9.7.104 The **Transport Assessment** (Doc Ref. 8.5) assesses the peak traffic generation for Sizewell C on a weekday, and identifies that there are no significant delays caused as a result of Sizewell C across the modelled network, during the peak construction phase.

9.7.105 The assessment identifies that during the early years of construction, in 2023, before any mitigation is completed, there would be impacts on the highway network particularly on the A12 and B1122. This would mean a change in journey time of up to 5% on some routes, at peak times. This is within the daily variation on these routes, so is unlikely to be noticeable.

9.7.106 However, when the full highway mitigation package is in place even in the peak construction period, traffic volumes during the peak hours show only small impacts across the network, within the bounds of usual daily variation. Across the day, some roads would experience a notable increase in traffic volumes although road capacity would not be exceeded, and the junctions are shown to operate within capacity with the proposed mitigation in place. In some locations such as the B1122 through Theberton and Middleton Moor, and the A12 at Farnham and Stratford St. Andrew, significant traffic reductions are anticipated as a result of the proposed bypasses.

9.7.107 The package of road safety improvements put forward in the **Transport Assessment** (Doc Ref. 8.5) would not only benefit the proposed Sizewell C Project, but would also provide a lasting legacy to residents of the surrounding towns and villages. Once the Sizewell C site is fully operational, traffic impacts are negligible with some areas showing improvement as a result of the legacy benefit of the proposed bypasses.

9.7.108 SZC Co. notes that in some instances, changes to the road network associated with the scheme, businesses may perceive a loss of passing trade which they may consider affects their business models. SZC Co. has carefully considered each of the elements of physical mitigation associated

with changes to the transport network to create an overall network that limits significant effects on travel as a result of the Sizewell C Project. People who own and occupy property (including small business premises with an annual value below a set amount) that has been reduced in value by physical factors (e.g. noise and vibration) caused by the use of a new or altered road may be able to claim compensation under the terms of the Land Compensation Act 1973.

iii. Accommodation effects

9.7.109 **Appendix 9A** of this volume identifies the NHB workforce that would be required during the construction phase, and **Appendix 9C** of this volume sets out where they would be estimated to live within a 60-minute travel time of the main development site.

9.7.110 There are uncertainties related to the locations that workers would choose to live, how many NHB workers would be required, and which sectors of the housing market they would choose to live in. The precise location that workers choose would be dependent on a number of factors, including their duration of stay; the price and type of accommodation; access to their permanent homes, park and rides and the main development site (via direct buses); and access to amenities such as sport and leisure, and, in the case of families, schools.

9.7.111 As identified in the baseline, there are substantial 'vacant' bedspaces at any given time, though this is constrained in the peak of the tourist season, and varies from place to place. Assumptions have been made relating to the likelihood/ability for NHB construction workers to take up accommodation in different sectors, for example affordability of tourist accommodation, where a discount has been applied to take account of limited affordability of much tourist accommodation.

9.7.112 As part of the embedded mitigation for the scheme a campus-based accommodation strategy would underpin the development. This would be supported by serviced-spaces for caravan accommodation. Experience at Hinkley Point C (as at April 2019) suggests that the on-site campus provided for the project is popular and sought after by contractors and that civils workers in particular are more likely to seek caravan accommodation.

9.7.113 The delivery of the campus and caravan site would reflect the numbers of workers requiring accommodation in the local area based on the workforce profile.

9.7.114 Use of existing accommodation would be required prior to the completion of any purpose built accommodation provided by SZC Co.

9.7.115 Overall, and noting that a degree of uncertainty is inherent in estimating the accommodation demand that would be generated by the Sizewell C Project, it has been concluded that a total campus provision of around 2,400 bedspaces and 600 caravan bedspaces (assuming a utilisation rate of 1.5 applied to 400 caravan plots) would be provided, for the following reasons which are outlined in more detail in the **Accommodation Strategy** (Doc Ref. 8.10).

9.7.116 As well as the avoidance of impacts on the local accommodation market, the campus accommodation is regarded by SZC Co. as essential because of availability for short stays, the ability to provide high quality and well managed amenities on-site, and the ability to manage workers' effects on the wider area. The on-site campus has additional advantages in that:

- Workers could either walk directly to site or take a very short bus journey within the site compound. This would materially reduce the trips of workers on the local road network.

- An on-site campus would be lower cost due to synergies with establishment of the main development site construction area, and the opportunity to share facilities such as utilities and security. Bussing costs of workers for off-site campus locations would also be avoided.

- An on-site campus would benefit the construction by allowing for a rapid and effective response to any on-site issues or incidents. It would benefit night shifts or those working irregular unsocial hours and assist through periods of construction which require intensive work, e.g. continuous concrete pours. This position was ratified by the preferred Hinkley Point C Civil Contractor during the Hinkley Point C examination process and has been reiterated through lessons learnt sessions with Hinkley Point C contractors and early contractor involvement for the Sizewell C Project.

- Minimising travel times between the accommodation campus and the construction area helps to increase the productivity and efficiency of the workforce through minimising the effective length of their working day and benefitting mental health by providing secure, high quality, safe and accessible accommodation close to work.

9.7.117 Sizewell B provided a successful 900-room on-site campus during construction. In 1990, the Inquiry Inspector stated that there were common sense advantages for a hostel to be located adjacent to the construction site, as this would be considerably more convenient for the occupants and the site operator, and would reduce traffic on the roads. The Inspector weighed the advantages of an on-site hostel against the possible impacts,

including concerns about disturbance to local villages, and concluded that the benefits in providing accommodation for construction workers on-site were tipped in favour, so long as it is properly managed. The on-site campus proved popular, and was regularly at capacity with average waiting lists of over 100 workers.

9.7.118 Caravan accommodation is proving popular at Hinkley Point C and therefore serviced spaces for up to 400 caravans would be created on Land to the East of Eastlands Industrial Estate in Leiston.

9.7.119 This facility would continue to be offered throughout the construction phase, providing an option to workers not wishing to use the accommodation campus or the PRS, owner-occupied sector or local tourist accommodation. Buses would run between the main development site and the caravan site.

9.7.120 An average of 1.5 workers per caravan is assumed, therefore creating a total of 600 construction workers staying at this facility. The number of workers per caravan would depend upon the size of caravans brought to site but an estimate of around 1.5 workers per caravan is considered realistic. Details of the design of the caravan site are set out in the descriptions of development in **Chapter 3** of this volume.

9.7.121 At the peak of construction, 5,884 of the 7,900 workforce would require accommodation locally (within 60-minutes of the main development site). For several years either side of peak construction, accommodation demand generated by the Sizewell C Project is expected to be much less than this.

9.7.122 The scale of the Sizewell C construction workforce, and especially the number of NHB workers who would seek accommodation in the local area, needs to be seen in the context of wider local demographics. The NHB workforce would be relatively small in number when seen in the context of the existing population of Suffolk County (equivalent to 0.7% of current population) or ESC (equivalent to 2.2% of current population).

9.7.123 In order to assess impacts more specifically, each component of the housing market has been considered separately. This includes owner-occupied housing, the PRS, and tourist accommodation. Regard has also been given to the potential supply of 'latent' accommodation, which may reduce the scale of demand in other sectors.

Owner-occupied sector

9.7.124 It is anticipated that by the time of peak construction 882 workers would have moved to owner-occupied properties. Some of these would eventually form part of the operational workforce, others would be long-term construction workers.

9.7.125 The 2011 Census identifies that there were 134,427 family homes (3+ bedrooms) in the owner-occupied sector across the 60-minute area in 2011. Since then the private housing sector has grown by approximately 4% in Suffolk, so this is considered an under-estimate.

9.7.126 As such, Sizewell C workers are likely to account for less than 1% of all family homes in the owner-occupied sector in the area – this is a small fraction of homes, and well within the average level of churn within the sector. Given the length of time these workers are likely to be involved with the Sizewell C Project, this effect would have built up over several years in advance of the peak.

9.7.127 The construction phase of the Sizewell C Project, including peak construction, is therefore expected to lead to a negligible effect overall on the operation of the overall Suffolk housing market, which would be **not significant.**

9.7.128 Workers are likely to concentrate close to the site, and this has been accounted for in ward-level modelling of the workforce by sector within the Gravity Model as set out in **Appendix 9C** of this volume.

9.7.129 **Table 9.40** sets out the effects in wards closest to the site, in the context of average annual change in the market based on household moves by tenure in 2011 (Census).

Table 9.40: Workers in owner-occupied sector accommodation in the context of stock and average annual churn

Local Wards	Workers in Owner-Occupied Sector at Peak (construction only)	Workers in Owner-Occupied Sector at Peak (operational only)	Total Stock (2011 census)	Workers as a % of Total Stock at Peak	Average Annual Build-Up	Average Annual Churn	Workers as a % of Annual Churn
Leiston	107	55	1,339	12.12%	23	102	23%
Aldeburgh	51	26	952	8.09%	11	139	8%
Saxmundham	41	21	1,107	5.57%	9	138	6%
Yoxford	19	10	520	5.56%	4	61	7%
Snape	16	8	518	4.56%	3	52	6%
Rendlesham	17	8	659	3.79%	4	90	4%
Orford and Tunstall.	9	5	449	3.18%	2	65	3%
Walberswick and Wenhaston.	11	6	567	3.04%	2	65	4%

Local Wards	Workers in Owner-Occupied Sector at Peak (construction only)	Workers in Owner-Occupied Sector at Peak (operational only)	Total Stock (2011 census)	Workers as a % of Total Stock at Peak	Average Annual Build-Up	Average Annual Churn	Workers as a % of Annual Churn
Wickham Market.	7	4	474	2.20%	1	4	3%
Halesworth	14	7	1,041	2.04%	3	129	2%

Source: Census, 2011.

9.7.130 This shows that in Leiston (for example), over 100 households in the owner-occupied sector moved in 2011 (Census). Sizewell workers would represent an average of around one in four of those moves in any given year up to the peak of construction. Elsewhere, Sizewell C workers may be expected to account for less than one in ten of annual moves per area.

9.7.131 As such, this impact is considered as being negligible at all spatial scales except for Leiston where there may be a minor adverse effect resulting in higher than usual demand for family-type accommodation for several years towards the peak. These effects would be **not significant.**

Private rented sector

9.7.132 It is anticipated that by the time of peak construction 1,200 workers would be living in private rented properties across the 60-minute area. The PRS provides options for construction workers in medium-term roles, as the shortest period for an assured shorthold tenancy is 6 months.

9.7.133 As set out in **section 9.4** of this chapter, there is a significant stock of homes and bedspaces in the sector – in 2011 there were over 99,000 bedspaces in the 60-minute area, and based on average national and regional growth rates, this may have since risen to over 128,000.

9.7.134 As such, Sizewell C workers are likely to account for up to around 1.2% of all bedspaces in the area – this is well within the overall calculated level of 'frictional vacancy' within the sector, and is therefore expected to lead to a negligible effect overall at the 60-minute area scale, which is **not significant.**

9.7.135 **Table 9.41** sets out the scale of workforce seeking PRS accommodation in the context of overall stock, vacancy and churn.

Table 9.41: Macro-level effects – non-home-based workers seeking private rented sector accommodation in the 60-minute area

Construction Workers at Peak				
(a)	Total NHB workers excl. project accommodation (campus and caravans).	2,884		
(b)	Of which seeking PRS accommodation.	1,200		
PRS Stock and Characteristics				
(c)	Total Stock of PRS Bedrooms (2011 Census).	99,033		
(d)	Total Stock of PRS Bedrooms (2019 estimate based on Strategic Housing Market Area and EHS).	128,743		
Vacancy Rates		**%**	**2011 Census**	**Potential Including Growth Since 2011**
(e)	Vacancy Rates (National – EHS 10-year average).	10.0%	10,200	13,261
(f)	Vacancy Rates (Suffolk Coastal – Strategic Housing Market Area).	8.3%	8,220	10,686
(g)	Vacancy Rates (Waveney – Strategic Housing Market Area).	6.9%	6,833	8,883
Turnover Rate		**2011 (Census) Turnover Rate in PRS in East Suffolk**		
(h)	Monthly turnover in the PRS.	2.8%		
Output		**% Spare**	**Est 'Spare' Capacity**	
(i)	Potential 'spare' capacity (est. lower range based on 2011 Census).	4.1%	4,060	
(j)	Potential 'spare' capacity (est. upper range based on potential PRS growth since 2011).	7.5%	9,656	

Source: Census, 2011; EHS, 2019; Coastal SHMA; Waveney SHMA

9.7.136 Although (as set out above) at this wider scale effects are not significant, workers are likely to concentrate close to the site, and this has been accounted for in ward-level modelling of the workforce by sector within the Gravity Model, as shown in **Appendix 9C** of this volume.

9.7.137 **Table 9.42** sets out the number of workers anticipated to seek PRS accommodation in the ten wards closest to the site, in the context of the overall stock and the frictional vacancy at ward scale.

Table 9.42: Workforce estimate in context of private rented sector stock and capacity in wards closest to the site

Local Wards	Workers at Peak in PRS	PRS Beds (2019 estimate)	% of PRS Bed Stock Taken	Frictional Vacancy Est.[8]	Exceedance of Frictional Vacancy	% of Frictional Vacancy
Leiston	392	1,461	27%	117	275	336%
Aldeburgh	105	706	15%	53	53	200%
Saxmundham	87	946	9%	67	20	130%
Rendlesham	54	957	6%	74	-20	72%
Yoxford	40	424	9%	32	-8	125%
Snape	31	456	7%	33	-3	92%
Halesworth	24	595	4%	48	-24	50%
Orford & Tunstall.	26	966	3%	72	-46	36%
Sutton	18	1,262	1%	103	-84	18%
Framlingham	16	1,100	1%	78	-62	20%

9.7.138 This analysis highlights that:

- in Leiston, Aldeburgh, Saxmundham and Yoxford the demand for PRS from the Sizewell C workforce is anticipated to exceed the frictional vacancy leading to potential major adverse effects that would be **significant** prior to mitigation. The most significant effects are identified in Leiston and Aldeburgh;

- in Rendlesham and Snape, the demand for PRS from the Sizewell C workforce is anticipated to account for between 50% and 100% of the frictional vacancy in the peak year – this is considered within the capacity required for the sector to operate, though has been highlighted as a potential risk and is considered a moderate adverse effect that would be **significant** prior to mitigation; and

- in Halesworth, Sutton, Orford & Tunstall and Framlingham, the demand for PRS from the Sizewell C workforce is anticipated to account for less than 50% of the frictional vacancy in the peak year – this is considered within the capacity required for the sector to operate and is considered a low risk that may cause minor adverse effects, that would be **not significant.**

[8] using EHS national vacancy rate for PRS and ward-level turnover rate

9.7.139 SZC Co. recognises that pre-existing housing characteristics and pressures may exacerbate vulnerability in some locations – particularly Leiston. The **Accommodation Strategy** (Doc Ref. 8.10) sets out how particular sensitivities have been identified between SZC Co. and ESC.

Tourist sector

9.7.140 It is anticipated that at the peak of construction there would be 802 workers seeking accommodation in the tourist sector within the 60-minute area.

9.7.141 As set out in **section 9.5** of this chapter and **Appendix 9D** of this volume, it is estimated that there is likely to be substantial vacancy on average across the year and even at peak months in tourist accommodation across the 60-minute area.

9.7.142 On this basis, workers seeking accommodation have the potential to generate income for tourist accommodation providers where accommodation may otherwise be unoccupied, presenting a minor beneficial effect at the 60-minute area scale, particularly during off-peak months.

9.7.143 However, SZC Co. notes that there are sensitivities within the market in terms of:

- the location of tourist accommodation – much of which is located towards the coast; and
- the location and variability in price and availability of different types of tourist accommodation, which affects occupancy.

9.7.144 This has the potential to lead to more significant local pressures on tourist accommodation.

9.7.145 **Table 9.43** sets out the number of workers predicted to seek tourist accommodation in areas close to the site at peak, set against the available and affordable stock.

Table 9.43: Workforce estimate in context of available and affordable tourist accommodation stock and capacity in wards closest to the site

Local Wards	Workers in Tourist Accommodation at Peak	Total Beds	% of Stock Used by Workers	Available/ Affordable Beds	% of Stock Used by Workers
Aldeburgh	462	1,691	27%	1,049	44%
Leiston	135	333	41%	160	84%
Yoxford	73	605	12%	335	22%

Local Wards	Workers in Tourist Accommodation at Peak	Total Beds	% of Stock Used by Workers	Available/ Affordable Beds	% of Stock Used by Workers
Saxmundham	55	423	13%	233	24%
Snape	21	411	5%	161	13%
Walberswick and Wenhaston	16	373	4%	263	6%
Southwold and Reydon	13	1,015	1%	833	2%
Orford and Tunstall	8	205	4%	126	6%
Kessingland	5	3,902	0%	1,040	0%
Hollesley with Eyke	2	274	1%	151	1%

9.7.146 This suggests that:

- Workers in Aldeburgh and Leiston may seek tourist sector accommodation equivalent to up to around 27% and 41% of the overall stock respectively.
- When discounting for availability/affordability, workers may occupy around 44% of stock available and affordable to them in Aldeburgh, and 84% in Leiston. This has the potential to result in a moderate, or major adverse effect on the accommodation sector in these locations at peak which would be significant, prior to mitigation. This assessment does not take into account the responsiveness and flexibility of the market – it assumes it is static and reflects the situation as presented in the baseline in **section 9.5** of this chapter.
- Elsewhere, negligible to minor adverse effects may occur in Yoxford, Saxmundham and Snape, though in the context of the overall stock and type of accommodation, these effects are likely to be minor and short-lived and would be **not significant.**

9.7.147 Some concern has been expressed through consultation and engagement around the potential displacement of tourists from accommodation, who are likely to have higher average daily expenditure than workers (on goods and services, not including accommodation). In effect however, this would be a commercial decision for accommodation providers, who decide whether to let accommodation to workers – within any planning or other regulatory restrictions with which they must comply.

9.7.148 The assessment suggests there would be capacity in tourism accommodation even in peak season and, where this is the case, expenditure would be additional. Even if there were to be a small level of displacement in the summer in some locations, this would likely be balanced by the benefits to providers outside of the peak season. Effects on the tourist economy more generally are assessed in **section 9.7(b)** of this chapter. Experience at Hinkley Point C (based on monitoring up to 2019) suggests that "*predictions* [made within the Socio-economic chapter of the Environmental Statement for Hinkley Point C] *for those in tourist accommodation are therefore fairly accurate at this point in time*" (Ref. 9.47).

Latent sector

9.7.149 Latent accommodation includes un-rated (i.e. not included in Visit East Anglia's database used to inform the Gravity Model) tourist accommodation, rooms for let in private homes, currently empty homes, and accommodation new to the market each year. This type of accommodation would offer an opportunity to mitigate negative effects on tourist and PRS capacity, as well as allowing local residents to benefit economically, for example, by renting out spare rooms.

9.7.150 At present, the Gravity Model makes no assessment of the likelihood of workers using latent accommodation. The stock of latent bedspaces is likely to follow the general distribution of the overall stock in family homes, rented, social rented and tourist accommodation.

9.7.151 Feedback from Hinkley Point C suggests that this type of accommodation is very popular with workers, with around 10%, of NHB workers using spare rooms in existing homes. As such, the figures presented above for worker uptake of accommodation in the PRS and tourist sectors may be considered an upper-estimate should these levels of latent accommodation be achieved.

9.7.152 Further information on the potential for the use of latent accommodation – particularly in terms of bringing empty homes back into use, and making more efficient use of existing stock, is set out in the **Accommodation Strategy** (Doc Ref. 8.10).

iv. Population change and dynamics

9.7.153 The population and demographic structure of the 60-minute travel area is likely to experience a level of change associated with the presence of a NHB construction workforce.

9.7.154 Based on assumptions set out in technical notes appended to this chapter, there would be an overall increase of 5,884 NHB workers within the 60-minute area at peak.

9.7.155 **Table 9.44** sets this distribution against average annual population turnover (new residents taken from Census 2011 data) to identify the proportion of NHB workers compared with 'usual' turnover.

Table 9.44: Non-home-based workers as proportion of annual new residents

Geography	Total New Residents in 2011	NHB Construction Workers at Peak	Annual Average Build-Up to Peak	NHB Construction Workers as % of New Residents in 2011
Local Wards				
Leiston	370	3,689	527	142%
Saxmundham	432	203	29	7%
Snape	172	76	11	6%
Yoxford	185	141	20	11%
Aldeburgh	293	644	92	31%
District				
East Suffolk.	10,068	5,580	797	8%
Great Yarmouth.	3,241	37	5	0%
South Norfolk.	7,016	61	9	0%
Mid Suffolk.	5,242	83	12	0%
Ipswich	7,513	97	14	0%
Babergh	4,688	27	4	0%
Other Scales				
60-minute area.	25,179	5,884	841	3%

Source: Census, 2011

9.7.156 **Table 9.44** demonstrates that the area which would have the largest proportionate population impact would be the local ward areas adjacent to the site – particularly Leiston – principally because of the Sizewell C Project accommodation (campus and caravan site).

9.7.157 This would likely lead to temporary (medium term) major impacts at the local ward level (Leiston) which would be **significant.** Other local wards (Aldeburgh) could also see moderate temporary (medium term) impacts in terms of population growth. Impacts are likely to be minor or negligible and **not significant** for all other areas.

9.7.158 It is not possible to identify the extent to which a population impact is beneficial or adverse, without considering the specific impacts which that

net additional population might have on public services and community cohesion, integration and sustainability, which are considered in the following sections.

v. Public services and community facilities

9.7.159 The introduction of a new NHB workforce into the 60-minute area could have impacts on demand for public services and community facilities, and the ability of service providers to respond. Demand would vary between different types of service depending on the demographic profile of the workforce (particularly age and gender) and the location of workers.

9.7.160 Current services in the area of relevance to the Sizewell C workforce may be split between the following key service providers and topic areas:

9.7.161 SCC:

- Education and social services.
- Regulatory and environmental services.
- Economic development and tourism.
- Libraries.
- Emergency planning.
- Public Health.

9.7.162 District Councils – mainly East Suffolk:

- Housing.
- Leisure.
- Economic development and tourism.
- Regulatory and environmental services.
- Emergency planning.

9.7.163 Emergency Services:

- Policing (Suffolk Constabulary).

- Fire (Suffolk Fire and Rescue).
- Ambulance (East of England Ambulance Service).
- Coastguard.

9.7.164 Health:

- Clinical Commissioning Group (NHS Ipswich and East Suffolk Clinical Commissioning Group) – commissioning services.

9.7.165 With the exception of health services, all other services are funded by a combination of council tax and central government grants and fees. Health services are funded by a grant formula from central government.

9.7.166 Where workers are living in accommodation where they pay council tax, this should in effect self 'mitigate' the impacts of their demand, and similarly where there are fees and charges for services (e.g. leisure). In theory, central government grant formulae should also respond to a changing population, however they are generally based on population estimates which do not take into account short-term migrant workers and funding may be slow to adjust.

9.7.167 It should be noted more broadly that migrant construction workers generally make a net contribution to the national exchequer on the basis that they are in work and generally of age groups (younger), and in household types (with few dependants) that make less demand on public services, for example on social services, education and acute healthcare.

9.7.168 The assessment of the key service areas below therefore identifies a 'gross' impact, based on the workforce model and spatial spread, and then a net impact on the basis of 'automatic mitigation' by services provider, and management proposals by SZC Co. for certain services. It is against the latter assessment that significance criteria are attached and any mitigation measures required.

9.7.169 This section covers all of the services listed above with the exception of Housing Services and Tourism and Economic Development (which are covered in preceding sections).

Pre-school and education – gross effects

9.7.170 Demand for education provision may arise from the children of NHB workers. **Table 9.45** shows the possible spread of workers bringing families at peak, based on:

- the owner-occupied component of the Gravity Model set out in **Appendix 9C** of this volume; and

- the number and age of children workers in this type of accommodation are predicted to bring with them based on survey information from Hinkley Point C set out in **Appendix 9B** of this volume.

9.7.171 Experience from Sizewell B and Hinkley Point C suggests that workers bringing families are likely to arrive earlier and stay longer, so it is likely that these families would build up over the period leading up to the peak.

9.7.172 The distribution of workers with children is likely to follow the spatial distribution of NHB workers in the owner-occupied sector set out in **Appendix 9C** of this volume.

Table 9.45: Spatial spread of family-type households with children in NHB workforce

Geography	Distribution of Workers In Owner-Occupied Sector at Peak	Pre-school	Primary School	Secondary School
Local Wards				
Leiston	18.7%	30	31	5
Saxmundham	7.1%	11	12	2
Snape	2.7%	4	5	1
Yoxford	3.3%	5	6	1
Aldeburgh	8.9%	14	15	3
District				
East Suffolk	83.8%	139	146	25
Great Yarmouth	1.9%	5	5	1
South Norfolk.	3.5%	9	9	2
Mid Suffolk	5.0%	12	12	2
Ipswich	4.3%	11	12	2
Babergh	1.6%	4	4	1
Other/Wider Scales				
Suffolk	94.6%	166	175	31
60-minute area	100%	180	190	33

Pre-school provision

9.7.173 Based on estimates of children of pre-school age taking up residence within the area as a result of the NHB worker population at peak, there are predicted to be between 166 pre-school aged children in Suffolk, of which around 139 would be in East Suffolk.

9.7.174 As such, against the assessed levels of sufficiency and existing and planned provision set out in **section 9.5** of this chapter, the impact at district-level and county-level is considered to be negligible and **not significant.**

9.7.175 The greatest local effects are anticipated to occur in Leiston with up to 30 estimated pre-school children at peak. Based on existing provision and childcare sufficiency set out in **section 9.5** of this chapter, local impacts are considered to be minor adverse and **not significant.**

Primary and secondary school provision

9.7.176 The way education demand interacts with current and projected education capacity depends whether the children are net additional to current demand.

9.7.177 It is likely that families living in owner-occupied family accommodation would be included in current and future projections as they would be part of the overall housing market 'churn'. Families living in the PRS however may contribute to net additional demand for school places.

9.7.178 In either case the 'revenue' cost of providing for additional pupils is formula-based and these households would also be paying council tax. Therefore the only impact would be if additional 'physical capacity' was required to meet demand, or if high levels of turnover or mobility put increasing pressure on school resources.

9.7.179 At a wider scale, the estimated 190 primary school aged children, even if all considered 'net additional' would have a negligible effect on existing capacity across the 60-minute area. Taking into account SCC forecasts for growth related to development and natural change (see **Table 9.29**) this would still be negligible at this scale.

9.7.180 However, it is noted that these effects may be localised as a result of the potential for workers to seek accommodation closer to the site. **Table 9.46** outlines the current primary school capacity in wards local to the site, and identifies the possible impact at each locality of the forecast child population if they were all net additional.

Table 9.46: Primary education capacity change as a result of forecast population increase (primary school places)

Geography	Potential SZC-Related Primary Age Children	Existing Capacity	Existing Surplus Capacity (#)	Existing Surplus Capacity (%)	Residual Surplus Capacity (#), If all SZC-Related Children Are Net Additional	Residual Surplus Capacity (#), If all SZC-Related Children Are Net Additional
Local Wards						
Leiston	31	525	165	31%	134	25.5%
Saxmundham	12	483	38	8%	26	5.4%
Snape	5	175	30	17%	25	14.5%
Yoxford	6	175	71	41%	65	37.4%
Aldeburgh	15	105	2	2%	-13	-12.3%
Wider Scales						
East Suffolk	146	15,560	2,014	12%	1,868	12%
60-minute area	190	25,416	3,123	12%	2,933	12%

9.7.181 As set out in **Table 9.29**, using SCC forecasts for demographic and housing related population change (though not including planning obligations delivering additional capacity), the above effects would be magnified, potentially leading to an exceedance of capacity in Leiston and Snape (noting that schools in Snape would already be at capacity).

9.7.182 **Table 9.47** outlines the current secondary school capacity in wards and Districts[9] across the 60-minute travel area, and identifies the possible impact at each locality of the forecast child population if they were all net additional.

Table 9.47: Secondary education capacity change as a result of forecast population increase (secondary school places)

Geography	Existing Capacity	Existing Surplus Capacity (#)	Existing Surplus Capacity (%)	Possible Secondary School-Aged Children (SZC)	Remaining Surplus Capacity If All Net Additional
Local Wards					
Leiston	560	166	30%	5	29%

[9] SZC Co. notes that SCC uses school planning areas for assessments of demand for places – however these areas are not based on 2011 Census Wards and therefore direct comparison to the outputs of the Gravity Model are not possible.

Geography	Existing Capacity	Existing Surplus Capacity (#)	Existing Surplus Capacity (%)	Possible Secondary School-Aged Children (SZC)	Remaining Surplus Capacity If All Net Additional
Saxmundham	600	126	27%	2	27%
Snape	--	--	--	1	--
Yoxford	--	--	--	1	--
Aldeburgh	--	--	--	3	--
Wider Scales					
East Suffolk	10,766	1,118	10%	25	11%
60-minute area	19,917	2,453	12%	33	12%

9.7.183 On this basis, assuming that the above represents a likely worst-case scenario (where all additional children are considered net additional), the NHB workforce could have a negligible effect at the 60-minute level, and at county and district levels, which would be **not significant.**

9.7.184 There is the possibility for a moderate adverse effect in terms or primary school capacity in Aldeburgh, based on current schools having little or no existing surplus capacity. However, within the context of small workforce children numbers, a slow ramp-up, falling birth rates and planned expansion this is likely to be **not significant** in the context of the dynamic baseline, and the net additionality of workers in this category.

9.7.185 It should be noted that as a result of decreasing birth rates – a national trend also experienced in most parts of Suffolk – school rolls at primary school level are anticipated to drop and spare capacity grow in future years. This is a background trend and would need to be considered in monitoring and planning any mitigation measures.

9.7.186 As set out in **Table 9.29**, forecasts provided by SCC identify that at around the peak of construction, there is the potential for primary schools in local wards to be operating very close to capacity. This forecast identifies very high levels of growth related to demographic change and housing growth, without factoring in additional supply driven by collection and implementation of planning obligations.

9.7.187 SZC Co. recognises that there is inherent uncertainty regarding future demand for school places, which is influenced by population factors and development. SCC are required to seek planning obligations for public services including education provision through Section 106 agreements and/or Community Infrastructure Levy regulations from development which

generates net additional change in the housing stock and therefore additional population.

9.7.188 However, in recognition that there may be a period during which funding for additional capacity from those sources catches up with demand and provision, SZC Co. will work with SCC throughout the construction phase to identify changes in capacity and demand from construction workers, and where applicable, mitigate those effects via a public services contingency fund to be secured through the Section 106 Agreement.

Social services – families

9.7.189 SCC's Social Services expenditure on children and families and may be affected by an additional 'family' population. Assumptions about the number of dependent children, and non-dependent adults likely to accompany workers at peak are set out in **Appendix 9B** of this volume.

9.7.190 It is anticipated that all family households would live in accommodation through which they would pay council tax. Those living in owner-occupied accommodation are unlikely to be additional to the current population. Net additional impact on demand for social services from workers, and their families is therefore regarded as negligible and **not significant** at all levels.

Social services – construction workers

9.7.191 SZC Co. has worked with SCC to understand existing pressures on the provision of services to support vulnerable adults, families and children in terms of the location of demand or services, and the potential effect that a NHB construction workforce may have on service delivery and perceptions of workers within the community.

9.7.192 Engagement with SCC, health stakeholders and individual service providers has identified a number of concerns, primarily related to changes in the population profile – particularly in Leiston – due to the number and narrow demographic of construction workers. These concerns are summarised here:

- potential risks to vulnerable young people and care leavers, particularly in Leiston, and particularly those who are in housing need or vulnerable to homelessness;
- potential risks related to cultural differences between NHB construction workers and residents;

- potential risks related to drugs, alcohol and prostitution including exploitation of young girls by a predominantly male workforce, and potential for related increase in trafficking;
- potential risks related to access to and delivery of sexual health services and increase in youth pregnancy;
- potential risks on the delivery of services, particularly to vulnerable older people who wish to remain in their homes but require care; and
- potential demand for social services and mental wellbeing services from construction workers and their families, and welfare in schools such as English as an Additional Language.

9.7.193 SZC Co. recognises that there may also be economic-based risks to service provision as an indirect result of job creation on the Sizewell C Project, which may lead to workforce churn that means some positions in care roles become harder to fill.

9.7.194 SZC Co. recognises that the Sizewell C Project has the potential to increase the risks set out above, and has identified mitigation measures in order to avoid or reduce the risks through direct interventions including:

- Linking implementation strategies with priority social services target groups, for example so that outreach programmes target children not in education, employment and training (NEETs) and other vulnerable groups – see **Employment, Skills and Education Strategy** provided in **Appendix A** of the **Economic Statement** (Doc Ref. 8.9). The measures within the **Employment, Skills and Education Strategy** would be secured by a Section 106 Agreement.
- Supporting community engagement as set out in the **Code of Construction Practice** (**CoCP**) (Doc Ref. 8.11), to address any issues that may arise from members of the public and especially vulnerable residents who access key public services.
- Working bilaterally with those organisations closest to the Sizewell C Project that raise safeguarding concerns to identify practical and effective solutions built in to a **Community Safety Management Plan** (Doc Ref. 8.16) and Worker Code of Conduct.
- Providing community information and worker information to promote integration and awareness via 'welcome packs' for contractors and workers and briefings for public service providers.

- Embedding vetting and security checks into recruitment and contracting, as set out in the **Community Safety Management Plan** (Doc Ref. 8.16).

- Managing workforce accommodation and building in measures to reduce risks in the design – including provision for emergency services presence, welfare, food/drink and recreation activities for workers at the accommodation campus, and physical and temporal separation of use of shared recreational facilities in Leiston.

- The provision of occupational healthcare for workers at the main development site including mental wellbeing services – this is set out in more detail in **Volume 2, Chapter 28** of the **ES**.

9.7.195 As a result of the mitigation, the Sizewell C Project is likely to have a negligible effect on the provision of social services at county level (Suffolk), though more localised effects in areas such as Leiston may be minor adverse.

Other county-level services

9.7.196 Due to the demographic profile of the NHB workforce – mainly single, male and of working age – their likely shift patterns, and the temporary nature of much of the workforce – impacts on other SCC run services for example libraries, arts and other cultural services are assumed to be negligible.

Formal sport and leisure

9.7.197 The NHB workforce is likely to create some additional demand for formal sport and leisure provision.

9.7.198 In order to assess the overall scale of the potential demand for formal sport and leisure services, the anticipated demographic profile of the NHB workforce has been applied (with caveats) to:

- Sport England's Sports Facilities Calculator, both for the peak and the average workforce, to identify the likely demand for provision; and

- local authority standard rates for sports facility demand.

9.7.199 Details of the audit of existing provision, approach to assessing demand based on published standards and in terms of local demand and demographic specific demand are set out in **Appendix 9E** of this volume.

9.7.200 This highlights the overall requirements for formal sport and leisure facilities across the 60-minute travel area arising from the NHB workforce in terms of facilities and proportions of facilities.

9.7.201 Sport England has produced typologies of demand for a wider range of sports, based on key demographics such as age, gender and employment. For the demographic of NHB workers, football and going to the gym are by far the activities most in demand, along with cycling which is undertaken by a much smaller proportion. There is very limited demand for swimming and racquet sports.

9.7.202 Demand for sports facilities is predicted to be very modest, and is likely to be able to be met from existing provision. The exception to this is where there is already a significant deficiency in sports provision by type, or location, for example synthetic pitches, although the increased demand would in any case be small.

9.7.203 Those workers living in PRS and owner-occupied sector accommodation would contribute to the revenue costs of service provision through council tax. In addition, most council leisure services are subject to fees and charges and users would therefore be making a net contribution to that provision.

9.7.204 SZC Co. would also provide sports and leisure facilities as part of the Sizewell C Project. This would include gym and informal recreation facilities at the accommodation campus, and formal recreation facilities including a full-size 3G pitch and MUGAs located off-site at Alde Valley School. The off-site facilities would be made available for shared used by the school and the local community and would remain as a legacy post-construction.

9.7.205 This would meet the main likely preferences of the construction workforce. The impact on leisure provision is therefore likely to be major beneficial and **significant** at all levels, as a result of meeting workforce demand and providing permanent new facilities for the community.

Regulatory and environmental services

9.7.206 The district council (ESC) provides a range of regulatory and environmental services. These include:

- Waste collection.
- Street cleaning.
- Food safety, health and safety, pest control and public health.

9.7.207 It is likely that a net temporary increase in population would require a proportionate increase in the delivery of these types of services although there is no detailed method for identifying impacts on specific services.

9.7.208 Those workers living in PRS and owner-occupied sector accommodation would already be paying for these services through council tax. In addition, all accommodation providers (including the campus and caravan site, and tourist accommodation providers who may pay business rates) would be required to pay for waste collection. As set out in the **Sizewell C Waste Management Strategy** in **Volume 2, Chapter 8** of the **ES**, SZC Co. will seek to reach an agreement with a commercial waste contractor to collect waste from accommodation campus and caravan facilities.

9.7.209 There may be a small increase in demand for services other than waste collection – which the facilities manager or SZC Co. would be required to pay for – as a result of workers living in project accommodation (i.e. campus or caravan sites), and temporary accommodation in the tourist sector. The proportion of the peak workforce who would live in these types of accommodation represents a temporary increase in population of less than 2% in ESC district at peak, and this would therefore represent a negligible effect at the local level.

9.7.210 Due to the location of project accommodation, and the propensity of workers to live as close to the site as possible, there is likely to be a local concentration of workers in Leiston and other wards to the east of the A12. In these areas, the change is likely to be greater as set out in **Table 9.48**. However, as services are provided at a Local Authority (District) scale, it is not relevant to consider the local significance of effects.

Table 9.48: NHB workers in non-council-tax accommodation

Geography	NHB Workers in Non-Council-Tax Accommodation	Total Population (2017)	NHB Workers in Non-Council-Tax Accommodation as a Proportion of Total Population
Local Wards			
Leiston	3,135	6,472	48.4%
Saxmundham	55	5,625	1.0%
Snape	21	1,957	1.1%
Yoxford	73	1,977	3.7%
Aldeburgh	462	3,230	14.3%
Districts			
East Suffolk	3,801	246,900	1.5%
Great	0	99,400	0%

Geography	NHB Workers in Non-Council-Tax Accommodation	Total Population (2017)	NHB Workers in Non-Council-Tax Accommodation as a Proportion of Total Population
Yarmouth			
South Norfolk	0	135,500	0%
Mid Suffolk	0	101,500	0%
Ipswich	0	138,500	0%
Babergh	0	90,800	0%
Other/Wider Scales			
Suffolk	3,801	757,000	0.5%
60-minute area.	3,802	316,683	1.2%

Source: ONS mid year population estimates, 2018

vi. Crime, anti-social behaviour and policing

9.7.211 An increase in population arising from the NHB workforce could have impacts on crime and anti-social behaviour, and consequent impacts on the requirement for policing services.

9.7.212 Likely impacts on crime are difficult to estimate as they would depend on both the behaviour of workers and the behaviour of current residents.

9.7.213 Using the experience of construction of Hinkley Point C and Sizewell B stations as a guide, there are indications that some increases above the norm in petty crime and behavioural offences, such as drunkenness, minor public disorder, and car theft could occur. Local experience at Sizewell B noted that the introduction of appropriate mitigation measures meant that rates fell even with major increases in the construction workforce.

9.7.214 Increases in traffic could increase road accidents – this is considered in **Chapter 10** of this volume and the **Transport Assessment** (Doc Ref. 8.5). **Chapter 10** and the **Transport Assessment** set out that:

- When the full highway mitigation package is in place even in the peak construction period, traffic volumes during the peak hours show only small impacts across the network, within the bounds of usual daily variation.

- Across the day, some roads would experience a notable increase in traffic volumes although road capacity would not be exceeded, and the junctions are shown to operate within capacity with the proposed mitigation in place.

- However, the B1122 through Theberton and Middleton Moor, and the A12 at Farnham and Stratford St. Andrew, show significant traffic reductions as a result of the proposed bypasses.

- Journey times across the network could increase slightly on some routes, though in the majority of cases the increases would be indistinguishable from daily variation in travel time.

- On some routes journey times would reduce significantly as a result of the proposed mitigation.

- During the early years of construction, in 2023, before any mitigation is completed there would be significant effects on the highway network particularly on the A12 and B1122, so there would be a need to bring forward delivery of the major highway schemes as soon as practical i.e. A12 / B1122 roundabout, two village bypass and the Sizewell link road.

- During construction, there will be large components which will be transported by road in the form of abnormal indivisible loads. In order to mitigate the potential disruption associated with these large and slow-moving vehicles, regular liaison with the emergency services and the highway authorities will enable the effective management of these deliveries. Details of these measures are provided in the **Construction Traffic Management Plan** (**CTMP**) (Doc Ref. 8.7).

- In the event of traffic disruption on the network, the **Traffic Incident Management Plan** (**TIMP**) (Doc Ref. 8.6) will mitigate the potential exacerbation of traffic delays.

- The package of road safety improvements put forward in the **Transport Assessment** would not only benefit the proposed Sizewell C Project, but would also provide a lasting legacy to residents of the surrounding towns and villages. Once the Sizewell C site is fully operational, traffic impacts are negligible with some areas showing improvement as a result of the legacy benefit of the proposed bypasses.

9.7.215 SZC Co. has been working with Suffolk Constabulary to anticipate the potential effects that might occur, on the assumption that a small proportion of NHB workers and their families, like the current population, could be both perpetrators and victims of crime.

9.7.216 As noted in the baseline assessment, rates of crime and disorder vary between different parts of the county with lower rates in the more rural areas and higher rates (although at or slightly below the national average) in urban areas and areas with a higher rate of deprivation.

9.7.217 **Section 9.5** of this chapter identifies that there were 54,124 total recorded crimes in Suffolk in 2018, at a rate of 71.5 crimes per 1,000 population per year. It should be noted that a substantial proportion relate to domestic violence – which has been raised as a potential concern at Sizewell C through engagement with Suffolk Constabulary.

9.7.218 Application of overall rates in Suffolk to the peak NHB workforce and their families – 5,884 NHB workers at peak – would equate to a proportional increase of 0.8% of current recorded crimes in Suffolk at the peak year of construction, if there is a direct proportional relationship between population and recorded crime.

9.7.219 For the average annual NHB workforce across the construction period, this would equate to an increase of around 0.4% of current recorded crimes per year if there is a direct proportional relationship between population and recorded crime.

9.7.220 Police services are paid for through a combination of central government funding (around 70%) and council taxes collected locally. The central funding is disaggregated based on a range of demographic, social, economic and crime indicators.

9.7.221 NHB workers living in the PRS and owner-occupied sector, and all households with families and dependants, would have their services funded through normal mechanisms like any other local resident. They would in most cases be occupying accommodation that would otherwise be occupied by other residents.

9.7.222 This would leave a potential net increase of around 0.5% of current recorded crimes at peak if there is a direct proportional relationship between population and recorded crime.

9.7.223 There is the potential for crime and disorder to be concentrated in locations where there would be a significant concentration of NHB workforce. It is anticipated that the majority of workers in non-council-tax accommodation at peak would be living either in project accommodation or tourist accommodation close to the site, so the majority of these effects would occur in the Leiston neighbourhood area.

9.7.224 If the recorded crime rates are applied to the number of NHB workers and their families in this area, prior to any mitigation this may lead to an increase in recorded crimes of up to 19.5% at the peak.

9.7.225 Therefore, before mitigation, there could be a moderate adverse effect which would be **significant** at peak at the local scale. The effect would be negligible and **not significant** in all other areas and at wider scales.

9.7.226 There would be a number of mitigating factors leading to the potential increase in local recorded crime being substantially reduced, including embedded design measures and tertiary measures such as the **Worker Code of Conduct.**

9.7.227 Additionally, experience from monitoring at Hinkley Point C (Ref 9.47) (which draws on Avon and Somerset Constabulary data (2018); SEAG Dashboard - Community Safety; and a 'fear of crime' survey) has identified that (partly as a result of mitigation measures and workforce management) - *précis:*

- In the period Dec 2016 to Dec 2018, a total of 202 instances of reported crime have been linked directly to the Hinkley Point C Project; a general increase in reported crimes over the 2016–18 period, with the exception of sexual assault, which was relatively stable. This follows national trends.
  - The trends in the Hinkley zone are not exceptional to the trends in Somerset as a whole, and hate crime in the Hinkley Zone declined in the latest quarter, contrary to a countywide increase.
  - In mid-2017, Avon and Somerset Constabulary noted a small increase in criminal and non-criminal activity resultant of, and against the Hinkley Point C workforce.
  - The level of criminal activity linked to Hinkley Point C and instances of non-criminal activity linked directly to Hinkley Point C did increase more substantially in the period from mid-2017 to mid-2018, but the increase was less than proportionate to the size of the workforce increase.
- Overall, the Worker Code of Conduct appears to be working effectively.
- There is a biennial Sedgemoor District Council survey on fear of crime. The Community Safety Dashboard reports no increase in the fear of crime locally over the construction period. Data from the Sedgemoor Crime and Anti-Social Behaviour Report confirms this, comparing 2017 with 2015. The percentage of Sedgemoor residents who feel very/fairly safe at home during the day has dropped by one percentage point between 2015 (95%) and 2017 (94%).

- A particularly anticipated local concern was the impact of a largely male workforce on the local night time economy, especially in Bridgwater. Whilst there have been some reported episodes, overall the recorded level of crime in Bridgwater Town Centre has shown a fall rather than an increase over the 2016–2018 period from 216 in the 6-month period to December 2016 to 131 in the six month period to December 2018. The number of recorded crimes for the Stogursey Parish, adjacent to the site, has also remained consistently low (between 2 and 11 crimes per 6 month period) over this timescale.

- There has been an issue with fly parking in 2018, causing public concern and high levels of complaints in several locations.

9.7.228 This feedback suggests that potential crime rate increases and their significance rating identified above may be considered an overestimate, and that mitigation proposals would be effective to reduce the significance.

9.7.229 SZC Co. recognises through engagement with Suffolk Constabulary, that recorded crimes (the metric used in this assessment) are only one contributor towards police resourcing, and that information on response to non-reported incidents and dealing with crimes not categorised by the Home Office definitions can lead to greater demand for police resourcing.

9.7.230 Potential effects related to major accidents and disasters, and measures to reduce, avoid or mitigate them are set out in **Volume 2, Chapter 27** of the **ES**, Major Accidents and Disasters.

vii. Fire and rescue service

9.7.231 The construction phase of Sizewell C could potentially impact on the Suffolk Fire and Rescue Service in three ways:

- potential incidents on the site, increasing both demand and type of incidents the service is required to respond to (and therefore demand for different skillsets);

- any increase in demand arising from the temporary increase in population caused by the construction workforce; and

- any increase in demand for community information and awareness training (e.g. home safety checks, traffic awareness talks in schools).

9.7.232 It is not possible to quantify these impacts as they would be based on responses to specific incidents, or would be ad-hoc, service level decisions regarding the provision of information and awareness to the community.

9.7.233 In relation to on-site incidents SZC Co. would have procedures in place to ensure that contractors operate safely and are able to effect rescue from any equipment they bring on to the main development site. Equipment, resources and training would also be put in place to ensure that the site could support contractors' rescue and provide first response to any fire incidents. Further information on this may be found in the **Community Safety Management Plan** (Doc Ref 8.16) and in the **Code of Construction Practice** (Doc Ref 8.11).

9.7.234 Through engagement with Suffolk Fire and Rescue Service, and their response to public consultation (see **Consultation Report** (Doc Ref. 5.1), concern has also been raised related to the potential effects on fire service ability to respond to incidents in local communities as a result of traffic delays and loss of on-call firefighters into the Sizewell C on-site fire and rescue team.

9.7.235 As set out above under 'Crime, Anti-social Behaviour and Policing', the **Transport Assessment** (Doc Ref. 8.5) summarises the potential effects on the road network that may influence response times, and where potentially adverse, identifies mitigation to address this through the **CTMP** (Doc Ref 8.7) and the **TIMP** (Doc Ref 8.6).

9.7.236 Experience at Hinkley Point C has shown that on-call firefighters may indeed seek work on the Sizewell C Project but that it is possible for people to secure work on the on-site fire and rescue team and maintain their roles as on-call firefighters in the community. Indeed, this may be an advantage as rather than holding day jobs in non-related areas such as supermarkets, working for the on-site fire and rescue team is improving their training, skills and experience which should also benefit the community.

9.7.237 Funding for fire services comes from two principal sources: a central government grant, and a levy on the council tax collected locally. In relation to any increase in services required as a result of NHB workers, those workers in owner-occupied and private rented accommodation would be contributing to the cost of fire services. For workers living in project accommodation, SZC Co. would operate in line with statutory fire safety requirements.

9.7.238 Any additional impacts on services (apart from any possible large scale incidents which are dealt with in **section 9.8** of this chapter) are likely to be small and relate either to residents in latent and tourist accommodation and the Suffolk Fire and Rescue Service role in dealing with road traffic accidents. Overall, effects of the Sizewell C Project on fire and rescue services are likely to be minor adverse, and **not significant** at the local level and negligible and **not significant** at the county level before mitigation.

9.7.239 However, it is noted that this may increase pressure on local services and the types of activities required disproportionately, as a result of the relative remoteness of the site and its access requirements for a nuclear construction site, as well as a potential rise in demand for home safety checks. As such, under certain conditions a minor adverse effect may arise before mitigation, and therefore SZC Co. will seek to develop a responsive mitigation strategy and relevant financial contributions in this regard, as discussed in **section 9.8** of this chapter.

viii. Health and ambulance services

9.7.240 Effects on residual demand for health services and ambulance services are considered in **Chapter 28** of **Volume 2** of the **ES**, Health and Wellbeing.

ix. Community cohesion and integration

9.7.241 SZC Co. recognises that there may be challenges in integrating a workforce with specific characteristics and needs into an existing community, and aims to work with local stakeholders and service providers, and contractors to ensure that the workforce can as closely as possible integrate with the existing community, and vice-versa.

9.7.242 The Government's Integrated Communities Strategy Green Paper (Ref 9.6) sets out definitions of community integration and potential reasons for division. It identifies that integration is not assimilation, and that:

> *"communities where people live work learn and socialise together, based on shared rights, responsibilities and opportunities – underpinned by a shared set of British values – tolerance, freedom and equality of opportunity – which have helped make Britain one of the most successful multi-faith, multi-ethnic societies in the world"* (Ref 9.6).

9.7.243 The Green Paper sets out the key target areas that should be investigated by local government, business, voluntary and community sectors to ensure integrated communities – many of which would form a fundamental part of SZC Co.'s primary and tertiary mitigation for Sizewell C as set out in **Table 9.49**.

Table 9.49: Integrated Communities Green Paper 'integration initiatives' and SZC Co.'s proposed actions to mitigate/avoid potential significant adverse effects at Sizewell C

Green Paper Integration Initiatives	SZC Co. Initiative for Sizewell C
Support for Migrants	
• Review of impact of English language requirements on visas, and future	SZC Co. recognises that some NHB construction workers would require information about the area

Green Paper Integration Initiatives	SZC Co. Initiative for Sizewell C
requirements. • Review of Life in the UK Test. • Potential provision of information on life in the UK for prospective migrants. • Provision of information for recent migrants to support integration.	and local cultures and services/facilities, and help to access public services (e.g. through translation) and community facilities. Welcome packs and information would be provided on induction to the Sizewell C Project, and SZC Co. would work to ensure the workforce understand the local environment e.g. the location and population of communities, and how and where to access community facilities and public services. This would be via regular engagement with contractors and workers through channels including the accommodation management system and occupational health services, and via re-induction and information updates for workers and contractors.
Support for Young People	
• Help ensure school intake is representative of the wider area and promote mixing arrangements between schools in areas of high segregation. • Promote British values across the curriculum. • High standard of safeguarding. • Promote meaningful social mixing.	SZC Co. have identified the potential for uptake of school places by workers' children, and set out that potential effects are likely to be not significant. SZC Co. would require contractors to support and promote a Worker Code of Conduct.
English Language	
• Potential new strategy for English Language in England/new community-based English language programme/improved provision of English language learning (integration areas)/new network of community-based conversation clubs.	The UK construction workforce has a high level of English language proficiency. However, as a contingency measure, SZC Co. would work with Tier 1 contractors to ensure translation services are available.
Economic Opportunity	
• Additional funding for Jobcentre Plus to support people from most segregated communities. • Support economically inactive people through pathways to work. • Support people from ethnic minorities into work in places where there is a gap in employment rates. • Increase take up of apprenticeships by people in isolated communities.	SZC Co.'s plans to enhance local employment, skills and education benefits include: • Development of a series of outreach initiatives to maximise opportunities for people to gain employment during the Sizewell C Project. • Partnerships with local organisations to deliver an employment brokerage, to place people into sustainable employment. • Measures to identify and address barriers to work for target groups including the unemployed and young people NEETs.
Challenge Practices That Can Hinder Integration and Equal Rights	
• Empower marginalised women/understand ways overseas influences can undermine attitudes to rights and freedoms in the	SZC Co. has a commitment to enhance the diversity of the construction workforce, for example by raising the profile of women in

Green Paper Integration Initiatives	SZC Co. Initiative for Sizewell C
UK/support faith communities and interfaith dialogue/support delivery of the Hate Crime Action Plan.	construction. SZC Co. would enforce a Worker Code of Conduct that would not tolerate hate crime or discrimination and would work with Suffolk Constabulary to address any potential significant effects. SZC Co. has prepared an **Equality Statement** (Doc Ref. 5.14) to accompany the DCO application.
Shared Space and Facilities	
• Support for shared community activities through culture and sport – including working with Sport England to use sport to bring people together. • Support for shared community spaces – including community hubs and libraries, and parks which help to create a sense of place and foster local residents' pride.	SZC Co. has listened to feedback from public consultation and will deliver as part of the Sizewell C Project: • A visitor information centre that can be accessed by the community and community organisations, including schools. • Shared sports facilities to enhance community provision, left as a legacy.

9.7.244 SZC Co. recognises that the Sizewell C Project would lead to changes in population and demographics within local communities during the construction phase.

9.7.245 This assessment considers how measures have been designed to manage the Sizewell C Project's construction workers, their use of and access to public services, accommodation and community facilities, and how measures have been designed to promote integration, manage community safety and perceptions of safety to reduce potential effects on community cohesion to minor adverse (**not significant**).

9.7.246 The success of these initiatives would be reported through workforce monitoring to track the location, accommodation sectors and overall number of construction workers on the Sizewell C Project, as well as through continual feedback from the community via community liaison services, as discussed in the **CoCP** (Doc Ref. 8.11).

c) Operation

i. Employment

Operational workforce

9.7.247 The operational workforce would start to build up gradually from around year five of the construction phase. At full operation, up to twelve years after the start of construction, when all construction activity has been completed, there would be around 900 workers at Sizewell C, of which 700

are expected to be permanent staff and 200 contractors. Contractor support would increase by approximately 1,000 workers during each unit's refuelling/maintenance outages (every 18 months).

Local recruitment

9.7.248 Based on 2011 Census travel to work data, around 61% of the workforce in the workplace zone in which Sizewell B is located live in the former SCDC, and around 23% live in the former WDC – the remaining 16% live in Ipswich (5%), Great Yarmouth (2%), Mid Suffolk (2%), South Norfolk (2%) or further afield.

9.7.249 It is anticipated that the operational workforce at Sizewell C would follow a similar pattern.

9.7.250 Information from Sizewell A and Sizewell B suggests a low local recruitment ratio, usually from 5% to 15%, for the managerial and technical category, but much higher ratios for administrative and clerical (55 to 85%) and the largest category, industrial staff (50 to 70%).

9.7.251 **Table 9.50** shows the recruitment assumptions for the directly employed operational workforce. The predictions in this table suggest relatively high local recruitment figures, taking into account:

- the likelihood of some transfers from Sizewell B; and
- aspirations from SZC Co. and the local authorities to strongly encourage local recruitment through a number of channels set out in the **Employment, Skills and Education Strategy** provided in **Appendix A** of the **Economic Statement** (Doc Ref. 8.9).

Table 9.50: Estimated local recruitment of operational workforce

Occupation Type	Total	Local		Non-Local	
		%	Estimate	%	Estimate
Management, Professional and Technical	180	15%	30	85%	150
Administrative and Clerical	60	70%	40	30%	20
Process, Elementary and Trades	460	65%	300	35%	160
Total	**700**		**370**		**330**

9.7.252 This suggests that around half of the permanent operational staff would be home-based i.e. drawn from a pre-existing residential population in the area. The remaining workforce would be non-home-based – though are

anticipated to move permanently to the area (as jobs are permanent) and would therefore become local residents.

9.7.253 In addition, it is estimated that there would be up to 200 contract workers working on the operational station at any one time; these are more likely to be from outside the local area, and many may be NHB.

9.7.254 This workforce is included in the overall Workforce Profile described in **Appendix 9A** of this volume, and begins to build up from year five of the Sizewell C Project. The precise levels of local recruitment at any one point are likely to vary depending on a variety of factors including the operational requirements at the time and SZC Co.'s overall workforce management strategy in relation to its nuclear fleet. There is likely to be some fluidity between the different station workforces.

9.7.255 When operational, Sizewell C would cause an increase of 36% in jobs within energy generation sector in Suffolk (based on 2018 ONS BRES data which shows there are currently 2,500 jobs in SIC 351: Electric Power Generation, Transmission and Distribution). This would represent a beneficial effect in terms of the policy aspirations of the local authorities, LEP and the sub-regional economy. This would be a moderate beneficial effect at the local level which would be **significant**.

Outages

9.7.256 During the operational phase, there would be a number of planned outages, which would require a short-term, temporary additional workforce at the Sizewell C site at regular intervals.

9.7.257 The outages would occur every 18 months or so per unit, and on average last up to two months.

9.7.258 A short-term, temporary workforce of approximately 1,000 would be required in addition to the 900 operational staff per outage. It is estimated that the majority of the annual temporary outage workforce would be recruited from outside the local area (around 85%), and that there would be some continuity of employment between the current (Sizewell B) and future (Sizewell C) outage teams – thereby minimising any additional new employment, but increasing the frequency for current contractors.

9.7.259 Sizewell B is due to be decommissioned in 2035[10], however may be subject to a lifetime extension, in which case there may be a period where outages would be required for both stations.

[10] https://www.edfenergy.com/energy/power-stations/sizewell-b

9.7.260 It is therefore anticipated that around 850 outage workers would be non-local and require accommodation in the area. There is likely to be an impact on local accommodation, including tourist accommodation. A small proportion would take up spare rooms in houses (latent accommodation) based on previous experience, and – at Sizewell B - this is usually facilitated by people advertising in local shops, at the power station itself, and in newspapers.

9.7.261 Survey information from a recent (2016) outage at Sizewell B (Ref 9.49) identified that:

- Around 85% of workers were staying in temporary accommodation, of which:
  - 22% had a private rented tenancy (though these may be more likely to be short-term agreements for use of spare rooms, rather than an assured shorthold tenancy);
  - 15% were renting spare rooms; and
  - 63% were in tourist accommodation (split evenly between self-catering and serviced accommodation).
- Around 59% shared accommodation.

ii. Wider economic effects

9.7.262 It is anticipated that Sizewell C power station operational employment would be attractive to the local workforce as a result of the traditionally high level of wages in energy generation. Stakeholders are keen to develop the external image of Suffolk as an advanced economy meeting the wider economic aspirations of the Energy Coast initiatives within NALEP, to diversify the economic base, address pockets of deprivation, improve the skills base in the long-term (especially in engineering and construction) and attract and retain more workers (especially younger workers, and those who have left Suffolk to go to university elsewhere who may not otherwise return to the area).

9.7.263 The operational Sizewell C power station would provide a long-term continuation of a substantial quota of skilled and secure jobs for local people with a major energy sector employer.

9.7.264 At full operation, the indirect employment effects and the increase in the level of income in the local economy would be of a more permanent nature.

9.7.265 Indirect economic benefits would be generated through:

- earnings of operational staff; and
- local contracts placed during operation.

Local indirect employment

9.7.266 The average earnings of Sizewell C power station employees (both construction and operational) would be substantially above the average for the area and would give a major boost to local average earnings, and to local services.

9.7.267 Figures for earnings generated by the Sizewell C power station may be of the order of £44.5 million per annum. Previous studies suggest additional local indirect employment of about 60% of direct employment, which would be in the order of approximately 360 jobs for the proposed operational Sizewell C station.

9.7.268 The approximately 1,000 outage workers would also be likely to have multiplier expenditure and employment impacts, proportionately more akin to those for un-accompanied NHB construction workers.

9.7.269 The combined indirect economic effect of earnings and expenditure by operational staff and outage workers is anticipated to be a moderate beneficial effect which would be **significant**.

Business and supply chain

9.7.270 The Sizewell C Project would provide opportunities for business growth, both directly associated with contracts, and also indirectly in supporting sectors.

9.7.271 Overall the development is likely to contribute to longer term economic stability in the area. It should also provide opportunities for the development of local firms with both nuclear construction and operational phase supply chain links, which would help to raise the skill level and presence of energy sector activity in the area.

9.7.272 Overall this should lead to growth in a key sector that is complementary to more traditional sectors (e.g. manufacturing) in the region, offering high quality employment and opportunities for local businesses through an intensive construction period and a prospective operating lifetime of around sixty years.

9.7.273 The indirect economic effect of supply chain and procurement of goods and services for the operational power station is anticipated to be a moderate beneficial effect which would be **significant**.

iii. Accommodation

9.7.274 It is SZC Co.'s existing policy that all operational permanent staff should live within 25 miles of the station. As set out above, information from the 2011 Census shows that around 61% of the workforce in the workplace zone in which Sizewell B is located live in the former SCDC, and around 23% live in the former Waveney District – the remaining 16% live in Ipswich (5%), Great Yarmouth (2%), Mid Suffolk (2%), South Norfolk (2%) or further afield.

9.7.275 It is similarly envisaged that the non-local outage workforce would be accommodated in the same area for the duration of their activities.

9.7.276 In terms of accommodation sectors, studies at a number of power stations show that permanent employees in the electrical supply industry have higher rates of owner-occupation than the national average. Ownership rates are particularly high for staff employees. In the absence of any public sector provision, it is anticipated that most of those not buying would rent in the private sector. As such, the approximate tenure mix at full operation is estimated to be around 80% owner occupation, and around 20% private rented.

9.7.277 The anticipated demand in total for owner-occupied sector and PRS accommodation is low in comparison with the construction phase, and as the demand is likely to be spread over a number of years, coinciding with the rundown of construction (and the release of some accommodation previously used by construction workers), it is not expected that there would be any adverse effects in meeting the accommodation demands associated with the operational phase.

9.7.278 **Table 9.51** provides an estimate of the geographical distribution of operational staff accommodation, based on the premise that the pattern would be similar to that for the current operational Sizewell B.

Table 9.51: Estimated geographical distribution of the operational workforce, by accommodation type – at full operation

Geography	Owner-occupied		Rented		Total	
	%	Number	%	Number	%	Number
Local Authority District						
East Suffolk	68%	609	17%	152	85%	761
Suffolk Coastal	49%	441	12%	110	61%	552
Waveney	19%	168	5%	42	23%	210
Ipswich	4%	34	1%	8	5%	42
Great Yarmouth	2%	16	0%	4	2%	20

Geography	Owner-occupied		Rented		Total	
	%	Number	%	Number	%	Number
Mid Suffolk	2%	16	0%	4	2%	20
South Norfolk	2%	14	0%	4	2%	18
Broadland	1%	6	0%	1	1%	7
Elsewhere	3%	29	1%	7	4%	36
Total	**80%**	**720**	**20%**	**180**		**900**

9.7.279 Based on existing supply and frictional capacity set out in **Appendix 9D** of this volume, there would be a negligible effect on local accommodation demand which would be **not significant**.

iv. Public Services

9.7.280 The operational workforce would have become established over the time of the construction period and become part of the permanent population of the area. Any impacts on education and public services would therefore have already been mitigated during the construction phase. As occupants of PRS or owner-occupied sector accommodation, the workforce would be council taxpayers and entitled to public services in common with other residents.

9.7.281 As such, the impact of the net additional operational workforce on demand for public services is considered to be negligible and **not significant.**

v. Community cohesion and integration

9.7.282 SZC Co. recognises that there may be challenges in integrating a workforce with specific characteristics and needs into an existing community and would work with stakeholders, service providers and contractors, to ensure that the workforce can as closely as possible integrate with the existing community, and vice-versa.

9.7.283 The build-up in operational workforce would commence in year five and peak at year 12, with a relatively shallow build up over time that would be well within average annual turnover. Some residents would be recruited locally, of which some may transfer from Sizewell B, and some would be new to the area.

9.7.284 Given the scale of change, the potential effects on community cohesion and integration are assessed as negligible and **not significant.**

d) Inter-relationship effects

i. Construction

9.7.285 Where relevant, the socio-economic assessment inherently includes inter-relationship effects on receptors related to other environmental aspects – for example, effects on emergency service provision refers to the socio-economic effects of the workforce, along with changes to response times reported in the **Transport Assessment** (Doc Ref 8.5).

9.7.286 As such, where relevant, primary and tertiary mitigation developed for the socio-economic assessment includes measures that cross-cut environmental aspects as described in **section 9.6** of this chapter, for example primary and tertiary measures set out in the **Community Safety Management Plan** (Doc Ref 8.16), the **Code of Construction Practice** (Doc Ref. 8.11) and the **Traffic Incident Management Plan** (Doc Ref. 8.6), **Construction Traffic Management Plan** (Doc Ref. 8.7), and the **Construction Worker Travel Plan** (Doc Ref. 8.8).

9.7.287 The **Community Impact Report** (Doc Ref 5.13) sets out where receptors will experience one or more significant effects across different environmental topics on a local community basis, and signposts to the full assessment (and subsequent development of mitigation).

ii. Operation

9.7.288 No further inter-relationship effects have been identified.

9.8 Mitigation and monitoring

a) Introduction

9.8.1 Where possible, mitigation measures have been proposed where a significant effect is predicted to occur. Primary and tertiary mitigation measures which have already been incorporated within the design of the proposed development are detailed in **section 9.6** of this chapter.

9.8.2 This section describes the proposed secondary mitigation measures for the socio-economic assessment within, and in the vicinity of, the proposed development. Where other mitigation is required to reduce or eliminate a significant effect, this is referred to as secondary mitigation. Secondary mitigation measures have not been incorporated into the design of the proposed development and would therefore not appear on any development plans.

9.8.3 This section also describes any required monitoring regimes, including monitoring of specific receptors/resources, or monitoring the effectiveness

of a mitigation measure. The requirements, scope, frequency and duration of a given monitoring regime are also set out, as far as possible.

b) Mitigation (and enhancement)

9.8.4 For the purpose of this assessment, mitigation measures have been proposed where there is an adverse impact of greater than minor significance and the impact magnitude, spatial scope, and temporal nature make it appropriate to do so.

9.8.5 Across the socio-economic assessment, SZC Co. has adopted a best practice precautionary approach to ensure that all evidenced impacts described in this assessment would be addressed through mitigation where practicable and that a monitoring system would be in place to address the sensitivities described in the impact assessments. The relevant strategies for mitigation and monitoring are listed and cross referenced below along with their key points. Where possible, enhancements have been identified which could bring additional benefits to the area.

9.8.6 Relevant mitigation and enhancement measures are listed and cross referenced below. These mitigation and enhancement measures would be implemented during the construction phase of the Sizewell C Project.

i. Employment, skills and education effects

9.8.7 The economic effects of the Sizewell C Project on skills, employment, and labour market and supply chain are substantial and beneficial in terms of the creation of new jobs, effects on unemployment and economic inactivity, generation of business activity in the supply chain, and indirect and induced benefits of earnings and spending of workers.

9.8.8 SZC Co. has set out the overall economic benefits of the Sizewell C Project in the **Economic Statement** (Doc Ref. 8.9), which includes measures to enhance the benefits of the Project, which are embedded into the assessment of significance (see **Section 9.6**).

9.8.9 As the proposed development results in beneficial effects on skills, employment, labour market, and supply chain, these effects do not require additional mitigation.

ii. Tourism

Tourism Fund

9.8.10 SZC Co. recognises that there may be potential for the tourist economy to be adversely affected as a result of the Sizewell C Project, in some locations and under some conditions.

9.8.11 SZC Co. recognises that there is inherent uncertainty in whether and where such adverse effects may occur. SZC Co. also recognises that there is an opportunity to tackle perceived changes to certain sensitivities that existing and potential visitors to the area may be concerned about, and to ensure that the residual effect of the Sizewell C Project on tourism is not negative, and is potentially positive.

9.8.12 As such, SZC Co. will make available a Tourism Fund to develop mitigation measures to reduce this risk and promote the area in order to reduce the risk of perceived changes in visitor behaviour from materialising. This Tourism Fund, along with its the governance, scale, and application, will be secured by the Section 106 Agreement (see **draft Section 106 Heads of Terms**). This Tourism Fund could be used to deliver initiatives such as:

- Development of or support for a tourism strategy/action plan.
- Marketing and promotion activities for the Suffolk coast and specific attractions and events within it, which can demonstrate a strong return on investment.
- Supporting local projects including capital and revenue investment.
- Undertaking future visitor surveys.
- Providing information about public transport and travel.
- Supporting existing tourist information centres.
- Responding to effects on particularly sensitive attractions/locations within the AONB.

iii. Agricultural economy

9.8.13 On completion of the construction phase, the land outside of the permanent development site would be restored to agricultural use and ecological habitat creation.

9.8.14 As the proposed development results in negligible effects on the local agricultural economy, these effects do not require additional mitigation.

iv. Accommodation

9.8.15 Although the construction phase assessments predict a negligible or minor adverse effect on the accommodation market at the wider scale, there are

predicted to be localised effects, which would be of major adverse significance and therefore require additional mitigation.

9.8.16 As such, mitigation has been proposed as part of an **Accommodation Strategy** (Doc Ref. 8.10) submitted with the application and summarised below.

9.8.17 The **Accommodation Strategy** (Doc Ref. 8.10) contains measures to specifically target hard to reach and vulnerable groups that may experience difficulties accessing or retaining housing as a result of the Sizewell C Project's effects on the lower end of the PRS – see **Accommodation Strategy** (Doc Ref. 8.10), and Housing Fund (secured through the Section 106 Agreement).

Housing Fund

9.8.18 SZC Co. is proposing additional support for housing in the local area by establishing a Housing Fund, linked to the **Accommodation Strategy** (Doc Ref 8.10).The Housing Fund would be informed by the scale of the workforce, likely accommodation sector demand, and existing supply and characteristics of the local housing market.

9.8.19 This support will particularly focus on the PRS, and the lower end of that sector where there is the greatest potential for workers to seek the same type of accommodation that local residents with housing need rely on.

9.8.20 The Housing Fund would be capable of delivering additional capacity and providing resilience in the build up to peak demand and during the peak, and may have the potential to leave a lasting legacy in terms of improvements to the existing housing stock.

9.8.21 The Housing Fund would provide financial support to a range of initiatives which would help to:

- Develop supply through a range of measures including:
  - supporting rent/deposit guarantee schemes – interventions to make the market work better, and support rent deposits for people at risk of homelessness;
  - providing equity loans to residents to enable them to secure suitable accommodation and free up homes/rooms in the PRS;
  - providing equity loans to residents in the social rented sector to help them access owner-occupied and rented property and rationalise the supply and occupancy of social rented homes as a result;

  - supporting empty homes back into use;
  - providing loans/grants/guaranteed lets, e.g. renovation grants;
  - helping to deliver the East Suffolk Housing Strategy (2017) (Ref 9.17) pledge to work with housing associations to explore opportunities for mixed schemes of private sale and affordable housing to generate profits to replace grant funding; and
  - tackling under-occupation.

- Provide funding for resilience – to support and provide resilience to services, staffing, advice and short-term response such as temporary accommodation and the use of bed and breakfast accommodation.

- Support growth in the tourist accommodation sector through support with planning, licensing and development, and funding for increases in capacity or re-design of sites.

9.8.22 This Housing Fund, along with its the governance, scale, and application, will be secured by the Section 106 Agreement (see **draft Section 106 Heads of Terms**).

Accommodation management system

9.8.23 In order to help manage the distribution of workers and avoid or reduce potential adverse effects on accommodation capacity in local areas in a responsive way, SZC Co. would work with partners to develop mechanisms that:

- allow local landlords, tourism businesses and residents to register accommodation available for workers; and

- enable SZC Co. and its contractors to signpost workers towards this accommodation and provide information to accommodation providers.

9.8.24 The implementation of the accommodation management system will be secured through the Section 106 Agreement (see **draft Section 106 Heads of Terms**) and will include the following components:

- Monitoring of the workforce (see part (c) of this section), contractors and local housing market (see information management and database/portal below).

- Provision of information to workers, contractors and accommodation providers, and working with providers to help them understand opportunities to support the Sizewell C Project's workforce.

Information management and database/portal

9.8.25 SZC Co. would collect, manage, and hold information about the local accommodation market (including registrations from providers with accommodation) that can be used to provide contractors and workers with a means of finding the most suitable accommodation and location.

9.8.26 In addition, information would be provided to prospective or existing landlords that could help ensure they are providing accommodation that meets safety and quality standards. This would help to avoid the risk of landlords being unaware of rules and regulations that apply to letting property, or new providers entering the market with accommodation of an unacceptably low standard.

9.8.27 The Accommodation Management System would serve to raise understanding of applicable regulations, and sources of further information for prospective accommodation providers.

9.8.28 SZC Co. will run a series of 'one-stop-shop' open events for providers of tourist accommodation and particularly caravan sites close to the Sizewell C Project, along with ESC, in order to:

- Inform them of the likely scale of demand from workers, how this changes over time, and the likely accommodation requirements and characteristics of the workforce.
- Set out expected safety and quality standards, as well as planning and licensing that may be required to provide accommodation to workers, for example amendments of residency criteria for caravan sites.
- Respond to any concerns that accommodation providers may have about NHB construction workers, including how the Sizewell C Project uses the Worker Code of Conduct to enforce high standards of behaviour both on and off-site.
- Explain what providers can/cannot expect from the Sizewell C Project based on lessons learnt from Hinkley Point C, e.g. the Sizewell C Project will not reimburse unpaid rent and – due to the large number of people on-site – can only enforce the Worker Code of Conduct if accommodation providers collect a full name/contractor name from tenants.

9.8.29 Through a 'look-ahead' with contractors and SZC Co.'s workforce delivery team, spikes in worker demand may be mitigated through a proactive approach to identifying suitable accommodation.

9.8.30 The Sizewell C Project would also be able to provide information about the key activities of the construction phase, facilities and build-up of the workforce back to the market, which would help providers understand more about the likely demand and plan for it. This may include location of project infrastructure such as park and ride sites, and pick-up points for buses for example.

9.8.31 It is anticipated that the measures funded by the Housing Fund and implemented as part of the accommodation management strategy would result in residual effects reducing to **not significant** (negligible to minor adverse) at all scales.

v. Public services and community facilities

Education

9.8.32 The assessment considers that effects on physical provision of educational facilities are negligible at the 60-minute, district and county scales, although there are uncertainties around the likely location of the workforce, and available school capacity in the future which could create minor adverse effects in localised areas.

9.8.33 SZC Co. would employ workforce monitoring and surveys as part of the mitigation of effects on accommodation. This monitoring would provide information to estimate the number and locations of workers who bring dependent children to the area temporarily. SZC Co. would provide this information to SCC and, with them, identify potential effects on education capacity.

9.8.34 Periodically, if a potential effect was identified through the information, SCC would be able to draw down on a Public Services Contingency Fund to expand provision in locations with limited capacity where the net additional effect of the workforce exceeds capacity. The establishment of this Public Services Contingency Fund will be secured through an obligation in the Section 106 Agreement (see **draft Section 106 Heads of Terms**).

9.8.35 Should the need arise, the public services contingency fund could also contribute to funding a support teacher or member of staff who could co-ordinate any additional activities required to integrate children into the local school system.

9.8.36 This would ensure that residual effects are negligible at all spatial levels.

Social care

9.8.37 SZC Co. is aware of the risks that the Sizewell C Project may pose to the delivery of social services. The Sizewell C Project's implementation plans, secured through obligations in the Section 106 Agreement (see **draft Section 106 Heads of Terms**), have been developed to limit potential effects on the delivery of social care.

9.8.38 **Section 9.6** sets out embedded (primary) and tertiary measures that contribute towards reducing risks associated with the provision of social care services.

9.8.39 Overall, the following additional mitigation activities would indirectly contribute to reducing the risk of adverse significant effects on social care and the beneficiaries of the service:

- Specifically targeting hard to reach and vulnerable groups that may experience difficulties accessing or retaining housing as a result of the Sizewell C Project's effects on the lower end of the PRS – see **Accommodation Strategy** and Housing Fund (Doc Ref. 8.10).

- Working bilaterally with those organisations closest to the Sizewell C Project that raise safeguarding concerns to identify practical and effective solutions, as set out in the **Community Safety Management Plan** (Doc Ref. 8.16).

- Providing community information to workers and contractors, and workforce information to communities, community groups and accommodation providers in order to promote integration and awareness of the Sizewell C Project and its effects, and the characteristics of the communities in the local area. This information would be provided through mechanisms secured in the **Accommodation Management System** which would be implemented in addition to the tertiary mitigation communication measures set out in the **CoCP** (see **Section 9.6**) (Doc Ref. 8.11).

- Managing workforce accommodation through the **Accommodation Management System.** The implementation of the Accommodation Management System would be secured through an obligation in the Section 106 Agreement (see **Section 106 Head of Terms**).

9.8.40 SZC Co. acknowledges the risks that the Sizewell C Project may pose to the delivery of social services as identified by stakeholders and has therefore proposed a Public Services Contingency Fund to be secured through the Section 106 Agreement to mitigate potential effects, and

respond to effects related to the Sizewell C Project as they arise. The establishment of this Public Services Contingency Fund will be secured through an obligation in the Section 106 Agreement (See **draft Section 106 Heads of Terms**).

9.8.41 The proposed mitigation would ensure that the residual effects of the Sizewell C Project on social services would be negligible at all scales.

Recreation, sport and leisure

9.8.42 The impact on demand for additional formal sport and leisure service provision is likely to be limited due to the demographic characteristics of the workforce, its temporary nature, its relatively short peak effects, and its propensity to use existing facilities based on demographics and market segmentation.

9.8.43 Any adverse effects would be avoided by primary mitigation, including the sports and leisure provision at Leiston set out at **Section 9.6.**

Regulatory and environmental services

9.8.44 Impacts on regulatory and environmental services are identified as negligible at the district level, with the potential to be minor adverse at the local (ward) level.

9.8.45 The proposed approach to mitigating accommodation impacts described above would mitigate the impact on the main regulatory service functions. The residual effects would therefore be negligible at the district and local levels.

Emergency services

9.8.46 SZC Co. has been working with service providers (including district and county councils, Suffolk Constabulary, Suffolk Fire and Rescue Service, and East of England Ambulance Service, as discussed in **Volume 2, Chapter 28** of the **ES**, Health and Wellbeing) to address any potential community safety impacts arising from the Sizewell C Project.

9.8.47 Effects identified range from negligible or minor adverse at regional scales to moderate adverse at some more local scales across emergency response for fire and rescue, policing and ambulance services.

9.8.48 The assessment sets out that while wider effects may be not significant, engagement with service providers has identified that there may be local factors and service-specific factors that contribute to disproportionate demand which will need to be mitigated through financial contributions secured by the Section 106 Agreement.

9.8.49 Additionally, SZC Co. recognises that in some cases, incidents that may arise may draw on more than one emergency service resource, and that some incidents may be more likely to occur than others due to the demographic factors of the workforce. The implication of these incidents have been considered in the **Community Safety Management Plan** (Doc Ref 8.16), and SZC Co. is working with Suffolk Constabulary to consider all aspects of potential additional demand for resources in order to develop appropriate mitigation via financial contributions secured by the Section 106 Agreement.

Policing services and community safety

9.8.50 The assessment considers that while potential effects on crime levels would be negligible at the Suffolk Constabulary service level, there may be some moderate adverse effects in local wards as a result of the concentration of NHB workers in some areas.

9.8.51 A **Community Safety Management Plan** (Doc Ref. 8.16) has been produced which sets out the overarching approach to ensuring that community safety and emergency services issues are comprehensively addressed, and governance and monitoring arrangements are in place to deal with any particular sensitivities should they arise. This should enable the service providers responsible for community safety to continue to provide existing services without disadvantage to the community caused by the Sizewell C Project.

9.8.52 Where necessary, SZC Co. will address effects on the provision of emergency services through financial contributions towards additional resourcing relevant to the identified net additional level of effect, secured through the Section 106 Agreement (see **draft Section 106 Heads of Terms**).

9.8.53 As a result of the proposed additional mitigation, the residual effects of the Sizewell C Project on policing services and community safety would be negligible at the Suffolk Constabulary scale, and at local (ward) scales.

Fire and rescue services

9.8.54 Impacts on fire and rescue services are likely to be negligible at the Suffolk Fire and Rescue Service level, but there is a risk they could be minor adverse at the local level subject to the types of incidents.

9.8.55 Mitigation is set out in the **Community Safety Management Plan** (Doc Ref. 8.16), and the **Accommodation Strategy** (Doc Ref. 8.10).

9.8.56 Where necessary, SZC Co. will address effects on the provision of emergency services through financial contributions towards additional

resourcing relevant to the identified net additional level of effect, secured through the Section 106 Agreement (see **draft Section 106 Heads of Terms**).

9.8.57 As a result of the proposed additional mitigation, the residual effects of the Sizewell C Project on fire and rescue services and community safety would be negligible at the Suffolk Fire and Rescue Service scale, and at local (ward) scales.

vi. Community cohesion and integration

9.8.58 The Sizewell C Project is likely to lead to significant effects on population and demographics on a temporary basis in Leiston. Perceived changes to community cohesion and integration may arise during this time and SZC Co. has set out measures by which this will be managed.

9.8.59 This would partly be addressed through the mitigation measures for economy and skills, accommodation and public services described elsewhere in this section but SZC Co. also proposes a number of actions to avoid/limit any negative impacts and to mitigate impacts locally.

9.8.60 SZC Co. would work with public service providers and individual facilities (such as schools) to provide them with up-to-date information about the construction workforce, as discussed in section 9.8(i) of this chapter, and management plans to ensure services are aware of potential demand in advance.

9.8.61 SZC Co. are aware of potential effects of the construction workforce on vulnerability to homelessness – proposed mitigation measures are set out in this chapter and in the **Accommodation Strategy** (Doc Ref. 8.9) including measures to ensure that workers are able to access secure and adequate quality accommodation.

Community Safety Management Plan

9.8.62 SZC Co. has developed a **Community Safety Management Plan** (Doc Ref. 8.16) in collaboration with local authorities, emergency services and public services, among other stakeholder groups. It outlines the approach to community safety in the area. It also sets out a range of measures that will contribute to both worker and community safety and health and wellbeing on the Sizewell C Project. Where appropriate, implementation of the measures set out in the **Community Safety Management Plan** will be secured through obligations in the Section 106 Agreement (see **draft Section 106 Heads of Terms**, provided as **Appendix J** to the **Planning Statement** (Doc Ref. 8.4)) or via the **Code of Construction Practice (CoCP)** (Doc Ref. 8.11) (which will itself be secured by requirement).

Additional mitigation measures set out in the **Community Safety Management Plan** include:

- a precautionary approach to manage impacts on community safety, cohesion and public services, with a focus on prevention where possible and measures to raise awareness of the Sizewell C Project's changes/risks to community safety;

- information for accommodation providers in the PRS and tourism sectors, setting out details of the workforce profile and the Worker Code of Conduct (see the **Accommodation Management System** and approach to mitigating accommodation impacts described above);

9.8.63 These would be in addition to the relevant primary and tertiary mitigation set out in **section 9.6** which include:

- a mechanism for the local community to register public concerns, through (for example) a hotline (secured through the **CoCP** (Doc Ref. 8.11));

- provision of occupational health services to reduce pressure on existing facilities and a review of any residual public health care requirements from NHB workers and their families; and

- provision of project-recreational facilities, including off-site sports facilities, helping to manage the demand from workers.

Property (accommodation campus and caravan site)

9.8.64 SZC Co. would ensure the active management of its on-site accommodation. This would include enforcement of expected standards of behaviour from workers, hours of operation, security issues, liaison with emergency services and complaints procedures for local residents. These measures would be included in the **Worker Code of Conduct** (see **Section 9.6**).

Community Fund

9.8.65 SZC Co. recognises that there would be intangible residual in-combination effects on local communities as a result of combined environmental effects, both perceived and real. In some instances, these cannot be directly mitigated through physical design measures, and require a more reactive approach.

9.8.66 As a result, SZC Co. would offer a Community Fund to be administered on behalf of the community to help mitigate these effects through schemes, measures and projects which promote the economic, social or environmental well-being of those communities and enhance their quality of life. The provision of the Community Fund will be secured through an obligation in the Section 106 Agreement (see **draft Section 106 Heads of Terms**).

9.8.67 The Community Fund may include:

- an ongoing programme of small grants to charities, voluntary groups and social enterprises – awarded for projects, measures or initiatives that help to mitigate impacts felt in the community from the construction of the Sizewell C Project; and
- strategic grants – for example for investment in local facilities or services to enhance the positive and reduce or avoid potential negative impacts on communities.

9.8.68 In general, activities receiving grants should aim to improve the social, economic or environmental wellbeing of the communities affected by the development and be relevant to the Sizewell C Project's effects, either by reducing or removing impacts or by helping the community to take advantage of opportunities presented by the Sizewell C Project.

9.8.69 The Community Fund will recognise that some communities closer to the main development site are likely to experience more and greater effects across a wider range of social, economic and environmental areas.

vii. Inter-relationship effects

9.8.70 As set out above (**part vi** of this section), the Community Fund would seek to mitigate intangible residual in-combination environmental effects on local communities (socio-economic receptors) as a result of combined environmental effects, both perceived and real.

c) Monitoring

9.8.71 This chapter sets out likely significant effects based on the best current knowledge and assumptions about the scale and nature of the Sizewell C Project's construction workforce, the supply of accommodation, and the likely spatial distribution of the workforce.

9.8.72 The spatial distribution of the workforce is itself based on a Gravity Model that has been reviewed by stakeholders.

9.8.73 However, SZC Co. acknowledges that, as with any assumptions, there is some uncertainty and the reality could be different.

9.8.74 SZC Co. has therefore taken a precautionary approach to the assessment of effects and has planned its mitigation based on the peak of construction. It is applying mitigation strategies that are comprehensive in scale and implementation strategies that are flexible and responsive to local variations, related to uncertainty, where they may occur. This is an important element in the adaptive approach to mitigating effects for this major project.

9.8.75 Any differences from the assessed case may or may not lead to different impacts which may or may not require different or additional mitigation. A difference in the size or distribution of the workforce alone may not lead to different impacts. For example, the assessment of accommodation impacts is based on assumptions about the supply of accommodation. If the workforce were more spatially concentrated, and the local accommodation market responded by making more accommodation available, the actual impacts may be largely similar or identical to the assessed impacts.

9.8.76 It is therefore necessary to monitor both the inputs (i.e. the scale, nature and distribution of the workforce), and also the outputs (the effects of the workforce on accommodation markets or public services).

9.8.77 SZC Co. recognises that effects and mitigation set out in this chapter have the potential to be influenced by factors beyond SZC Co.'s control including political, legislative and policy change, economic change and local factors.

9.8.78 In order to plan for this uncertainty, and to help the local authorities manage mitigation effectively, SZC Co. and contractors will work together to develop an effective approach to monitoring of the workforce that will help to inform how mitigation can be best directed to areas, sectors and services that would address any issues as they arise.

i. Workforce monitoring and surveys

9.8.79 Information on the location and type of accommodation being used by workers will be collected throughout the construction period through regular workforce surveys. This will be benchmarked to an overall database that will record any worker who is employed on the Sizewell C Project, and who travels to site. The workforce profile includes all workers who work at the site for five days in any calendar month, or four consecutive days, and therefore captures people likely to seek temporary accommodation in the local area on a medium-to-long-term basis.

9.8.80 The monitoring and workforce survey system will be implemented based on the following principles:

- That workers will be inducted on to the Sizewell C Project and given a unique reference number and site access card that will be used to track their progress on a single database. This will inform SZC Co. of how many people are working on the Sizewell C Project, and how many people travel to site, and how regularly.

- Workers will periodically need to re-induct on the Sizewell C Project, but will retain their unique reference number.

- Regular workforce surveys will be undertaken, fixed to a statistically significant sample size, and with consistent survey questions that can provide longitudinal data.

- Workforce surveys will return information relating to:

  - Whether the workforce is HB or NHB – by asking about the permanent place of residence of if workers do not move to the area for work (i.e. HB workers), and the temporary place of residence if workers do move to the area for work (i.e. NHB workers).

  - The skill/role of the employee.

  - Demographic and housing characteristics of the worker relevant to the assessment, including their age, gender, the type of temporary accommodation they are staying in, and whether they have brought with them any dependent children or adults.

9.8.81 This data will be collected in a single database and reviewed every six months in order to track the scale and potential effects of the workforce to inform the delivery of mitigation measures as set out in this assessment.

9.8.82 SZC Co. will undertake monitoring of the workforce and will use reasonable endeavours to obtain the necessary information from workers and contractors. The implementation of this monitoring will be secured through a Section 106 Agreement (see **draft Section 106 Heads of Terms**).

ii. Monitoring of effects

9.8.83 In some instances, the monitoring of potential effects of the construction workforce is needed to identify where and which mitigation measures need to be enacted. SZC Co. will continue to agree relevant indicators of effects with local authorities responsible for services that may be affected. From time to time, East Suffolk Council and SZC Co. will propose relevant indicators to a Socio-Economic Advisory Group for its approval. The establishment of the Socio-Economic Advisory Group will be secured

through an obligation in the Section 106 Agreement (see **draft Section 106 Heads of Terms**).

Accommodation effects

9.8.84 Local authorities are required to provide a substantial amount of monitoring data to central government in order to monitor the level of service demand, for example in the form returns that monitor demand for services related to housing need, and effectiveness of homelessness prevention services.

9.8.85 SZC Co. and ESC recognise the value of utilising this information as supporting evidence to demonstrate effects. Further details are set out in the **Accommodation Strategy** (Doc Ref. 8.10).

Community safety and community cohesion effects

9.8.86 SZC Co.'s communication, community and stakeholder engagement strategy sets out measures for the community to report incidents and liaise with the Sizewell C Project about concerns with regards to community safety, cohesion and integration as a result of the construction workforce. The strategy also includes measure for the provision of information and is set out in the **Code of Construction Practice** (Doc Ref. 8.11).

9.8.87 Feedback would also be gained via the Community Safety Working Group, further details of which are set out in the **Community Safety Management Plan** (Doc. Ref. 8.16). The establishment of the Community Safety Working Group, will be secured through an obligation in the Section 106 Agreement (see **draft Section 106 Heads of Terms**).

9.8.88 This information would allow SZC Co. to enact the measures set out within its implementation plans, most importantly the measures set out in the **Community Safety Management Plan** (Doc Ref. 8.16), and inform public service providers with responsibilities for community safety of the location and nature of effects.

Supply chain and employment and skills effects

9.8.89 SZC Co. supply chain team will seek to collect data on businesses supplying the Sizewell C Project, most likely utilising a socio-economic reporting tool similar to the one already in use at Hinkley Point C. This will enable reporting of international, UK, and local/regional content and spend, for the purposes of reporting to government and other stakeholders as required.

9.8.90 Tier 1 and Tier 2 suppliers will be encouraged to participate in gathering information which will be used compare and contrast local and regional levels of engagement.

9.8.91 There would also be ongoing review of the effectiveness of the measures set out in the **Employment, Skills and Education Strategy** provided in **Appendix A** of the **Economic Statement** (Doc Ref. 8.9) and the **Supply Chain Strategy** provided in **Appendix B** of the **Economic Statement** (Doc Ref. 8.9), including key performance indicators.

iii. Governance

9.8.92 By monitoring workforce patterns, and through ongoing stakeholder engagement, potential effects arising (on housing, public services or community safety) will be identified.

9.8.93 SZC Co. will work with local authorities and contractors to regularly review and report on monitoring and survey information collected, against the changing background of policy, economic and legislative change that may arise during the Sizewell C Project, and collaboratively decide on how best to release, distribute and track mitigation in order for it to have sufficient time to be implemented, and to make sure it is directed to the areas it is needed most.

9.8.94 This reporting would be undertaken by a socio-economic advisory group, the terms of reference of which would be secured through the Section 106 Agreement (see **draft Section 106 Heads of Terms)**.

9.9 Residual effects

9.9.1 **Table 9.52** presents a summary of the socio-economic assessment. It identifies the receptor/s likely to be impacted, the level of effect and, where the effect is deemed to be significant, the table includes the mitigation proposed and the resulting residual effect.

9.9.2 It should be noted that not all such effects would be adverse and some would be beneficial.

Table 9.52: Summary of effects for the socio-economic assessment

Receptor	Impact	Primary or Tertiary Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Economic Effects – Construction					
Labour market.	Home-based recruitment.	Enhancement through **Employment, Skills and Education Strategy** provided in **Appendix A** of the **Economic Statement** (Doc Ref. 8.9).	Moderate Beneficial **(Significant)** at 90-minute (CDCZ) scale.	None	Moderate Beneficial **(Significant)** at CDCZ.
Labour market (workless i.e. unemployed or economically inactive).	Effects on unemployment and economic inactivity.	Enhancement through **Employment, Skills and Education Strategy** provided in **Appendix A** of the **Economic Statement** (Doc Ref. 8.9).	Moderate/Major Beneficial **(Significant)** at CDCZ scale.	None	Moderate/Major Beneficial **(Significant)** at CDCZ scale.
Labour market (Employed).	Effects on labour market churn and 'displacement'.	**Employment, Skills and Education Strategy** provided in **Appendix A** of the **Economic Statement** (Doc Ref. 8.9).	Negligible **(Not Significant)** at CDCZ scale.	None	Negligible **(Not Significant)** at CDCZ scale.
Local/regional	Business and supply chain.	**Supply Chain**	Moderate Beneficial **(Significant)**	None	Moderate Beneficial

Receptor	Impact	Primary or Tertiary Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
economy.		**Strategy** provided as Appendix B of the **Economic Statement** (Doc Ref. 8.9).	at local and regional scale.		**(Significant)** at local and regional scale.
Local/regional economy.	Wages/spending and additionality.	None	Moderate Beneficial **(Significant)** at local and regional scale.	None	Moderate Beneficial **(Significant)** at local and regional scale.
Local/regional economy.	Effects on tourism economy.	None	Potential for Minor to Moderate Adverse **(Potentially Significant)** effect at the local (Suffolk coast) scale[11].	Tourism Fund.	Negligible **(Not Significant)** at the local (Suffolk coast) scale
Local/regional economy.	Effects on agricultural economy.	None	Negligible **(Not Significant)** at Suffolk (county) scale.	None	Negligible **(Not Significant)** at Suffolk (county) scale.
Local/regional economy.	Effects of transport on business.	None	Negligible **(Not Significant)** at Suffolk (county) scale.	None	Negligible **(Not Significant)** at Suffolk (county) scale.
Accommodation Effects - Construction					
Tourist accommodation sector.	Effects on capacity and operation of the tourist accommodation sector.	Accommodation Campus and Caravan Site.	Minor Beneficial **(Significant)** at 60-minute area scale. Minor to Major Adverse **(Significant)** at local scale (wards).	Housing Fund. Accommodation Management System.	Minor Beneficial **(Not Significant)** at 60-minute area scale. Negligible to Minor Adverse **(Not Significant)** at local scale (wards).
Private rented	Effects on capacity and	Accommodation	Negligible **(Not Significant)** at 60-	Housing Fund.	Negligible **(Not Significant)** at

[11] SZC Co. recognises that there is inherent uncertainty about the extent to which this may occur, and there is an opportunity to tackle perceived changes to certain sensitivities that existing and potential visitors to the area may be concerned about

Receptor	Impact	Primary or Tertiary Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
accommodation sector.	operation of the private rented accommodation sector.	Campus and Caravan Site.	minute area scale. Minor to Major Adverse **(Significant)** at local scale (wards).	Accommodation Management System.	60-minute area scale. Negligible to Minor Adverse **(Not Significant)** at local scale (wards).
Owner occupied accommodation sector.	Effects on capacity and operation of the owner-occupied accommodation sector.	Accommodation Campus and Caravan Site.	Negligible **(Not Significant)** at 60-minute area scale. Negligible to Minor Adverse **(Not Significant)** at local scale (wards).	None	Negligible **(Not Significant)** at 60-minute area scale. Negligible to Minor Adverse **(Not Significant)** at local scale (wards).
Population Dynamics – Construction					
Population	Population change and dynamics.	None	Negligible or Minor **(Not Significant)** at 60-minute area scale. Moderate to Major **(Significant)** at local scale (wards).	None	Negligible or Minor **(Not Significant)** at 60-minute area scale. Moderate to Major **(Significant)** at local scale (wards).
Public Services Effects – Construction					
Pre-school provision and childcare services.	Effects on demand for childcare against existing capacity.	None	Negligible **(Not Significant)** at District and County scale. Negligible to Minor Adverse **(Not Significant)** at local scale (wards).	None (though may draw on public services contingency fund).	Negligible **(Not Significant)** at District and County scale. Negligible **(Not Significant)** at local scale (wards).
Primary school capacity.	Effects on demand for primary education against existing capacity.	None	Negligible **(Not Significant)** at 60-minute area, District and County scale. Negligible to Minor/Moderate Adverse **(Not Significant)** at local scale (wards).	None (though may draw on public services contingency fund).	Negligible **(Not Significant)** at 60-minute area, District and County scale. Negligible **(Not Significant)** at local scale (wards).

Receptor	Impact	Primary or Tertiary Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Secondary school capacity.	Effects on demand for secondary education against existing capacity.	None	Negligible **(Not Significant)** at 60-minute area, District and County scale. Negligible to Minor Adverse **(Not Significant)** at local scale (wards).	None (though may draw on public services contingency fund).	Negligible **(Not Significant)** at 60-minute area, District and County scale. Negligible **(Not Significant)** at local scale (wards).
Social Services provision / capacity.	Effect on provision of social services (Demand from workers' families).	None	Negligible **(Not Significant)** at 60-minute area and County scale.	None (though may draw on public services contingency fund).	Negligible **(Not Significant)** at 60-minute area and County scale.
Social Services provision / capacity.	Effect on provision of social services (Construction workforce).	**Employment, Skills and Education Strategy** provided in **Appendix A** of the **Economic Statement**. Occupational Healthcare Service.	Negligible **(Not Significant)** at County scale. Minor Adverse **(Not Significant)** at local scale (wards).	Welcome Packs. Housing Fund. Community Fund. Additional measures set out in the Community Safety Management Plan Public services contingency fund.	Negligible **(Not Significant)** at County scale. Minor Adverse **(Not Significant)** at local scale (wards).
County Council-run services.	Effects on demand for / capacity of other county-level services.	None	Negligible **(Not Significant)** at County scale.	None (though may draw on public services contingency fund).	Negligible **(Not Significant)** at County scale.
Provision and capacity of formal sports facilities.	Demand for formal sports and leisure facilities from construction workforce.	On-site recreation and leisure facilities within Accommodation Campus.	Major Beneficial **(Significant)** at all scales.	None.	Major Beneficial **(Significant)** at all scales.

Receptor	Impact	Primary or Tertiary Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
		Off-site recreation and leisure facilities in Leiston (3G pitch and MUGA).			
District Council services (waste, cleaning, environmental and public health).	Effect of the construction workforce on demand for regulatory and environmental services.	Sizewell C Waste Management Strategy.	Negligible **(Not Significant)** at District scale.	None (though may draw on public services contingency fund).	Negligible **(Not Significant)** at District scale.
Policing services and community safety.	Effect of the construction workforce on crime and policing.	Accommodation Campus and Caravan Site.	Negligible **(Not significant)** at Suffolk Constabulary scale. Moderate Adverse **(Significant)** at local (ward) scale.	Additional measures set out in the Community Safety Management Plan Financial compensation.	Negligible **(Not significant)** at Suffolk Constabulary scale.
Fire and rescue services.	Effect of the construction workforce on provision of fire and rescue services.	Accommodation Campus and Caravan Site. Trasport Incident Management Plan.	Negligible **(Not significant)** at Suffolk Fire and Rescue Service scale. Minor Adverse **(Not Significant)** at local (ward) scale.	Additional measures set out in the Community Safety Management Plan Accommodation Management System. Financial compensation.	Negligible **(Not significant)** at Suffolk Fire and Rescue Service scale.
Community cohesion / integration.	Effect of the construction workforce community cohesion and integration.	Various – See Table 9.49.	Minor Adverse **(Not Significant)** at all scales.	Various – See Table 9.49.	Negligible or Minor Adverse **(Not Significant)** at all scales.
Inter-relationship Effects – Construction					
Communities,	Effect of socio-economic	Various inherently	Negligible	Community Fund	Negligible

Receptor	Impact	Primary or Tertiary Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
community facilities and homes	effects combined with other environmental e.g. transport effects	cross-aspect – see Section 9.7 (d) (vi)			
Operational Effects					
Labour Market.	Effect on local direct employment.	**Employment, Skills and Education Strategy** provided in **Appendix A** of the **Economic Statement**	Moderate Beneficial **(Significant)** at County scale.	None	Moderate Beneficial **(Significant)** at County scale.
Labour Market.	Effect on local indirect employment / economic effects.	None	Moderate Beneficial **(Significant)** at County scale.	None	Moderate Beneficial **(Significant)** at County scale.
Local / regional economy.	Effect on business and supply chain through procurement of goods and services.	None	Moderate Beneficial **(Significant)** at Regional scale.	None	Moderate Beneficial **(Significant)** at Regional scale.
Private rented accommodation sector.	Effects on capacity and operation of the private rented accommodation sector.	None	Negligible **(Not Significant)** at all scales.	None	Negligible **(Not Significant)** at all scales.
Owner occupied accommodation sector.	Effects on capacity and operation of the owner-occupied accommodation sector.	None	Negligible **(Not Significant)** at all scales.	None	Negligible **(Not Significant)** at all scales.
Public services.	Effects on net additional demand for public services.	None	Negligible **(Not Significant)** at all scales.	None	Negligible **(Not Significant)** at all scales.

Receptor	Impact	Primary or Tertiary Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Community cohesion / integration.	Effects on population change, community cohesion and integration.	None	Negligible **(Not Significant)** at all scales.	None	Negligible **(Not Significant)** at all scales.
Inter-relationship Effects – Operation					
Communities, community facilities and homes	No impact	None	Negligible	None	Negligible

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Appendix H Hinkley Point C Peak Construction Monitoring and Auditing Study

HINKLEY POINT C PEAK CONSTRUCTION: IMPACTS MONITORING AND AUDITING STUDY (2023-24)



Commissioned by the Local Government Association New Nuclear Local Authorities Group (NNLAG)

Impact Assessment Unit (IAU), School of Built Environment, Faculty of Health, Science and Technology, Oxford Brookes University

November 2024

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Foreword

The New Nuclear Local Authorities Group (NNLAG) is delighted to present this second study of impacts of the construction stage of Hinkley Point C (HPC) New Nuclear Build. As a follow-on by Oxford Brookes University from their initial study of early years construction of HPC in 2018/19, it provides a timely update and further insight into the practicalities of impacts monitoring, now that HPC is nearing peak construction. Much has happened in the nuclear sector of the UK over the last five years, not least the creation of Great British Nuclear, the development consent and commencement of Sizewell C, and the advancement of SMR technology, which is reflected in the study.

Nuclear power projects are unique in their complexity, scale and longevity, which means that changes from the pre-examination stage to implementation are inevitable. This study is important in its recognition of the difficulty in predicting all impacts of a large infrastructure project. This means strong and accurate monitoring, and an adaptive approach to impact assessment and mitigation, is essential for a smooth delivery of a project.

Learning from Hinkley Point C provides vital information for new nuclear sites that follow on – be it large scale, small modular or nuclear fusion projects. Many of the findings are also applicable to other major infrastructure projects, including all Nationally Significant Infrastructure Projects (NSIPs). There is not much research available about the implementation of NSIPs, so this study will hopefully further inform and shape the debate of what good implementation and monitoring of NSIPs should look like – as part of the Government's NSIP reform as well as for any individual project being developed in the country.

We hope that this document will be a useful reference point for local authorities, project promoters and their teams, and Government, be it for nuclear or other infrastructure projects, to better plan for and implement their projects in a way that maximises benefits and minimises negative impacts, to the advantage of all parties.

Cllr Richard Rout, Suffolk County Council, Chair of the New Nuclear Local Authorities Group, October 2024

About NNLAG

NNLAG is a Local Government Association (LGA) Special Interest Group is the UK's principal local authority forum for debate and the sharing of knowledge, experience and best practice on new nuclear developments. It consists of 10 Local Authorities from across the UK that already host or are likely to host nuclear new build projects: Anglesey County Council, Bassetlaw District Council, Cumberland Council, East Suffolk Council, Essex County Council, Folkestone and Hythe Council, Maldon District Council, Somerset Council, South Gloucestershire Council, and Suffolk County Council.

This study was funded jointly by four of its member organisations - Suffolk County Council, Essex County Council, Cumberland Council and East Suffolk Council – with in-kind support from Somerset Council, and is supported by all its members.

Executive Summary

The Aims of the Study

This study is the second study of the impacts of the construction stage of Hinkley Point C (HPC) New Nuclear Build (NNB), one of the largest construction projects in Europe. The first HPC study (IAU/NNLAG 2019) focused on the impacts of the early years of construction. The main aim of the second HPC study is to assess the actual socio-economic and biophysical impacts at peak construction (with peak as measured by the size of the workforce) and to compare those with predictions. The study also seeks to explain any differences, how they can be managed and provide recommendations for future planning and assessment processes. The report has three elements:

1. Review of implementation of HPC Study 1 recommendations
2. Refresh of HPC Sector Impacts for HPC Peak Construction
3. Examination of relevance for other nuclear and other NSIPs

1. Review of implementation of HPC Study 1 recommendations

The review of follow-up measures on the 2019 HPC Study 1 recommendations covers both actions to fill gaps in the HPC monitoring organisation and in data sources. In summary, there is continuing good availability and continuity of data on many key impacts of the HPC project primarily through EDF Energy (EDFE) reporting via the Socio-economic Advisory Group (SEAG) and the Transport Review Group (TRG), and through the various community fora. However, on some 2019 recommendations progress appears more mixed. For example whilst there appears to be progress on the organisation of the monitoring of accommodation and environmental monitoring, there is still little publicly available environmental data. There are also continuing limitations on the availability of disaggregated employment information from the six-monthly Workforce Surveys. Administrative issues, including the reorganisation of the Somerset authorities, which initially delayed the public availability of data, are now largely resolved.

2. Refresh of HPC Sector Impacts for HPC Peak Construction

This is the main section of the report. The refresh of the HPC Sector Impact Indicators uses the same three-step approach as in the early construction impacts HPC Study 1: impact identification, assembly of monitoring information for key indicators/KPIs and auditing of findings against targets. As for the initial 2019 HPC Study 1, this new peak construction study is also based on information and data that is already or can be made publicly available, to maximise its credibility and to allow NNLAG to make the study publicly available and utilise it as evidence in support of consultation responses/ evidence at examination for other projects. The main sources of such data for the refresh are again the quarterly reports of SEAG and TRG, plus the Minutes of the various community fora (Community, Site and Transport). The peak construction period to date, as defined by workforce numbers was the 2023-2024 period, although the peak is likely to run for longer, and probably even higher, for several more years. As for the first study, the main spatial scope of the local impacts assessment is the 90 minutes commuting time CDCZ (Construction Development Commuting Zone), and various local authority areas – although the various Somerset districts merged in the April 2023 reorganisation into Somerset Council.

An additional complexity to this study has been a major review, 2019-2022, by EDFE of the likely size of the peak construction workforce and associated socio-economic indicators (Uplift 1). This revealed that in order to maintain safety and quality standards and the construction programme, there was a need to increase the peak number of workers on site from 5,600 to 8,600**.** EDFE produced a set of six Uplift Topic Papers, covering the various sectors, to assess the local impacts of this uplift. The uplift papers are built into each of the report's sector refresh study; in some cases, there are revised indicator targets. There was a further complexity in 2024 with work by EDFE on another uplift plan (Uplift 2) that is likely to increase peak employment to over 12,000, with additional mitigations on the anticipated changes in accommodation, transport, health and other impacts. The detailed papers underpinning Uplift 2 were not publicly available at the time of this report and there is only limited coverage of possible impact implications.

The audited findings of the 2023-2024 peak period impacts have a similar overall pattern to those of the early construction stage, but with some changes of note as follows in Table E1. The colour coding system is the same as used for Study 1, as set out below:

DG	Predictions very accurate with actuals; fully compliant
LG	Most predictions are good, but with a few topic and/or time gaps, and inaccuracies; largely compliant
A	Mixed accuracy/with several topic and/or time gaps, and inaccuracies; only partially compliant
O	Prediction inaccuracies/gaps in many areas; very limited compliance
R	Prediction very inaccurate; non-compliant
B	No information available; auditing not possible at the time of the study

(NB: letters added to colours for black and white printing, and to aid those with colour reading issues)

Table E1: Summary of the audited findings of the 2023-2024 peak period impacts

Economic Development: good performance against many indicators including local employment content, training and education, apprenticeships, jobs brokerage, local supply chain inputs and tourism. Mitigation and enhancement measures also appear to be working well, including the very significant maintaining of the local content percentage as total numbers rise fast. Yet, on the other hand, the Uplift 1 predicted and very significant construction totals are badly out after only a very short period after the new predictions.	DG	O
Accommodation: findings on the spatial distribution of both No-Home Based (NHB) and Home –Based (HB) workforce appear improved against predictions, compared with the early construction stage. There is still some skew in the tenure mix towards the Private Rented Sector (PRS), but the increase in campus provision has been significant. The housing support strategy, and the resultant delivery of bedspaces, appear to be working well.	LG	A
Social and Community: continuation of good performance against many of the impact indicators. For health, the staffing growth of the on-site Medical Campus has supported well the growth in workforce. For community safety, mitigation measures, including the Worker's Code of Conduct appear to be working well in controlling crime, relative to workforce numbers. There are some possible issues with schoolchildren numbers becoming much higher than the original predictions.	DG	A

Transport: There is a continuation into the peak period of good performance against predictions for many transport indicators, including workforce journey by bus to the main site, and the freight Delivery Management System. More mitigation measures, including the jetty and more P&R sites, are also now in place. Less positively, the car share system to P&R sites continues to be less effective than predicted, and there is the continuing issue of fly parking.	DG	O
Biophysical and Environmental Health: It is good to see a new set of KPIs to be reported to a new Environmental Monitoring Group. However, as for the earlier study, the topics addressed in this section still lack the detailed publicly available impact data to complete an audit. It must be assumed that HPC environmental impacts are well regulated with monitoring mainly related.to any exceedances of standards and thresholds. However, there may be a need for additional monitoring in relation to potential impacts of a currently proposed material change.	LG	B

A number of factors influence such findings, some positively, others less so :

- *Positive factors* include the implementation of the transformational array of skill training measures, accommodation campus developments (including the Medical Centre), Park and Ride (P&R) and the site bus service, Workers Code of Conduct and community safety initiatives, and the implementation of many management plans and EDFE funding initiatives (including for housing and community impact mitigation).
- *Factors that are more negative* include the failure of Uplift 1 to anticipate the scale of the overlap between the Civils and Mechanical and Electrical phases of construction and the Mechanical, Electrical and Heating (MEH) worker requirements for future years. Monitoring and reporting of some impacts, especially some disaggregated workforce details and environmental impacts are sparse. The definitions of some indicators, especially '*what is a worker'*, are still under debate.

3. Relevance for Other Studies

Sizewell C and other NNB

The Suffolk local authorities' Local Impact Report (LIR) made good use of the findings of the 2019 HPC Study 1 as a basis for supporting arguments in the Sizewell C (SZC) examination and in recommendations and conditions in the SZC Development Consent Order (DCO). The Examining Authority also noted the importance of impacts monitoring for the SZC project, as developed in the DCO Requirements and Conditions, in various project construction Management Plans, and in the Planning Statement. Both the findings from the early study and this current study raise further considerations for the project governance of the SZC construction stage, such as: the need to revisit the SZC peak workforce predictions and to clarify the nature of an overall construction stage-monitoring plan. Others for example include the scope for independent auditing of project impacts; and the level of target for some indicators (e.g aiming higher still on local apprenticeships, female employment and skill training provision). Such findings are also relevant for other NNB, which may initially be for Wylfa on Anglesey.

Small Modular Reactors (SMRs)

There is considerable interest in SMRs as part of the future UK energy mix, and as a possible complement and/or substitute for large nuclear reactors (LRs) such as HPC and SZC. They have many claimed advantages, but also potential disadvantages compared with LRs. A standardised

design outcome will help progress, and offset some cost/time and risk concerns. Most impact literature on SMRs has focused to date on risk and safety issues. There seems to have been little work on other impacts, social acceptance, and community capacity issues. Whilst the nature of environmental impacts originating from SMRs or LRs may not differ greatly, and our findings are relevant, it is likely that there will be differences in magnitude. UK government consultation on new nuclear National Policy Statements (NPSs) beyond 2025 might provide the opportunity to include a more streamlined regulatory process and tests (e.g EN-6 lite) that could apply to SMRs and other advanced nuclear projects that are smaller in scale and impacts compared to the LR projects. It may also lead to some opening up of more potential nuclear power locations from the present eight named sites, but this should not weaken the consideration of essential biophysical and socio-economic impacts considerations.

Nuclear Fusion Projects

Operational nuclear fusion power station projects are much further in the distance in terms of contributing to the UK energy mix. However, the UK government is committed to building on the pioneering JET project research and in its latest 2023 strategy has set out a vision for UK fusion that is focussed not just on the UK's unique scientific and technical expertise, but also on commercialising that technology by developing a thriving UK fusion sector. The government has chosen West Burton in Nottinghamshire as the initial fusion power site. The government is also consulting on an NPS for fusion energy. The draft Fusion Energy Policy Statement (FENPS) promotes an open site policy that allows developers to identify, shortlist, assess, select and promote those sites which are best placed to meet the technical requirements of the specific fusion technology selected. It sets out a whole host of factors for consideration when siting a fusion station including, for example: flood risk, population densities, transport infrastructure and grid connection, but it currently fails to consider socio-economic impacts. As our research has shown, the consideration of such impacts is crucial for major energy projects, and new fusion will not be an exception.

4. Generic recommendations

These generic recommendations focus on the theme of this research -- that for an effective and efficient adaptive approach to impact assessment, good monitoring of actual impacts and auditing of these against predicted impacts are essential. Flowing from this, the research report recommends:

- A monitoring and auditing framework covering key socio-economic and biophysical indicators should be an integral, clear and easily identifiable element in each of the project Environmental Statement, Development Consent Order and in S106 agreements (as appropriate).
- In addition to covering socio-economic and biophysical impacts, it should cover key stages in the lifecycle of the project, and not just focus on peak construction.
- A clear set of KPIs agreed pre-application (primarily between the developer and local authorities) and easily located in the documentation, provide the essential first step to monitoring and auditing. It is important that key definitional questions, such as 'what is a worker,' are addressed at an early stage.
- Monitoring is a prime responsibility of the developer, in association with the local authorities, the community, and other relevant agencies. Formal data sharing agreements are recommended.
- Quantitative data should be collected on a consistent basis; there is a need to avoid potential bias in content from proponent–led data, and use should be made of community stakeholder knowledge and opinions, which may be qualitative in content.

- An independent body preferably provides the auditing of the monitoring information against predictions. Such auditing can provide a valuable check on findings and a neutral position between the various agencies involved in the project.
- All monitoring and auditing information should be publicly available, and 'published' on a regular basis in an agreed online format based on the initial monitoring and auditing framework. Annual Monitoring and Auditing reports are recommended.
- A rigorous approach to monitoring and auditing, involving primary information collection, can be resource intensive. A monitoring light and proportionate approach, using publicly available data and focussing on significant impacts, as in this latest HPC study, can provide a useful way forward, given developer and local authority co-operation.
- Findings from monitoring and auditing can provide the building blocks for any additional impact mitigation and enhancement measures, and updating of predictions in an adaptive assessment and management approach.
- Monitoring and auditing reports provide a vital resource for future major project developments in all their various sectors. There should be a repository for such reports (PINs re NSIPs—although recent activity not encouraging?)

List of Abbreviations used in the Study

AD	Associated Development
AMR	Advanced Modular Reactor
CDCZ	Construction Development Commuting Zone
CIM	Community Impacts Mitigation (fund)
CoCP	Code of Construction Practice
CTMP	Construction Traffic Management Plan
CWDS	Construction Workforce Development Strategy
CWTP	Construction Workforce Travel Plan
DCO	Development Consent Order
DMS	Delivery Management Strategy
EcoMP	Ecology Management Plan
EDFE	Electricite de France Energy
EIA	Environmental Impact Assessment
EMMP	Environmental Management and Monitoring Plan
EMQR	Environmental Monitoring Quarterly Report
EPSRC	Engineering and Physical Sciences Research Council
ES	Environmental Statement
ExA	Examining Authority
FENPS	Fusion Energy National Planning Policy Statement
FOAK	First Of A Kind
GW	Gigawatt
HB	Home based (workers)
HGV	Heavy Goods Vehicle
HMG	His Majesty's Government
HMO	Home of Multiple Occupation
HPC	Hinkley Point C
HTFG	Health Task and Finish Group
IAU	Impacts Assessment Unit
IMD	Index of Multiple Deprivation
IPA	Infrastructure and Planning Authority
JET	Joint European Torus
KPI	Key Performance Indicator
LGA	Local Government Association
LIR	Local Impact Report
LR	Large Reactor
LSOA	Lower Super Output Area (for IMD)
LWR	Light Water Reactor
MEH	Mechanical Electrical and Heating
MW	Megawatt
NHB	Non-Homed based (workers)
NHS CCG	National Health Service
NIC	National Infrastructure Commission
NIPA	National Infrastructure Projects Association
NNB	New Nuclear Build
NNLAG	New Nuclear Local Authorities Group
NPS	National Policy Statement
NSIPs	Nationally Significant Infrastructure Projects
ONS	Office of National Statistics
P&R	Park & Ride
PINs	Planning Inspectorate

PRS	Private Rented Sector
PWR	Pressurised Water Reactor
RAG	Read Amber Green (colour coding system)
SDC	Sedgemoor District Council
SEAG	Socio-economic Advisory Group
SMR	Small Modular Reactor
SRN	Strategic Road Network
SZC	Sizewell C
TA	Transport Assessment
TRG	Transport Review Group
UKAEA	United Kingdome Atomic Energy Authority

PART 1: CONTEXT

1. Introduction -- Aim and Scope of the Research

1.1 Aims of the Study

As in most aspects of life, we should learn from experience, and this is certainly the case for the environmental impact assessment (EIA) process. This is particularly so when we are dealing with the socio-economic and biophysical impact of Nationally Significant Infrastructure Projects (NSIPs), such as Nuclear New Build (NNB), where uncertainty and complexity are key features. Such major projects have long construction periods and much longer operational lives. Assessment should be an iterative learning process with monitoring and auditing of actual impacts as essential elements in the process over the project lifecycle. Monitoring involves the identification and measurement of actual impacts; auditing is the comparison of actual impacts with those predicted. Yet there is little experience in this area, as noted in a report by the National Infrastructure Projects Association (NIPA):

'There has been little research on the results of the effectiveness of the environmental monitoring and management during the construction of NSIPs. The sharing of the findings of monitoring could improve decision-making, could provide reassurance to communities for whom the anticipation of impact can be more daunting than the reality, and enable developers to improve environmental management practices' (NIPA 2019).

The report refers to the ongoing Oxford Brookes University Impacts Assessment Unit (IAU) research on HPC impacts monitoring and auditing to help to fill the research gap.

This study is the second study of the impacts of the construction stage of Hinkley Point C (HPC) NNB, one of the largest construction projects in Europe. The first HPC study (IAU/NNLAG 2019) focused on the impacts of the early years of construction. The aim of the second HPC study is to assess the actual socio-economic and biophysical impacts at peak construction (with peak as measured by the size of the workforce) and to compare those with predictions. The study also seeks to explain any differences, how they can be managed and provide recommendations for future planning and assessment processes. This project follow-up can be of great value for the more effective management of current projects and for consents and licenses for future projects.

The Oxford Brookes University IAU has undertaken both HPC studies. The IAU has a long research history of impact assessment of major energy projects, including the pioneering study of the construction of Sizewell B nuclear power station (Glasson 2005). As with the first HPC study, the New Nuclear Local Authorities Group (NNLAG) of the Local Government Association (LGA) has provided some funding support.

1.2 Scope

The work has a number of elements. ***The first element was to revisit the HPC Study 1 recommendations to assess how the project has addressed them***. The recommendations follow very directly from identified gaps in organisation, process and data. They relate primarily, but not exclusively, to the activities of EDF Energy (EDFE) as the developer. The extent of progress on some of the recommendations was dependent on work on refreshing the Red/Amber/Green (RAG) indicator ratings for the various impact sectors, including improving access to the availability of disaggregated employment information from the HPC Workforce Survey.

The second, and most important and substantial element in the research, was to revisit and to refresh the RAG indicator ratings, for a set of Key Performance Indicators (KPIs) across the topic areas. As per recommendations from the previous study, there should be a focus on a narrower set of key indicators drawing on HPC Study 1 findings; but a consideration of possible opportunities for any limited filling of any key identified gaps, as long as information is publicly available. There should also be more study of construction and operational stage employment impact as possible (jobs, training, opportunities, possible long-term impacts etc). The stage included the following steps:

- *An identification of set of key indicators/KPIs across the six sectors used in HPC Study 1 (i.e: economic development, transport, social and community, accommodation, environmental health and biophysical environment).*
- *Assembly of monitoring information on the indicators for 2023/24 peak construction employment, including trend data as available, using publicly available information.*
- *Auditing of indicator performance against KPI projections from relevant contexts (i.e. original ES, DCO and S106 documents, and more recent refresh of projections undertaken for EDFE in 2020/22 in relation to increase in projected peak workforce to 8500; new S106 etc). This should use the original HPC Study 1 RAG approach to allow comparisons over time*.

The main sources of data for the refresh are from the quarterly reports of the Socio-Economic Advisory Group (SEAG) and the Transport Review Group (TRG), plus the Minutes of the various Fora (Community, Site and Transport). There is some data on several key topics, including especially employment, transport, social and community, accommodation and a little on the biophysical environment. The transport and accommodation are improved and more in depth than for HPC Study 1 but there is still a lack of in-depth and publicly available information on several key economic indicators from the 6-monthly Workforce Surveys. As for the first HPC study, the primary spatial scope of the local impacts assessment is the 90 minutes commuting time CDCZ (Construction Development Commuting Zone), and various local authority areas – although the various Somerset districts merged in the April 2023 reorganisation into one Somerset Council.

A third, more limited element of the research, was to examine the relevance of the work to other likely NNB projects, especially the immediate Sizewell C (SZC), to more long-term emerging new nuclear technologies, and to other NSIPS. The SZC work explored the extent to which key documents, including the Local Impact Report (LIR) (Suffolk Councils 2020), the Sizewell C Environmental Statement (ES, EDF 2019) and the Examination Report and Development Consent Order (DCO) drew on some of the findings and recommendations of the earlier HPC Study 1. The work reports on both coverage of findings and recommendations for SZC proposals/requirements etc. It also adds any implications for SZC of the findings of this HPC Study 2.

The review of findings for potential other new nuclear technologies includes particular reference to SMR (small modular reactors), and nuclear fusion projects. The review draws on international and academic documentation on these emerging technologies, plus emerging proposals for implementation in the UK. A final review examines more generally any implications of the research for other NSIPs with major long-term construction periods**.** Reflecting the three main elements of the research, the report has three main sections:

1. Context

2. Refresh of HPC Sector Impacts for Peak HPC Construction

3. Relevance for Other Studies.

1.3 Research Parameters

The research uses and adapts as appropriate the same set of parameters as used for the initial early stage construction study (HPC Study 1 IAU/NNLAG 2019).

Key elements of the project*:* the study includes the impacts of the main site development, and also associated developments (especially accommodation campuses and transport projects), at peak construction in 2023-2024.

Impacts focus*:* the research identifies, monitors and audits key predicted impacts under the topic headings (economic development, traffic etc), including an assessment of good predictions as well as those falling outside predicted ranges, and unforeseen impacts.

Testable predictions*:* there is a focus on testable predictions, or statements of developer intent/requirements, rather than on general discussions of possible impacts.

Monitoring and auditing accuracy*:* for some predictions, auditing accuracy will be a matter of whether a requirement has been carried out in a timely manner; for others accuracy will involve an assessment of whether the actual impacts fall within predicted ranges, which will be specified as far as possible.

Publicly available information: as for the initial HPC Study 1, this study will also '*be based on information and data that is already or can be made publicly available, to maximise its credibility and to allow NNLAG to make the study publicly available and utilise it as evidence in support of consultation responses/ evidence at examination.'* There are degrees of public availability and, as appropriate and with provider's permission, the study seeks to add to the stock of relevant publicly available information.

Range of impact scales: impacts are audited across a range of spatial scales, as included in predictions. For example, noise impacts may be assessed at the level of local villages adjacent to the site and transport routes, other impacts may be district and/or county wide. Some impacts, such as employment, supply chain and traffic, may stretch much wider on a sub-regional and 90 minutes CDCZ (construction daily commuting zone) scale.

Baseline context: the disaggregation of project-related impacts from baseline trends can raise methodological challenges. Data will be available that indicate local trends in a number of variables, such as unemployment levels, traffic volumes and crime levels. However, there can be problems when we attempt to explain these local trends. To what extent are they due to (a) the construction project itself, (b) national and regional factors or (c) other local changes independent of the construction project? It may be straightforward to isolate the role of national and regional factors, but the relative roles of the construction project and other local changes may sometimes be difficult to determine.

A snapshot in time: this short study seeks to apply these parameters and criteria to a comprehensive set of key impacts for the peak construction stage of the HPC project, but in such a timescale the

focus will be on key strategic impacts. There is not scope for additional tailor-made studies to collect new data.

1.4 Research team

The IAU team comprised Prof. John Glasson (research lead and main author), Dr Bridget Durning (admin lead), and Visiting Prof. Martin Broderick (specialist inputs). The team wish to acknowledge the support of the NNLAG Steering Group, especially Michael Moll (Suffolk CC) and the officers from the Somerset Local Authorities, especially Joanna Whitehead and Andy Coupe, who have helped to identify and interpret various data sources.

2. Follow-up on HPC Study 1 Recommendations

The recommendations follow directly from the gaps identified in s5.4 of the earlier HPC Study 1 (IAU/NNLAG 2019). They relate primarily, but not exclusively, to the activities of EDFE as the developer. It is noted where other stakeholders should be involved. The section on the right of Table 2.1 provides a report on current responses to the issues raised in the 2019 report, set out on the left.

Table 2.1: Specific 2019 issues and current responses for HPC construction stage monitoring issues

	Issues raised in 2019 report	**Current responses in 2023/24**
Gaps in monitoring organisation and process	• There is a strong case for reviewing the operational effectiveness of the various monitoring groups feeding especially into the SEAG. For employment, this is already in hand, as outlined in the Construction Workforce Development Strategy (CWDS) and Implementation Plan (EDFE 2018), with plans to rationalise workforce- monitoring arrangements by assessing progress in three strategic themes: Employment, Skills, Apprenticeships and Young People. Associated with this should be a review of the utility of some of the current indicators/KPIs used in some of the various sectors (eg in accommodation). There is a need for an environment-monitoring group, and an improvement in the operation of the accommodation-monitoring group.	• Quarterly meetings of SEAG, with major membership from NNB Genco HPC, local authorities, NHS CCG, Avon and Somerset Police, Somerset Community Foundation and others, report on data across the main impact sectors. The sectors include Employment/ Skills/Supply Chain/Tourism, Transport, Accommodation, Health/Community Safety/Community Relations, and Environment data findings derived from meetings of various monitoring sub-groups. • The scope of the sub-groups appears to have improved since HPC Study 1, especially for Accommodation and Environment sectors. It is good to see the introduction of an Environment monitoring sub-group, as recommended. Since April 2023, local authority membership has shifted from Districts and Somerset County to the new Somerset Council authority. • TRG continues to operate efficiently as the formal group monitoring workforce travel and construction traffic activities. Major membership is again from NNB Genco HPC, Somerset LAs, and National Highways. TRG produces a quarterly monitoring report.

		• The various community fora – Community Forum, Transport Forum and Main Site Neighbourhood Forum – continue to meet quarterly and the minutes provide a valuable barometer of locally perceived issues.
	• An improved, full, transparent and publicly available Workforce Survey is needed to underpin better the auditing of many socio-economic impacts (again in hand, but needs to be fully and openly reported to SEAG). There may also be a case for reviewing the content and management of the onboarding (worker induction) survey.	• There is a Workforce Survey every six months (December for Winter Survey and June for Summer Survey) with results analysed and disseminated by EDFE primarily via SEAG meetings. It is good to see more information on the sample/confidence basis of the survey, plus some additional workforce information – including age and gender information, time worked on project, employment by contractor, in addition to detailed information on accommodation (including Non –Home Based [NHB] families) and on Transport and Travel. However, the full scope of the survey and its findings is still unclear, nor is it clear whether a full and transparent Workforce Survey is publicly available. There is no information on the scope of the onboarding (worker induction) survey.
	• Some Economic Development data (eg on impact of HPC construction on employment in local firms) is more qualitative. A survey would help. Other topics may also benefit from some tailor-made survey activities at intervals during the construction period. This may involve adding in new questions to the Workforce Survey).	• The Socio-Economic Impact reports (2022, 2023) produced by EDFE provide some overview information on the important supply chain impact of the project on local and regional SW firms. However, it is unclear whether this information involved a local firm survey dimension.
	• There is a need to pick up the evolution of various socio-economic issues (eg local accommodation tenure, community safety) as the site workforce builds up to peak, and the Bridgwater Campus accommodation becomes more fully used.	• The data reported to SEAG, especially on accommodation, does pick up various evolving socio-economic issues. The impact of the build up to peak construction employment is set out in the refreshing of KPIs in subsequent sections of this report. The accommodation data includes the build-up in use of the Bridgwater and other Campuses and implications for other accommodation tenure groups, especially the Private Rented Sector (PRS).
Gaps in monitoring data	• The monitoring system is not delivering enough accurate and *disaggregated employment information*, especially on local content by skill category and by	• There is no publicly available information from the Workforce Survey on local employment by skill category. As such, it is not possible to assess whether local people are gaining some of the most

	disadvantaged and under-represented groups (see organisational recommendation above).	skilled jobs, and whether local training initiatives are opening up opportunities to such jobs. Is such information collected in the Workforce Surveys, as recommended here, and as set out by the Joint Councils in discussions on the revised peak workforce in the 2020/21 version of Workforce Uplift papers (April 2021)*? **Breakdown of output from workforce survey to provide:* • *Worker type (Civils; MEH; Professional / Management; Operational; Site Services)* • *Ratio of HB to NHB by worker type* • *Age Profile of the workforce* • *Gender of the workforce* • *Ethnicity of the workforce* • *Workforce reporting a disability* • *HB and Somerset breakdown of the total workforce*
	• Similarly, there is a lack of *disaggregated data on supply chain impacts* in Somerset and districts (see organisational recommendation above).	• There is information reported to SEAG on local business registrations by former Districts, but not on value of contracts by District. In contrast, the annual Socio-Economic Impacts Reports (see EDF 2023, 2024) do provide useful summary supply chain information for UK regions/nations – including for each: the number of companies building HPC, number of jobs expected to be supported and the projected economic value to the region.
	• Various omitted transport issues need to be monitored, and reported to the TRG, including: fly parking, EURO IV (exhaust emissions), deflectograph road condition surveys, increased delay to local drivers and reduced highway capacity, bus passenger movements to site, LGV movements, and take-up of traffic noise insulation scheme. A bulk delivery materials plan should be submitted to LAs by developer before temporary jetty operational	• The Transport Review Group Quarterly Report provides very detailed information on bus and other modes of travel between the various P&R sites, the Main Site and various Associated Development sites. It also provides detailed information on freight traffic movements. There is close monitoring of the ongoing fly parking issue.
	• The data on accommodation is fragmented, limiting effective auditing and monitoring. Targets need to be clarified and data reporting needs to be full and regular. Monitoring the use and users of the accommodation campuses provides a straightforward data opportunity.	• There appears to be improved monitoring and regular reporting of accommodation data, including tenure type numbers of NHB workers by administrative areas, and various housing funding initiatives.

	• Is the wellbeing of the communities local to HPC being adequately monitored (especially the impacts on the older residents), and is the Community Impacts Mitigation (CIM) fund effectively responding to project impacts on local wellbeing? (also LA issue)	• Over £15m of the £20m CIM fund is now allocated. There is a wide mix of projects targeted across various age groups in the local community, with many responding to local wellbeing issues.
	• There is a need to update some relevant contextual LA and central government indicators (eg IMD, fear of crime, housing affordability) which are not available until mid-2019 onwards (also LA issue).	• This is now possible as now have 2019 IMD information that covers the early years of HPC— although not the peak. The various IMD domains in relevant sectors – e.g. transport and health — are covered in the sector studies.
	• There is a major absence of *publicly available* information on environmental health and biophysical environmental impacts. Data collected by various stakeholders (especially EDFE and the LAs) should be publicly reported as part of the monitoring and auditing process (also LA issue).	• There is some improvement with a new Environmental sub-group and improved reporting of environmental monitoring. However, as for the earlier study, the topics addressed in this sub-group still lack the detailed publicly available impact information needed to complete an audit.

In summary, whilst there is continuing good availability on much impacts monitoring data through EDFE reporting via SEAG and TRG, progress on the 2019 recommendations appears mixed. For example whilst there appears to be some progress on accommodation and environmental monitoring, there are continuing limitations on the availability of disaggregated employment information from the Workforce Survey. Administrative issues, including the reorganisation of the Somerset authorities, initially delayed the public availability of data.

PART 2: REFRESH OF SECTOR IMPACT INDICATORS FOR PEAK HPC CONSTRUCTION

3. Introduction

The refresh of the HPC Sector Impact Indicators uses the same three-stage approach as in the early construction impacts study (HPC Study 1, IAU/NNLAG 2019): impacts identification, assembly of monitoring information for key indicators/KPIs and auditing of findings against predictions. As for the initial 2019 study, this new peak construction study is based on information and data that is already or can be made publicly available, to maximise its credibility and to allow NNLAG to make the study publicly available and utilise it as evidence in support of consultation responses/ evidence at examination. The main sources of such data for the refresh are again the quarterly reports of the Socio-Economic Advisory Group (SEAG) and the Transport Review Group (TRG), plus the Minutes of the various Fora (Community, Site and Transport). These were all previously publicly available on the Sedgemoor DC website, but availability there lapsed a little in mid-2022, possibly because of staffing pressures, and partly because of pending Somerset local authority reorganisation. However, via the good offices of staff at the new Somerset Council, much data subsequently became available. They continue to be available on EDFE's dedicated HPC website. As for the first study, the main spatial scope of the local impacts assessment is the 90 minutes commuting time CDCZ (Construction Development Commuting Zone), and various local authority areas – although the various Somerset districts merged in the April 2023 reorganisation into Somerset Council.

An additional complexity to our analysis this time around has been a major review, 2020-2022, by EDFE of the likely size of the peak construction workforce and associated socio-economic indicators (Uplift 1). **The indicator update followed from an EDFE '*internal review of the project in 2019 that revealed that in order to maintain safety and quality standards and the construction programme, there was a need to increase the peak number of workers on site from 5,600 to 8,600'*.** EDFE produced a set of six Uplift Topic Papers, covering the six sectors of this and previous reports, to assess the local impacts of this uplift. The conclusions of the review revealed that in order to maintain safety and quality standards and to maintain the programme, the number of workers at the peak of construction would need to increase above the number that was originally assessed within the Development Consent Order (DCO) application. The review highlighted that there would need to be a greater overlap between the Mechanical Electrical and Heating (MEH) and Civils phases of the project and that the number of support and professional/management roles based at the HPC site would be significantly above the number anticipated in the DCO application. The various uplift papers are built into each of this report's sector refresh studies. In some cases, they introduce revised targets; where not, the default position is the original targets/KPIs.

As for the 2019 HPC Study 1, this peak construction indicator refresh includes three key steps for each sector:

-- An identification of set of key indicators/KPIs.

-- Assembly of monitoring information on the indicators for 2023/24 peak construction employment, including trend data as available, using publicly available information;

-- Auditing of indicator performance against KPI projections from relevant contexts (i.e. original ES, DCO and S106 documents, and more recent refresh of projections undertaken for EDFE in 2019/22 in relation to increase in projected peak workforce to 8500; new S106 etc). This should use the original HPC Study 1 RAG approach to allow comparisons over time.

In addition to comments on each impact issue indicator, we have applied a very simple colour code audit (RAG system) as used in the 2019 HPC Study 1 report, ranging from Dark Green (very accurate/compliant), through Amber to Dark Red (very inaccurate/non-compliant). A blue colour coding indicates 'No Information Available' yet. In undertaking the refresh, the progress of any measures or governance proposals implemented since the original study are assessed along with any particular issues that have come up since 2019 and which were not considered in the original study.

There was a further complexity in 2024 with work by EDFE on another uplift plan (Uplift 2). This is likely to increase peak employment to over 12,000, and the length of the peak, with additional mitigations on the anticipated changes in accommodation, transport, health and other impacts. The detailed papers underpinning Uplift 2 were not publicly available for this study, but some likely assessments of implications are included in Section 9 of this report.

4. Refresh RAG Indicator Ratings: Economic Development

4.1. Context: Strategic Issues and Indicator Update

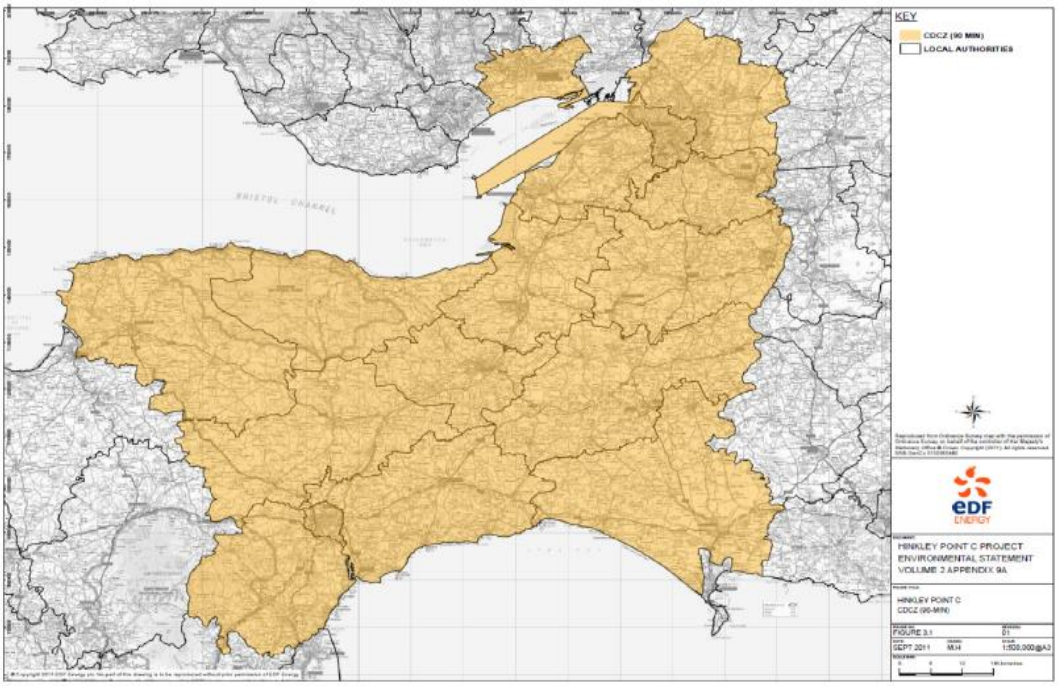
The economic development section focuses on HPC peak construction employment, skills and supply chain impacts and issues. Many local and regional impacts flow from the extent of the local content of construction employment. Home-based (HB) construction workers already have accommodation and ongoing interactions with a whole range of local services (e.g. schools, doctors). In contrast, Non Home-based (NHB) workers place new demands on local accommodation and other services. Local suppliers to the project can have a multiplier effect on local and regional benefits of the project, but there may also be some issues including job displacement from local firms and wage inflation.

The report draws on a range of sources. Our 2019 HPC Study 1 Report on the impacts of early stage construction sets out the sources of key indicators/KPIs. This new peak construction report updates these with information from a set of Topic Papers prepared for the 2021-22 Uplift Study (EDFE 2022). Other key sources of monitoring information are the various reports of SEAG and TRG, supplemented by information from the various community fora, and from other sources such as the Index of Multiple Deprivation (IMD) and local authority data (e.g. Sedgemoor Annual Monitoring Report). Whilst the focus is on publicly available information, we have benefitted from contacts with a number of local authority and EDFE staff.

The Workforce Development Topic Paper (EDFE Feb 2022) sets out some revised objectives and targets for overall peak employment (averaging 8600 over peak period, with c38% HB recruitment), and some revised detailed figures for training, job services, apprenticeships, recruitment from underrepresented groups (e.g. 1 in 5 per outreach intervention), worker retention and others. The Supplemental Agreement to the S106 (NNB Generation Company HPC March 2022) refers to the revised Topic Paper and notes, for example, additional opportunities for local workers and to expand and diversify activity including supporting hard to reach groups to get back to work, plus maximising the benefit of the Hinkley Supply Chain.

However, many of the original indicators/KPIs will continue as the default position where there is no indication of revision of targets. Similarly, the Uplift Topic Paper uses the same CDCZ spatial base which represents the 90-min maximum commuting zone of local Home-Based (HB) workers (See Figure 4.1). Non Home-Based (NHB) workers originate from outside this zone, although they will almost wholly live within this zone during the duration of their time on the project and largely within a 60-min commute zone, during the duration of their time on the project.

Figure 4.1: Hinkley Point C CDCZ



4. 2. Monitoring Findings

Preamble:

A key source of economic development information is the bi-annual Workforce Survey undertaken by an independent market research company. Respondents are encouraged to complete the survey online. The response rate varies; for example, for winter 2022 the sample was low at about 24% of the site workforce with a confidence limit of +/- 2.57%. This was a reduction on previous years, for example for winter 2021 the sample was about 45% with a confidence limit of 1.76%. EDFE provides a short summary of some of the key socio-economic indicators for SEAG and TRG; this approach does exclude some relevant economic development findings – as noted below. Table 4.1 sets out findings and trends in monitoring data on indicators/KPIs.

Table 4.1: Monitoring data on Economic Development indicators/KPIs

Issue	Indicators/KPIs	Findings/trends	Source and comments
Economic Development: Employment/recruitment and skills/training			SEAG from Workforce Survey—except where noted

Size of construction workforce	8600 at peak (Uplift 1 paper)	2021 (Sum) -- 6199 2021 (Win) -- 6656 2022 (S) – 7875 2022 (W) – 8221 2023 (S) – 9789* 2023 (W) -- 10590* 2024 (S) -- 10262* *Based on a worker 5-day rule: be 'working' at HPC Site; not merely visiting, AND have been at Site on at least 5 separate days in the 30 day monitoring period AND have been at Site for at least 37.5 hours in the 30 day monitoring period ' which gives slightly higher figures.	Plus TRG
% CDCZ HB content	Amended to 38% at peak (CDCZ)	CDCZ 2022 (S) – 36% 2022 (W) –35% 2023 (S) – 36% 2023 (W) – 34% 2024 (S) – 35%	
% of workforce with families	% and numbers; prediction 9%	2021 (W) - 9% 2022 (W) – 12% 2023 (W) – 12% 2024 (S) -- 11%	
% and numbers of workforce previously unemployed	8% original target	Jan 2019 was only 1.9%; recent data in 2024 (S) indicates 2.8%. A further 3% of the workforce started work at the site straight from FT or PT education. Contextual data: Somerset unemployment rate for 2022 (Jan to Dec) was 2.9%; GB was 3.6%. Approx 15% of those registering with HPC Job Service are unemployed. HPC is helping young people stay and thrive in Somerset. The local area has seen a 25% growth in young people aged 25-39 - three times greater than the national average (2011-2022).	S106 SCC Report for HPC Education, Employment and Skills 2024 EDFE HPC Socio-economic Impact Report
% and numbers of female workforce	8% original target	2021 (W) – 14% 2022 (W) – 13% 2023 (W) – 13% 2024 (S) -- 13%	
Age profile of workforce	Indicator – profile is a factor influencing impact on various services	Recent workforce surveys (S&W 2023 and S 2024) show a construction site age profile of approx: <35 -- 40% 35 -54 -- 45% >54 -- 15%	
Ethnicity of the workforce		2024 (S) Overall, workforce is approx 82% White (64% White British); 9% Asian/Asian British; 3% Black/Black British, 3% of mixed background and 3% other ethnic groups. This distribution is similar to UK population as a whole (but UK is 74% White British).	
Numbers of apprenticeships; including gender mix	Initial target was 400; then revised to 1000	2021 (Q4) -- 922 2022 (Q3) – 1101 2023 (Q3) – 1200 2023 (Q4) – 1300 (18% female) 2024 (Q2) – 1364 (19% female) Approx 65-70% of apprentices are local (in 90 min CDCZ)	
Job categories for home-based workers.	*Numbers and % total by category for various skill types*	EDFE 13 April 2021 agreed, in an Uplift Monitoring Information Paper, to provide more monitoring information on Workforce from 6-monthly surveys to include:	*Data not available -- dependent on EDFE*

% and numbers of total workforce from vulnerable and disadvantaged groups.	*EDF and contractors equality policies –to employ diverse workforce with focus on gender, ethnicity and disability*	• Worker type (Civils; MEH; Professional / Management; Operational; Site Services) • Ratio of Home-Based to Non-Home-Based by worker type • Ethnicity of the workforce • Workforce who are reporting that they have a disability Only the following additional data is reported: • Home Based and Somerset breakdown of the total workforce • Age profile of the workforce • Gender of the workforce • Ethnicity of the workforce	
Recruitment through Job Brokerage scheme	No specified targets	2019 (Apr) -- 759 2022 (Feb) –1403	
Registrations on Jobs Service system (cumulative)	No specified targets	2019 (Jan) – 15,150 2022 (Nov)—16,014 2023 (Mar) ---16,255 c50% within 90 min CDCZ	
Delivery of local training and skill development programmes	Wide array of programmes	Wide range of programmes: e.g. - Hinkley Support Operative (HSO) Programme (11% female) - Centres of Excellence (e.g Welding). More than 8 000 trained in the various Centres - Young HPC - Occupational traineeships	2022, 2023 and 2024 EDF HPC Socio-economic Impact Reports
Develop new and relevant pipelines from education to employment	*Wide array of training and educational initiatives; with financial commitments (e.g. completion of HSO programme)*	By end of 2021 £24m invested directly into education, skills and employment initiatives, primarily in Somerset/SW.	2022 and 2023 EDF HPC Socio-economic Impact Reports
Impact on local multiple deprivation Issues (economic)		Now have 2019 IMD to compare local findings with earlier 2015 IMD, but does not overlap HPC peak employment. The % of Somerset Lower- layer Super Output Areas (LSOAs) in 20% most deprived in England in the Employment domain increased from 6.7% to 11.3% between 2015 and 2019.	Somerset Intelligence English Indices of Deprivation (2019 Somerset Summary)
Economic Development: Supply Chain			
Somerset and regional supplier registrations	Not stated	Somerset 2021 (W) - 2208 2022 (W) – 2226 2023 (S) -- 2990	Other SW region 2021 (W) - 1775 2023 (S) – 2358
Number and value of contracts awarded to Somerset and wider SW	£1.5bn for SW region	2021 (Dec)-SW (inc Som) -£3.5bn agg 2022 (Dec)-SW (inc.Som)- £4.1bn agg 2023 (Dec)- SW (inc Som) -£5.3bn agg Estimated £7.3bn by end of construction.	2022 and 2023 EDF HPC Socio-economic Impact Reports; some data

region companies		2021 – 350 businesses in Sedgemoor and West Somerset in HPC supply chain, with projected £500m spend	from EDFE interactive map
Number and value of contracts awarded to companies in other UK regions and nations	Number of companies building HPC, number of likely supported jobs and projected economic value to the region and UK. Original target 57% value to UK.	By end of 2021, 22000 UK jobs, in 3800 businesses supported (with c1400 in SW region). Value of HPC contracts to UK economy of £18bn with 64% of value going to UK companies.	2022 and 2023 EDF HPC Socio-economic Impact Reports
% tourism business confidence; total digital media hits	35% baseline	Was above baseline at 46% in Dec 2018. Lack of recent confidence data. However, tourist perception data -- Survey of impact of HPC on Somerset tourism (2023) indicated that over 90% of tourists not affected by HPC construction activity. But local micro-economic impact of conversion of former Brean Sands tourist venue to temporary HPC workforce campus.	(Qa Research 2023)
Lift and shift implications of movement of non-unique businesses and workers from HPC to SZC	No specified targets.	Some limited reference to worker (including apprentices) movement from HPC to SZC – although premature as SZC funding not finalised (early 2024). Jobs Service registrations now include SZC, with 663 by Mar 23. Considerable local authority interaction between Somerset and Suffolk on impacts and their management.	

4.3. Auditing of Findings

Preamble:

In addition to comments on each impact issue indicator, we have applied a very simple colour code audit (RAG system) as used in the 2019 report, ranging from Dark Green (very accurate/compliant), through Amber to Dark Red (very inaccurate/non-compliant). A blue colour coding indicates No Information Available (NIA) yet. Table 4.2 provides an audit of actual against predicted economic development impacts.

Table 4.2: Audit of actual against predicted Economic Development impacts.

Impact Issue Indicator	Commentary on actual vs predicted impacts Commentary on performance in relation to objectives and targets (as available)	Summary RAG colour coding
Economic Development: Employment/recruitment and skills/training		
Size of construction workforce	Total site workforce figure in the Winter of 2023 is 25% above the predicted peak of 8600. The 5-day rule data gives a higher figure. Whilst these are the key site figures, there are some additional off site workers including campus accommodation, operational and some management staff. In total, there may be c1000 others located primarily locally.	O
% CDCZ HB content	CDCZ HB figure of 34-36 % is close to prediction; very positive given the substantial growth in the total workforce.	DG

% of workforce with families	Recently 11-12% of total. Percentage figure rising with MEH stage and buildup of operational workforce. Over 1000 staff with families is significant re impacts on accommodation, education, health services etc.	LG
% and numbers of workforce previously unemployed	Limited information, but in total, recruitment from unemployed plus those straight from education is about 6%.	A
% and numbers of female workforce	Good level of female employment. Well above original default figure.	DG
Numbers of apprenticeships; including gender mix	Excellent performance and already well above aspirational target of 1000. Female 18-19% is above female % employment on the site.	DG
Job categories for HB workers; % and numbers of total workforce from vulnerable and disadvantaged groups	No information available	*B*
Recruitment through Job Brokerage scheme (cumulative)	Cumulative total has almost doubled in last three years. This is better than the London Olympics job brokerage scheme that placed c1250 people in total over life of that construction project.	DG
Registrations on Jobs Service system (cumulative)	Maintaining a good level of registrations, but little cumulative growth over last three years; but may be due to registration/job churn and tightening labour market.	DG
Delivery of local training and skill development measures	Continuation of wide range of training and skill development initiatives, underpinned by substantial financial commitments by EDFE. Take-up appears to be good. New training places (30,000 to completion) available to meet demands of peak construction. New Centres of Excellence – Mechanical Engineering, Welding and Electrical.	DG
Develop new and relevant pipelines from education to employment	Continuation and development of school engagement initiatives; Bridgwater and Taunton College partnership with the project.	**DG**
Reduction in local economic deprivation indices	Review of IMD for localities in West Somerset and Sedgemoor near to the HPC site do not show any overall improvement in deprivation rankings nationally between 2015 and 2019. This period only includes early construction so not good indicator for peak construction.	A
Economic Development: Supply chain		
Somerset and regional supplier registrations	Continuing high level of registrations.	DG
Number and value of contracts awarded to Somerset and wider SW region companies	Performance far exceeds, indeed trebles, the original predicted £1.5bn value of contracts for SW region. Could still do with better publicly available information on local contracts.	DG

Number and value of contracts awarded to companies in other UK regions and nations	With 64% of value of HPC contracts likely to go to UK companies, HPC appears to be providing positive economic impacts across the UK economy.	DG
% tourism business confidence; total digital media hits	Survey of impact of HPC on Somerset tourism (Qa Research 2023) indicated that over 90% of tourists not affected by HPC construction activity. However, some specific concern about impacts of project use of Brean Sands accommodation on local tourism in that area.	LG
Lift and shift implications of movement of non-unique businesses and workers from HPC to SZC?	Implications of potential electric car battery factory being located in Bridgwater may provide, in the longer term, local opportunities for ex-HPC construction workers and linked businesses. Re Sizewell shift --- Job Registration Scheme now includes growing number interested in SZC	LG

5. Refresh RAG Indicator Ratings: Accommodation

5. 1. Context: Strategic Issues and Indicator Update

The accommodation of the NHB workforce and the implications for local accommodation markets have constituted some of the most significant socio-economic impact issues in the planning and management of HPC in the local community to date. The original accommodation strategy suggested a distribution of the NHB workforce (then estimated to be 3,700 workers at peak) between five types of accommodation:

- Campuses;
- Private Rented Sector (PRS);
- Owner Occupied;
- Tourist; and
- Latent Accommodation – including spare rooms and previously un-rented properties.

Issues raised in our earlier HPC Study 1 report included, in particular, impacts on the PRS and the location of those impacts, with a much larger impact on the Bridgwater area than predicted in the ES and DCO. Important mitigation measures included the provision of two purpose built workforce campuses, although only the Site Campus was operational at the time of the previous HPC Study 1 report. The Bridgwater Campus has subsequently opened, recently followed by the Brean Sands Campus based in the pre-existing Pontins self-catering tourist venue. There have also been numerous local housing market support initiatives by EDFE as set out in the DCO accommodation strategy and Section 106 agreement.

As with the Economic Development sector, the accommodation sector study draws on a range of sources. Our 2019 HPC Study 1 Report on the impacts of early stage construction sets out the sources of key indicators/KPIs. This new peak construction report updates these with information from topic papers prepared for the 2021-22 Uplift Study (EDFE 2022). Other key sources of monitoring information are the various reports of SEAG and TRG, supplemented by information from the various community fora, and from other sources such as the Index of Multiple Deprivation (IMD) and local

authority/housing market data (e.g. Sedgemoor Annual Monitoring Report and Somerset Intelligence). However, many of the original indicators/KPIs will continue as the default position where there is no indication of revision of targets.

The HPC Workforce Uplift – Updated Accommodation Topic Paper (EDF 2022) sets out the factors considered for a set of revised peak accommodation impacts predictions for an increased peak NHB workforce of 5090. It draws on a NHB spatial distribution analysis (Spatial Distribution Note [SDN] EDF 2022) that influences the potential impacts on the housing market. Relevant factors include the location of the existing workforce, the type of accommodation the workforce is staying in, the availability of accommodation and the likely makeup of the workforce. In summary, the prediction is for the increased workforce to continue to locate closer to the HPC site than was originally anticipated in the ES and DCO.

Table 5.1 sets out the revised predictions for housing tenure types, compared with those in the original DCO, informed by the 2021 Workforce Survey results. The 38% HB peak is the one adopted by EDFE. The distribution includes two important strategic interventions increasing the capacity of campuses and investment in caravan parks used by HPC workers—together totalling about 950 extra bedspaces The table also sets out the predicted PRS+Latent accommodation distribution for local areas in Somerset. The indicative geographical distribution of the PRS and latent workforce uses the 60-minute commuting zone as used in the previous HPC NHB workforce impact analysis.

Table 5.1: The revised predictions for housing tenure types, compared with those in the original DCO, informed by the 2021 Workforce Survey results (Source: EDFE Uplift Accommodation Topic Paper 2022)

		DCO (Peak)	Latest Survey (May 21)	Revised SDN (Peak) (38% HB)	Revised SDN (Peak) (34% HB)
Total Workforce		5,600	6,200	8,210	8,210
HB		1,900	1,980	3,120	2,790
NHB		3,700	4,220	5,090	5,420
NHB in Project Campus and Caravans		1,450	1,480	2,380	2,380
Residual NHB		2,240	2,740	2,710	3,040
Residual NHB in PRS or Latent		1,150	1,920	1,760	2,020
PRS + Latent	Bridgwater	250	1,410	1.090	1,250
	Burnham & Highbridge	100	60	50	70
	Cannington	50	80	230	260
	Cheddar	20	-	-	-
	Glastonbury	20	-	-	-
	Hinkley Point	10	100	90	90
	Minehead	50	10	-	-
	Somerset South	30	-	10	10
	Somerset West	10	-	-	-
	Taunton	250	250	230	270
	Watchet & Williton	70	10	40	50
	Weston-Super-Mare	290	10	20	20

Table 5.2: Predicted tenure distribution for NHB workforce at peak (38% HB workforce scenario) (Source: EDFE Uplift Accommodation Topic Paper 2022)

Accommodation type	**Predicted % of total at peak**	**Numbers**
PRS and Latent	38	1780
Campuses	39	1915[1]
Tourist etc	19	1135[2]
Owner Occupier	4	260
Total	100	5090

[1]Includes extra 480 bedspaces at the existing Campuses plus Pontins at Brean Sands (+800?). [2] Includes extra 470 Caravan Site bed spaces at Quantock Lakes (Nether Stowey), Moorhouse Farm (Holford) and Mill Farm (Fiddington).

5. 2. Monitoring Findings

Table 5.3: Monitoring data on Accommodation indicators/KPIs

<table>
<tr><th>Issues</th><th>Indicators/KPIs</th><th>Findings/Trends</th><th>Sources and Comments</th></tr>
<tr><td colspan="4">Workforce accommodation</td></tr>
<tr><td>Mix of accommodation tenure types in 60 min CDCZ at peak for NHB workers</td><td>% predicted distributions
<table><tr><th>Accom. type</th><th>Predict % of total at peak</th><th>Number</th></tr><tr><td>PRS and Latent</td><td>35</td><td>1780</td></tr><tr><td>Camp</td><td>38</td><td>1915</td></tr><tr><td>Tourist etc</td><td>22</td><td>1135</td></tr><tr><td>Owner Occup</td><td>5</td><td>260</td></tr><tr><td>Total</td><td>100</td><td>5090</td></tr><tr><td></td><td></td><td></td></tr></table></td><td>Actual for period 2021 to 2023
<table><tr><th>Accom. type</th><th>W/ 21</th><th>S/ 22</th><th>W/ 22</th><th>W/ 23</th></tr><tr><td>PRS and Latent</td><td>39</td><td>53</td><td>52</td><td>45</td></tr><tr><td>Camp</td><td>47</td><td>29</td><td>28</td><td>34</td></tr><tr><td>Tourist etc</td><td>10</td><td>14</td><td>15</td><td>14</td></tr><tr><td>Owner Occup.</td><td>4</td><td>4</td><td>4</td><td>6</td></tr><tr><td>Total</td><td>100</td><td>100</td><td>100</td><td>100</td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr></table></td><td>Accom. Uplift 1 Paper -- allowing for 479 new campsite plots, plus Brean Sands Campus to take up to 900.</td></tr>
<tr><td>PRS (incl.Latent) accommodation by District and Ward Clusters</td><td>Predicted % distributions
<table><tr><th>Previous District</th><th>Nos</th><th>%</th></tr><tr><td>Sedgemoor</td><td>1320</td><td>74</td></tr><tr><td>W. Somerset</td><td>130</td><td>7</td></tr><tr><td>Taunton Deane</td><td>250</td><td>14</td></tr></table></td><td>Actual for period 2021 to 2024
<table><tr><th>Previous District</th><th>W/21 Nos</th><th>W/22 %</th><th>W/23</th><th>S/24</th></tr><tr><td>Sedgemoor</td><td>71 (1163)</td><td>69 (1925)</td><td>67 (2121)</td><td>66 (1847)</td></tr><tr><td>W. Somerset</td><td>6</td><td>9</td><td>6</td><td>5</td></tr><tr><td>Taunton Deane</td><td>17</td><td>17</td><td>22</td><td>21</td></tr></table></td><td>EDFE Uplift 1 Accom. Topic Paper, and SEAG and Workforce reports.</td></tr>
</table>

	North Somerset and Others	80	5		North Somerset and Others	6	5	5	8
	Total	1780	100		Total	100	100	100	100
	Of which in following ward clusters				Of which in following ward clusters				
	Bridgwater	1110	62		Bridgwater	1712	61	55	39
	Taunton	240	14		Taunton	472	17	22	31
	H. Point	80	4		H. Point	218	8	3	4
	Cannington	230	13		Cannington	130	5	6	6
	Others	120	7		Others	153	9	14	20
	Total	1780	100		Total	2685	100	100	100
Numbers and distribution by Districts of NHB workers with families									

District		S/23	W/23
Sedgemoor		46	59
Taunton Deane		34	29
W. Somerset		6	1
Others		14	11
Total		100	100

Numbers and distribution by Districts of HB workers

Predicted % distributions
1. From Council's 2012 Somerset only predictions; 2. From 2022 Uplift Spatial Distribution predictions

Previous District	% 1	% 2
Sedgemoor	47	46
W. Somerset	9	8
Taunton Deane	16	12
Other SW and others	28	34
Total	100	

Actual % distribution 2021-2023

Previous District	W/21 %	W/22 %	W/23 %
Sedgemoor	42	44	41
W. Somerset	8	8	8
Taunton Deane	11	9	12
Other SW and others	39	39	39
Total	100	100	100
(Number)	(2384)	(2868)	(3574)

Local housing market impacts

Implementation of EDF local housing support strategy	Funding drawn down and bedspaces produced against targets, total site preparation s106 contributions (DCO funding) including Housing Contingency Funding) targets: -- Sedgemoor: c£2.7m -- SW&T :c£1.6m New bed spaces delivered in the PRS (Site Prep Funding) --Sedgemoor target: 1249 --West Somerset:250 New bed spaces delivered in the PRS (DCO funding including Housing Contingency Funding) -- Sedgemoor target:351	Cumulative total delivered by Q3/23: --Sedgemoor: c£2.6m --SW&T: c£1.3m Cumulative total delivered by Q3/23: --S : 1406 --WS: 360 Cumulative total delivered Q3/23: --S: 912 --WS&T: 462	SEAG Accom. Dashboard

	-- West Somerset & Taunton: 510 -- N. Somerset:359 Overall additional bedspaces anticipated at peak: now 3900 (1000 estimated at peak in original accommodation strategy)	--NS: 718	
Impacts on local vulnerable groups	Trends in homeless acceptances Households in temporary accommodation	Households assessed as homeless per 1,000 households has grown by 4 households per 1,000 between 2018/19 and 2020/21 in Sedgemoor compared to 2 per 1,000 nationally Sedgemoor: 19/20 – 2433 20/21 – 2731 21/22 – 2227	Accom. Uplift Paper (EDFE 2022) DLUHC
Impacts on local house prices		Based on lower quartile house prices divided by residence-based earnings, the affordability gap has been getting wider, proportionately, at local and national scales, but Sedgemoor and Somerset West and Taunton remain more affordable than the national and regional average. The Sedgemoor ratio has increased from c8 to c9 over the construction period to date.	Accom. Uplift Paper (EDFE 2022)
Growth in number and % share of housing as HMOs		Actual HMOs as % of all dwellings in Sedgemoor DC area increased from 0.03 to 0.25 over 2012 to 2019 period.	Ditto
Impact on local multiple deprivation Issues (Housing)		% of Somerset LSOAs in 20% most deprived in England for *Barriers to Housing and Services** increased from 22% to 25.7 % between 2015 and 2019 -- but all of Somerset and before peak. *(*measures the physical and financial accessibility of housing and local services)*	Somerset Intelligence English Indices of Deprivation (2019 Somerset Summary)

5. 3. Auditing of Findings

Table 5.4: Audit of actual against predicted Accommodation impacts.

Impact Issue Indicator	Commentary on actual vs predicted impacts Commentary on performance in relation to objectives and targets (as available)	Summary RAG colour coding
Workforce accommodation		
Geographical distribution of non-home based workers (NHB)	Original predictions by both EDFE and the Councils for the distribution of the NHB workforce were for a concentration in Sedgemoor, partly reflecting the location of the large Bridgwater Campus in the District. Recent findings reinforce these predictions; indeed the concentration appears greater than anticipated, probably largely because of the reluctance of NHB workers to commute daily from outside the local districts. The current findings for	LG

	Somerset West and Taunton Deane are very much in line with original predictions.	
Numbers and distribution by Districts of home-based (HB) workers	Peak findings are similar within Somerset to the original default Council predictions, and Uplift Spatial Distribution estimates. However, the growth outside the 90-minute commute area has been noted as a possible result of post Covid working patterns, with those who in the past might have been on site 4-5 days a week may now only be once or twice a week. It may also reflect the shift in skills requirements for the MEH stage of construction. At c20% of the workforce, this is considerably above that anticipated with the original DCO assessment.	LG / A
Mix of accommodation tenure type in 60 min CDCZ at peak for NHB workers	The mix of housing tenure for NHB workers in Summer 23 was skewed much more towards PRS (including latent, which is seen as closest in type to PRS) than in latest uplift predictions. The combined campus and tourist (hotels, B&B, camping/caravans etc) accommodation was around 50% rather than the predicted 60% of the total. This may partly reflect the fact that the planned additional bedspace and camping sites provision numbers have not yet all had an impact, although the recent impact of the new Brean Sands Campus has significantly increased the % share of campus accommodation.	A
Trends in accommodation tenure type in 60 min CDCZ at peak	The full opening and occupancy of the Bridgwater Campus increased the % workforce in the then two campuses to almost 50% of NHB workers in Winter 21, but with the continuing growth in workforce and the campuses at capacity this proportion fell back and PRS again dominated the tenure mix by Winter 22. However, the recent addition of the Brean Sands Campus has now reversed this trend.	LG
PRS (incl.Latent) accommodation by District and Ward Clusters	The distribution of the important and sensitive PRS (including latent accommodation) by ward cluster is reasonably close to predictions in the uplift papers for Bridgwater and Taunton. The numbers for Cannington are much lower than predicted.	LG
Numbers and distribution by Districts of NHB workers with families	The numbers and distribution are roughly in line with original predictions, being somewhat less concentrated in Sedgemoor than the workforce as a whole	LG
Local housing market impacts		
Implementation of EDFE local housing support strategy	Data on the drawdown of funding support from the EDFE local housing support strategy, and the resultant delivery of bedspaces, especially in Sedgemoor, West Somerset /Taunton Deane and North Somerset, indicate continuing effective implementation of the strategy in delivering a substantial number of extra bedspaces. Although it is not possible to know whether all the successfully developed bed spaces are still available and utilised.	DG
Impacts on local vulnerable groups and on house prices	There is a range of relative data from national and local authority sources covering impacts on vulnerable groups. For example, there has been a small drop in the number of households on waiting lists in Sedgemoor between 20/21 and 21/22. This partly reflects the success of EDFE housing strategy and local authority partnership initiatives. The housing affordability gap has been getting wider, proportionately, at local and national scales, but Sedgemoor and Somerset West and Taunton remain more affordable than the national and regional average. The Sedgemoor ratio has increased from c8 to c9 over the construction period to date.	LG
Growth in number and % share of housing as HMOs	There has been a substantial increase in the HMO %, especially for Sedgemoor, but figures are still a little below SW and England levels.	A

Impact on local multiple deprivation Issues (housing)	Some small deterioration in relative position of Somerset nationally re incidence of deprivation, including small deterioration in barriers for housing and services. However— data is for whole of Somerset and only up to 2019 (i.e not peak).	A	B

6. Refresh RAG Indicator Ratings: Social and Community

6. 1. Context: Strategic Issues and Indicator Update

The social and community impacts sector includes peak construction impacts on a range of essential local services, people and communities and on managing those impacts. These impacts include those on health, crime and safety, other emergency services, education and wellbeing. Many of the impacts flow directly from the extent and accommodation distribution of the HPC NHB workforce in the community including their family make-up (e.g. accompanied with partner, children). Key original references to these issues, as set out in detail in the 2019 HPC Study 1 report, include various documents from 2011/12, in particular a Health Action Plan, Community Safety Management Plan and the S106 Agreement. In response to the workforce uplift proposals and also in light of the COVID pandemic, health and community safety issues were reviewed in two uplift topic papers – Health Topic Paper (EDFE 2022) and Community Safety (EDFE 2022).

The Health Topic Paper reviewed the nature of the larger workforce, possible additional impacts and appropriate mitigations. It concluded that Workforce Survey evidence to date showed no particular shift in the make-up of the workforce (i.e largely homogenous, being majority male, 35-49 years of age, and of white ethnic origin), and that any health impacts could be well managed via Hinkley Health, the on-site health facility. Indeed, the response to the impacts of the COVID pandemic showed the ability of Hinkley Health to flex very effectively to manage an extreme situation.

The Community Safety Topic Paper considered potential impacts of the workforce uplift on issues including crime and disorder, the nighttime economy, equality within the community and on existing mitigation measures. Detailed evidence traced impacts through to 2021 and set out the range of mitigation measures, including the Workforce Code of Conduct and various funding support for local services. The most common cause of local complaints, not anticipated in the original ES and DCO, fly parking, is covered here and in the transport sector review. The uplift topic paper concludes with a number of recommendations for enhanced mitigation funding and some amendments to the Community Safety Management Plan.

Monitoring data on health and community safety issues is reported on a regular basis by EDFE to SEAG; the Sedgemoor Annual Monitoring Report and Somerset Intelligence are other valuable sources. Other topic specific sources include Somerset CCG and SW Public Health for local health and hospital services; and Health Task and Finish Group (HTFG), Avon and Somerset Constabulary and local authorities for crime and fear of crime. Contextual baseline information is available from national sources, such as ONS Annual Population Survey for personal wellbeing, and the Index of Multiple Deprivation on trends in relevant domains. Most of the original indicators/KPIs will continue as the default position where there is no indication of revision of targets

6. 2. Monitoring Findings

Table 6.1: Monitoring data on Social and Community indicators/KPIs

<table>
<tr><th>Issues</th><th>Indicators/KPIs</th><th>Findings/Trends</th><th>Sources and Comments</th></tr>
<tr><td>Changing nature of NHB workforce – including family composition – implications for services</td><td>DCO predicted number of NHB family members at peak construction as 500 workers with their families, resulting in additional 600 non-worker adults, 300 school age children and 65 pre-school children moving into the area.</td><td>Summer 23 data indicates 691 workers with families, and 700 non-workers adults, 427 school age children and 231 pre-school children moving into the area.

Winter 23 data indicates 854 workers with families, and 911 non-workers adults, 524 school age children and 268 pre-school children moving into the area.</td><td>SEAG – Workforce Survey</td></tr>
<tr><td colspan="4">Health and wellbeing</td></tr>
<tr><td>Pressure on NHS--NHB HPC worker referral to local GPs and hospitals</td><td>Numbers referred</td><td><table><tr><td></td><td></td><td>Q4 /21</td><td>Q4 /22</td><td>All 23</td></tr><tr><td>GPs</td><td></td><td>0</td><td>0</td><td>0</td></tr><tr><td>Hosp.</td><td></td><td>30</td><td>59</td><td>233</td></tr></table></td><td>SEAG</td></tr>
<tr><td>Mitigation provision--health staff in on-site medical centre</td><td>Number of staff and range of skills</td><td>About 30 FTE staff during 2022 (c19 FTE in 2018); wide range of skills, (including 15 nurses, and approval to increase to 20). About 35 FTE staff in 2023.</td><td>SEAG</td></tr>
<tr><td>The number of drug and alcohol checks completed across all staff.</td><td>Numbers completed In Q/Yr.</td><td><table><tr><td>Q4 /21</td><td>Q4 /22</td><td>Q4/ 23</td></tr><tr><td>3305</td><td>5249</td><td>4806</td></tr></table></td><td>SEAG</td></tr>
<tr><td>The number of call-outs made to the SW Ambulance Service NHS Foundation Trust.</td><td>Number of callouts — cumulative for year</td><td><table><tr><td>2021</td><td>2202</td><td>2023</td></tr><tr><td>38</td><td>73</td><td>58</td></tr></table>(c50 in 2018)</td><td>SEAG</td></tr>
<tr><td>HTFG –e.g. mental health open referrals; sexual health referrals</td><td>Comparison of numbers and trends in Hinkley Zone and in Somerset</td><td>Examples of HTFG data –2022

• Hate crime in the Hinkley Zone remains lower than at peaks seen during 2021.
• Numbers of sexual assaults have stabilised in the Hinkley Zone, although there are declines in the rest of the county.
• Offences where victims were women and offences where victims were children have declined for the second successive quarter in the Hinkley Zone but have been generally stable over the last two years.</td><td>HTFG Somerset Partnership: Supplementary Data 2023</td></tr>
<tr><td colspan="4"></td></tr>
</table>

<table>
<tr><td colspan="4">Community safety</td></tr>
<tr><td>Reported crime linked directly to HPC</td><td>Trends in cumulative numbers, and by Quarter (Q)

Trends in Annual Crime Numbers</td><td><table><tr><td></td><td>Q1/22</td><td>Q3/22</td><td>Q4/24</td></tr><tr><td>Q</td><td>82</td><td>96</td><td>100</td></tr><tr><td>Cum</td><td>908</td><td>1169</td><td>1651</td></tr></table>
<table><tr><td>Year</td><td>2020</td><td>2021</td><td>2022</td><td>2023</td></tr><tr><td>Nos</td><td>160</td><td>192</td><td>278</td><td>382</td></tr></table></td><td>SEAG - Q1 here is April to June; Q3 is Oct to Dec; Q4 is Jan –Mar.</td></tr>
<tr><td>Non-reported criminal activity linked directly to HPC</td><td>Trends in cumulative numbers</td><td><table><tr><td></td><td>Q1/2</td><td>Q3/22</td><td>Q4/24</td></tr><tr><td>Q</td><td>95</td><td>79</td><td>103</td></tr><tr><td>Cum</td><td>1056</td><td>1340</td><td>1965</td></tr></table></td><td>SEAG</td></tr>
<tr><td>Annual fear of crime index – SDC</td><td>% SDC residents feeling very safe or safe in own home during the day</td><td>2017- 94
2021- 92</td><td>SDC Community Safety Report 2021</td></tr>
<tr><td>Numbers of criminal offences and abuse</td><td>Comparison of data in Hinkley Zone (HZ) and Somerset (S) -- using examples of hate crimes and sexual assaults</td><td><table><tr><td></td><td></td><td>Hate Crimes</td><td>Sexual Assaults</td></tr><tr><td>HZ</td><td>Dec 2016</td><td>30</td><td>13</td></tr><tr><td>S</td><td>Ditto</td><td>102</td><td>101</td></tr><tr><td>HZ</td><td>Dec 2022</td><td>41</td><td>30</td></tr><tr><td>S</td><td>Ditto</td><td>206</td><td>128</td></tr></table></td><td>HTFG Somerset Partnership: Supplementary Data 2023</td></tr>
<tr><td>Location specific –especially re night time economy</td><td>Reported crime data for e.g Bridgewater Town Centre</td><td>June 22 - 209
Dec 22 – 151
April 23 – 174

Percentage of violence and sexual offences (at c35%) and anti-social behaviour offences (at c20%) have remained consistent over last 3 yrs.

Bridgwater as a whole has a much higher crime rate than Somerset (2022 –was 131/1000 pop compared with 65/1000 for Somerset).</td><td>Police UK data—all reported crimes</td></tr>
<tr><td>Location specific –especially re fly parking</td><td>Reported complaints to EDF</td><td>Q3/22-- 119
Q4/22—159
Q3/23 – 142
Q2/24 -- 266
EDFE Parking Patrollers mitigation but continuing problem although many offenders are not HPC.</td><td>TRG Quarterly Reports; Stakeholder Relations Reports</td></tr>
<tr><td>Impact on other emergency services</td><td>Number of incidents of fire directly related to HPC</td><td>Nine in 2022 with cumulative 38 by end of that year.</td><td></td></tr>
<tr><td colspan="4">Education</td></tr>
<tr><td>Impact on local schools capacities –from NHB with families</td><td>Spatial distribution of NHB families in Somerset</td><td>No data on distribution of NHB workforce families with school age children</td><td></td></tr>
</table>

Community welfare			
Impact on community cohesion and local quality of life; feeling of community wellbeing –from extended construction period, especially for communities close to site.	Wellbeing indicators; Incidence of complaints;	Level of complaints remains low over period 2019 to 2023 –with the exception of fly parking. Very low for worker behaviour. For SDC – a very small dip in reported personal wellbeing from 7.7/10 in 2016/17 to 7.6/10 in 2021/22. Stogursey had 7 reported crimes in March 23, which was very similar to early construction period figures.	EDF Complaints Register ONS Annual Population Survey – personal wellbeing at LA level
Impact on community cohesion and local quality of life –via use of Community Impacts Mitigation (CIM) funding	Use of CIM fund	20/21 open funding of c£500, 000 for 10 larger projects (at c £50000 per project) and c£140,000 for c40 projects at c£3500 per project. New grants totalling £2.6m made to 57 organisations in 22/23.2.Mix of projects across various age groups in the local community. In total, over £15m of the £20m CIM fund is now allocated.	EDF HPC Community Fund – Annual Reports 2021/22, 2022/23.
Changes in local performance in relative deprivation domains of Index of Multiple deprivation (IMD) –e.g. health; education skills and training; crime; living environment	Trends in IMD between 2015 and 2019	Sedgemoor was the worst performing Somerset district with an index of 121 out of 317 nationally. It scores lower than other Somerset districts on all domains, with the exception of *Barriers to Housing and Services* where it scores better than all local districts with an index of 176. Of 25 Somerset LSOAs that became more deprived between 2015 and 2019, 5 were in Sedgemoor and 8 were in West Somerset and Taunton Deane. All this however is pre-peak construction.	Somerset Intelligence: IMD 2019 Summary

6. 3. Auditing of Findings

Table 6.2: Audit of actual against predicted Social and Community impacts.

Impact Indicator Issue	Commentary on actual vs predicted impacts Commentary on performance in relation to objectives and targets (as available)	Summary RAG colour coding
Changing nature of NHB workforce – including family composition – implications for services	A 70% increase in the new peak workforce has to date been accompanied by an approx. 40% increase above the DCO predicted proportion of those NHB workers with families, bringing with them an approx.10% increase above the DCO predicted proportion of family members. The most significant difference is in the substantially higher number of pre-school children. Overall, the NHB family accompanied workforce is proportionately less for peak construction than that anticipated if the original DCO % rates had prevailed for the uplifted workforce numbers.	A
Health and wellbeing		

Pressure on NHS—with potential NHB HPC worker referral to local GPs and hospitals	Impacts of the increasing workforce on the NHS appears very limited, continuing the trends established in early construction. Impacts on local GP services appear negligible and local hospital referrals average about 10-20 per month. As examples of potential particular health issues HTFP data shows no significant rise in mental health open referrals and sexual health referrals in the Hinkley Zone compared with Somerset as a whole.	DG
Mitigation provision--health staff in on-site medical centre (Hinkley Health); Workforce health checks	The provision of the bespoke Hinkley Health (HH) facility continues to be the major asset in minimising workforce impacts on local health facilities. Medical staffing has grown, from approx 20 to 35 FTE (2018-2023) to handle the demands of the larger workforce, although no dental provision. HH facility also used by some HB workforce, thus taking some pressure off local GPs. Other mitigation and health enhancement measures, such as drug and alcohol checks completed across all staff, and health-screening sessions, continue at a good level.	DG
The number of call-outs made to ambulance and fire emergency services.	The number of ambulance callouts has not changed much since 2018 when the workforce was much lower, and is quite low for such a major project. There is a similar continuation of low figures of instances of fires linked to HPC construction.	DG
Community Safety		
Impact on local policing: changes in reported and non-reported level of crime linked directly to HPC	Anticipated impact areas were the behaviour of a predominantly male workforce, with a concern of anti-social behaviour and increased levels of various types of crime. However, data reported to SEAG on crime linked directly to HPC show no major changes, relative to workforce numbers, on the outcomes for early construction.	DG
Numbers and types of criminal offences and abuse	Hate crime in Hinkley Zone is relatively low and has increased less over 2016-2022 period than for Somerset as a whole. Numbers of sexual assaults have stabilised in the Hinkley Zone, although there have been declines in the rest of the county.	LG
Fear of crime	Small decline in SDC safety feeling, but still very positive—even with major increase in project numbers	DG
Location specific – especially re night time economy	Data show no major growth in reported crimes for Bridgwater Town Centre or in percentage types of crime over last three years, although Bridgwater as a whole has a much higher crime rate than Somerset.	LG
Location specific – especially re fly parking	Fly parking is the most significant area of complaint by community. EDFE seek to mitigate in various ways, including system of Parking Patrollers and through Code of Conduct. Complaints are not always easy to validate and do include many related to non-HPC workforce. Overall, HPC related offences are falling a little even with increase to peak workforce.	R
Education		
Impact on local schools capacities –from NHB with families	As for our 2019 report, there is a problem re monitoring data. EDFE has made upfront payments for additional school space capacity in areas of Somerset where there was an expectation of limited pre-school and/or primary school capacity. This includes a new primary school at Northgate in Bridgwater that also provides pre-school places. Schoolchildren numbers are now (2023-24) becoming much higher than the original DCO predictions, at almost double for school age children and four	A

	times higher for pre-school. As such, the EDFE funded/Somerset mitigation provision may not be adequate, depending on family distribution.	
Community welfare		
Impact on community cohesion and local quality of life; feeling of community wellbeing –from extended construction period	Levels of complaints remain low, with the exception of fly –parking (discussed in Transport sector). National wellbeing data are in line with those for early construction, with only a very small shift downwards for Sedgemoor. Stogursey had 7 reported crimes in March 23, which was very similar to early construction period figures.	LG
Impact on community cohesion and local quality of life – Community Impacts Mitigation fund	Community Impacts Mitigation funding is providing initiatives of facilities and services to help to improve the social, economic, and environmental wellbeing of communities affected by the HPC construction. Over £15m of the £20m fund is now committed. Recent allocations on open and small projects are very much in line with earlier funding.	DG
Changes in local performance in relative deprivation domains of Index of Multiple deprivation (IMD) –e.g. health; education skills and training; crime; living environment	There have been some small negative shifts in relative deprivation for parts of Sedgemoor and West Somerset and Taunton Deane between 2015 and 2019, although Sedgemoor has improved in the important domain of *Barriers to Housing and Services*. However, this period precedes peak construction by several years and it is difficult to draw any firm conclusions on the relative impacts of HPC peak construction.	A / B

7. Refresh RAG Indicator Ratings: Transport Sector

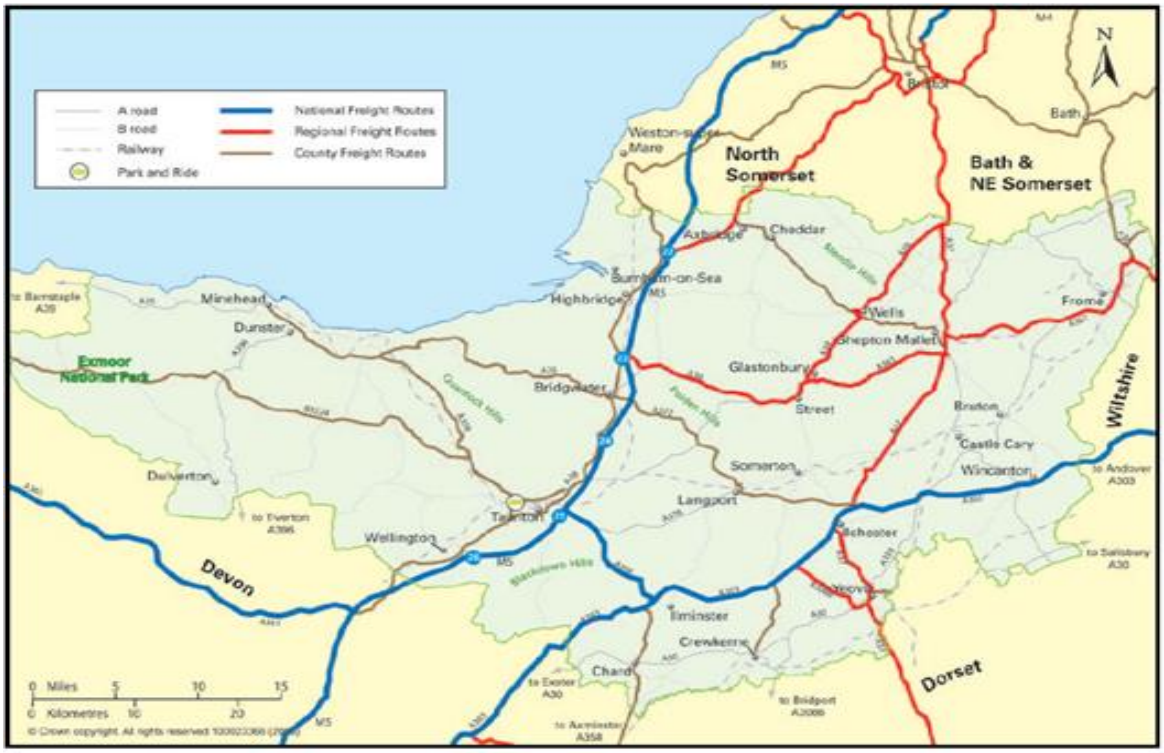
7.1 Context: Strategic Issues and Indicator Update

The report draws on a range of sources. The 2019 HPC Study 1 on the impacts of early stage construction sets out the sources of key indicators/KPIs. This new peak construction report updates these with information from papers prepared for the 2021-22 Transport Uplift Study (EDFE Jan 2022). Other key sources of monitoring information are the various reports of SEAG and TRG, supplemented where available by information from the various community fora and from local authority data.

The HPC Workforce Uplift – Update Transport Topic Paper (EDFE 2022) sets out some revised objectives and targets for overall peak employment (then averaging 8600 over peak period, with c 38% HB recruitment). To understand the likely transport impacts of the workforce uplift, there is a review and comparison of a revised peak workforce number of 8,600 against the original DCO Environmental Statement (ES) (Volume 2, Chap10 EDF 2011), the Transport Assessment (TA) and Construction Workforce Travel Plan (CWTP). These assessed a peak construction workforce of 5,600 and included appropriate mitigation measures to address associated impacts.

This update of the transport sector identifies any likely adverse or beneficial transport impacts and effects arising from the workforce uplift. It identifies existing mitigation measures implemented in response to the DCO, and, if any there are likely adverse effects resulting from the workforce uplift, which are over and above those identified within the DCO application, additional mitigation are suggested. A range of additional data was agreed as part of Workforce Uplift 1 and is now reported in the TRG quarterly report - e.g. parking accumulation and some bus data. However, many of the original indicators/KPIs will continue as the default position where there is no indication of revision of targets. Similarly, the Transport Uplift Topic Paper uses the same spatial base, distinguishing between the local Construction Development Commuting Zone (CDCZ), which represents the 90-min maximum commuting zone of local HB workers. NHB workers originate from outside this zone, although they will almost wholly live within this zone, and largely within a 60-min commute zone, during the duration of their time on the project. Figure 7.1 shows the national, regional and county freight routes within Somerset.

Figure 7.1: National, regional and county freight routes within Somerset



EDFE committed to the key elements set out in the Somerset Local Transport Plan on freight management that wherever possible HGVs should use the Strategic Road Network (SRN); and possible HGVs will adhere to the National Regional and County Freight Routes set out in Figure 7.1. Two HGV routes (Figure 7.2) were proposed and adopted from J23 and J24 of the M5 motorway to the HPC site during the construction stage.

In order to meet with Workforce Transport Objectives set out in the TA, a strategy was developed for work trips to and from the HPC site. Crucial to the management of the traffic effects of the construction of HPC are a set of mitigation measures developed between EDFE and key local, regional and

national stakeholders, in discussions and consultations leading up to the submission of the developer's draft DCO and accompanying the ES, and in the formal examination of the project. These are set out in Figure 7.3

Figure 7.2: Designated HGV Routes to HPC

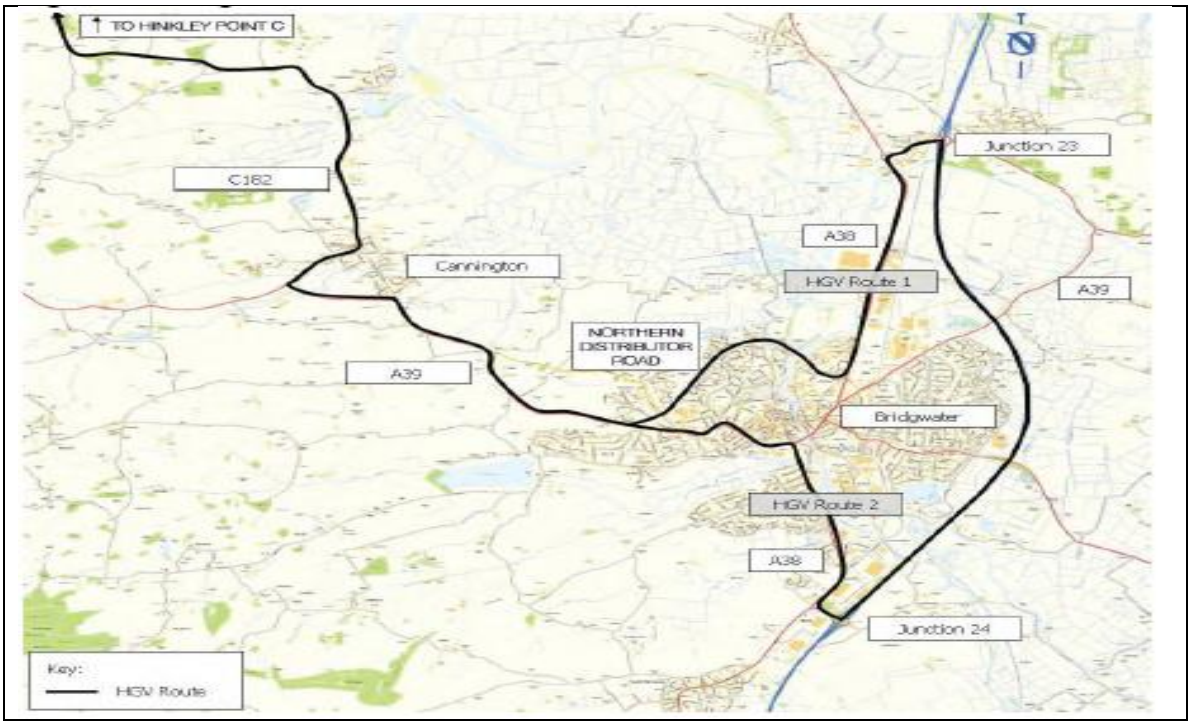
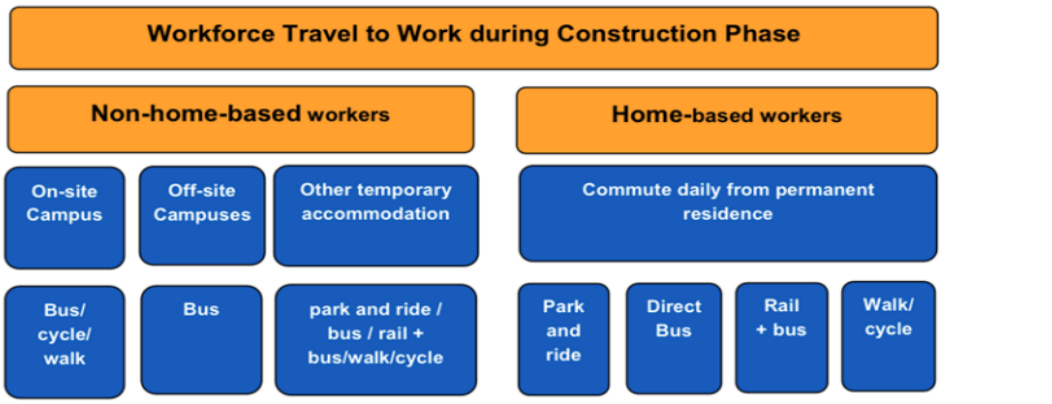


Figure 7.3: Workforce Travel to Work Mechanisms

Figure 5.1: Travel to Work Mechanism for Workforce



Environmental Statement – Annex 7: Transport Assessment (October 2011): Page 89

7.2 Monitoring Findings

Key sources of transport sector monitoring information are the TRG quarterly reports. As part of the DCO, the developer must implement and monitor the implementation of the Construction Workforce Travel Plan (CWTP) and the (CTMP) until the end of construction. These plans include various limits and targets, including for example on mode share targets for worker travel to the site, HGV deliveries to site against maximum daily limits and details of any breaches. Recent performance against targets and limits are set out in Table 7.1.

Table 7.1: Monitoring data on Transport indicators/KPIs

<table>
<tr><th>Issue</th><th>Indicators/KPIs</th><th>Findings/Trends</th><th>Sources of data</th></tr>
<tr><td colspan="4">People movements</td></tr>
<tr><td>HPC site journey to work</td><td>Mode share targets, eg: bus (87%), walk (9%), and car (4%)</td><td>
<table>
<tr><td>For Q2/%</td><td>2020</td><td>2021</td><td>2022</td><td>2023</td><td>2024</td></tr>
<tr><td>Bus</td><td>75</td><td>84</td><td>86</td><td>87</td><td>90</td></tr>
<tr><td>Walk</td><td>17</td><td>10</td><td>9</td><td>10</td><td>5</td></tr>
<tr><td>Car</td><td>7</td><td>4</td><td>4</td><td>3</td><td>3</td></tr>
<tr><td>Cycle</td><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>M/Bike.</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr>
</table>
</td><td>All TRG, except where indicated</td></tr>
<tr><td>Travel to and from Associated Development (AD) Sites: J23, J24, Cannington, Williton, and Morrison’s</td><td>Mode share targets, eg for J23
Sustainable – 4%
Car driver – 58%
Car passenger – 38%

eg for J24
Sustainable – 4%
Car driver – 60%
Car passenger – 36%</td><td>
<table>
<tr><td>For J23 Q2 %</td><td>2020</td><td>2021</td><td>2022</td><td>2023</td><td>2024</td></tr>
<tr><td>Sus</td><td>3</td><td>0</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>Driver</td><td>75</td><td>81</td><td>82</td><td>80</td><td>84</td></tr>
<tr><td>Pass.</td><td>22</td><td>19</td><td>17</td><td>19</td><td>15</td></tr>
<tr><td>For J24 Q2%</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Sus</td><td>5</td><td>18</td><td>13</td><td>23</td><td>20</td></tr>
<tr><td>Driver</td><td>71</td><td>69</td><td>73</td><td>64</td><td>66</td></tr>
<tr><td>Pass.</td><td>24</td><td>13</td><td>14</td><td>13</td><td>14</td></tr>
</table>
</td><td></td></tr>
</table>

<table>
<tr><td></td><td></td><td>NB: the proportion of car drivers and car passengers for J24 is affected by the fact that many local workers now walk to the P&R site because of the introduction of an expanded distance by which workers are expected to walk to collect a bus.</td><td></td></tr>
<tr><td>Number of passengers using bus service to HPC Site</td><td>Not specified -- but see mode share target above</td><td>Dec 2018 – 1993
Sept 2023 -- 8521
June 2024 – 9809</td><td></td></tr>
<tr><td>Location specific – especially re fly parking</td><td>Reported complaints to EDF</td><td><table><tr><td>Q2 Nos</td><td>2018</td><td>2020</td><td>2021</td><td>2022</td><td>2023</td><td>2024</td></tr><tr><td></td><td>165</td><td>26</td><td>15</td><td>247</td><td>405</td><td>266</td></tr></table>EDFE Parking Patrollers mitigation but continuing problem. Covid influenced 2020 and 2021 figures.</td><td></td></tr>
<tr><td colspan="4">Freight movements</td></tr>
<tr><td>DMS bookings v HPC construction works HGV (Limits)</td><td>Target max
• Mon-Fri: 750
• Sat: 375
• Qrtly Av: 500
• HGV Route 1: 450
• HGV Route 2: 300</td><td><table><tr><td>For Q2 targets</td><td>2020</td><td>2021</td><td>2022</td><td>2023</td><td>2024</td></tr><tr><td>750</td><td>230</td><td>320</td><td>294</td><td>243</td><td>252</td></tr><tr><td>375</td><td>23</td><td>102</td><td>68</td><td>34</td><td>18</td></tr><tr><td>500</td><td>136</td><td>201</td><td>181</td><td>139</td><td>154</td></tr><tr><td>For HGV routes</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>1—J23 450</td><td>188</td><td>241</td><td>207</td><td>187</td><td>177</td></tr><tr><td>2—J24 300</td><td>72</td><td>120</td><td>114</td><td>71</td><td>84</td></tr></table></td><td></td></tr>
<tr><td>Abnormal Indivisible Loads (monthly and quarterly)</td><td>No limit specified</td><td><table><tr><td>Q2 Nos</td><td>2020</td><td>2021</td><td>2022</td><td>2023</td><td>2024</td></tr><tr><td></td><td>213</td><td>329</td><td>255</td><td>203</td><td>312</td></tr></table></td><td></td></tr>
<tr><td>Temporary Jetty</td><td>Operational in Sept 2019. Target to deliver minimum of 80% by weight of materials for on-site concrete.</td><td><table><tr><td>Materials delivered</td><td>Sept 19-Aug 20</td><td>Sept 22-Aug 23</td><td>Sept 19-Aug 23</td></tr><tr><td>via Road</td><td>37.3</td><td>37.4</td><td>37.2</td></tr><tr><td>via Jetty</td><td>62.7</td><td>62.6</td><td>62.8</td></tr></table></td><td></td></tr>
</table>

7.3. Auditing of Findings

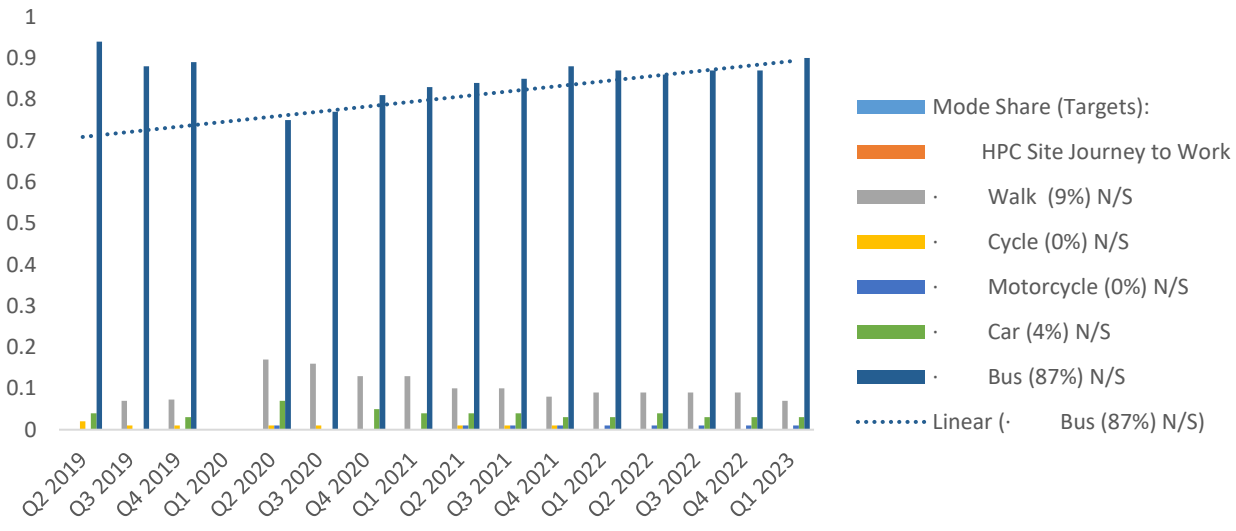
In addition to comments on each impact issue indicator, we have applied a very simple colour code audit (RAG system) as used in the 2019 HPC Study 1 report, ranging from Dark Green (very accurate/compliant), through Amber to Dark Red (very inaccurate/non-compliant). A blue colour coding indicates No Information Available yet.

Table 7.2: Audit of actual against predicted Transport impacts.

Workforce movements

Impact sector	Commentary on actual vs predicted impacts Commentary on performance in relation to objectives and targets (as available)	Summary RAG colour coding
HPC site journey to work	HPC Site Journey to Work Mode share Bus has a target of 87%. Q2-Q4 2019 easily exceeded 87%. This dipped at the beginning of Covid lockdown, in Q1 2020, but recovered well with a definite rising trajectory (see Figure 7.4). This, coupled with the use of walking, is very positive. It is important to recognise changes to the bus strategy and routing to reflect worker locations and ensure that the direct bus service is maximised to minimise the number of workers travelling to a P&R location. The use of an 800m+ rule and introduction of walk and ride are other significant changes. NB: Recent reduction in walking is due to numerical proportions of main site campus workers v overall increase in worker numbers and resultant increase in actual bus numbers.	G
Travel to and from AD Sites: J23, J24, Cannington, Williton	A continuing issue with high proportion of car drivers. Recent more long distant commuting by HB workforce in the MEH stage places some constraints on the car sharing percentage. There is a continuing and considerable promotion of HPC Car Share to meet the car share targets at project peak. Driver percentage for J24 is affected by increase in walking to P&R.	O
Fly parking complaints	Fly parking by HPC workers is a continuing and locally very significant transport impact issue. Complaints about fly parking far outweigh all HPC transport (including HPC Bus Service, HGV speeds and roadworks) and other complaints. Non-HPC workers are also fly parkers and the distinction with HPC workers may not always be locally recognised. In Q2 2017 a three-step approach to tackling fly parking associated with using the HPC bus service was approved by the HPC Site Director and has been communicated to the Tier 1's. There is a three-step approach following a community complaint or HPC monitoring team identifying a fly-parking vehicle that is on the HPC Transport database. By step 3 NNB expect disciplinary action through Tier 1's (ultimately, if no action, HPC Site Pass withdrawn). There has been a more concerted effort over the last year or so with a refresh of the policy and many more incidences of formal warnings and withdrawal of site passes.	R

Figure 7.4: HPC Site - Journey to Work



Freight movements

Impact sector	*Commentary on actual vs predicted impacts*	*Summary RAG colour coding*
Delivery Management Strategy (DMS) actuals v construction works HGV targets – HGV FMF/local	Monitoring and reporting show a consistently good compliance with the three criteria caps: Mon-Fri (750), Saturday (375) and Quarterly Average (500). The DMS is working well using a GPS based model. NB: HGV movements were scoped out of the Transport Uplift Assessment (2022) due to: • HGVs are already restricted to travelling outside of the peak- workforce travel times; therefore, they will not coincide with any change in workforce travel patterns. • HGV movements managed, controlled and reported through the CTMP and TRG in line with the current agreed conditions and practices. • No material change in HGV movements proposed associated with the workforce uplift.	G
HGV breaches of construction works (monitored but no targets set)	Breaches in terms of HGV limits, timing restrictions, routing violation have increased a little over time from initially very low single figures to figures averaging about 30 per quarter. However, this is still very low and less than 1% (0.23%) of total HGV movements (11,523) during Q2 2024. Low numbers reflect positive action by EDFE on driver induction and training. All HGV drivers who were involved in breaches receive a Driver Strike.	LG
Materials delivered by Jetty	The 80% target has proved challenging -- but the provision of the Jetty in Sept 2019 has helped to take a large proportion of materials off the road. Much is dependent on tides.	A
Abnormal Invisible loads	Has remained consistent in 200-300 range over build up to peak construction period.	LG

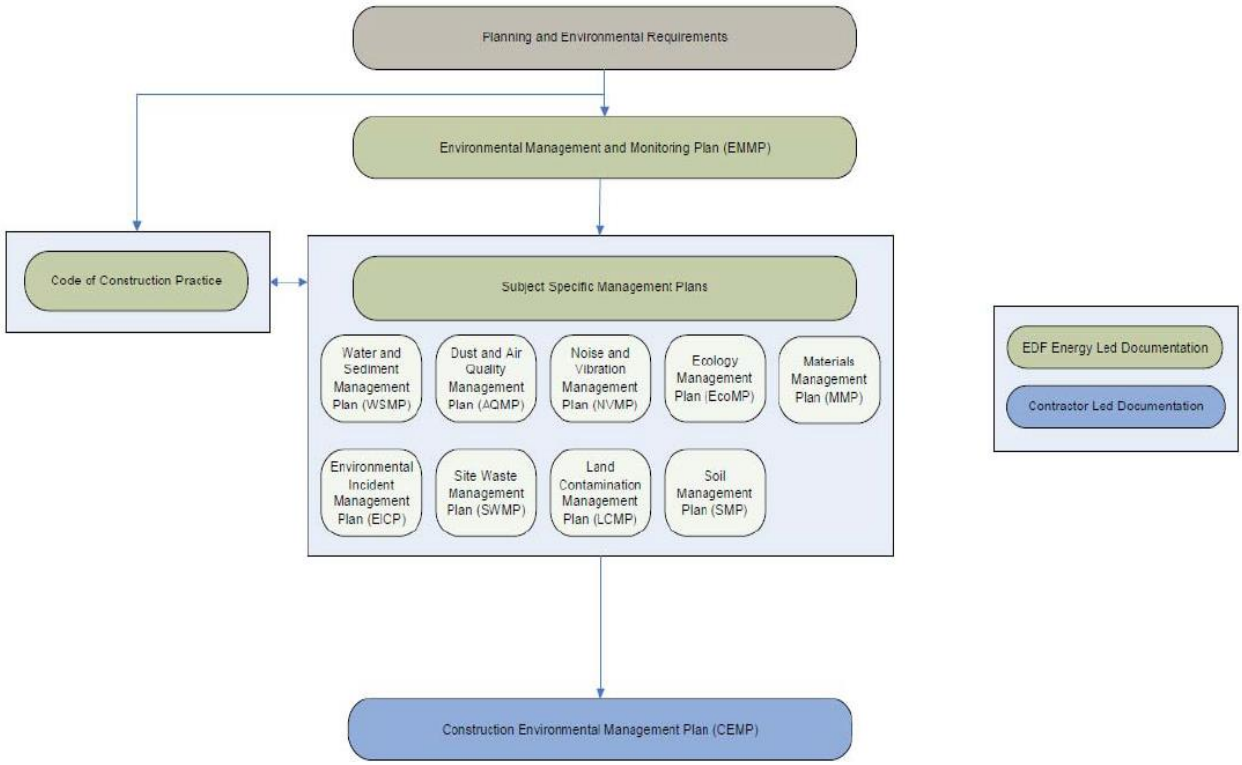
8. Refresh RAG Indicator Ratings: Biophysical and Environmental Health Impacts

8.1 Context: Strategic Issues and Indicator Update

Biophysical and Environmental Health issues are largely addressed by an Environmental Management and Monitoring Plan (EMMP) that was developed to cover the HPC Main Site and Associated Developments (Figure 8.1), including for example impacts of the development on local water quality, air quality, noise, and waste. The EMMP also includes an Ecology Management Plan (EcoMP). In the 2019 HPC Study 1 Report Biophysical and Environmental Health impacts were in separate sections. In this new study, the Biophysical and the Environmental Health impacts of the development on the local area (eg. noise, waste) are taken together. Other Environmental Health impacts, of the workforce on local health services and on the local population, are in the Social and Community section (see Section 6).

Figure 8.1: Environmental Management and Monitoring Plan

Figure 1.1 Environmental Management System Documentation



The report draws on a range of sources. The 2019 HPC Study 1 on the impacts of early stage construction sets out the sources of key indicators/KPIs. This new peak construction report updates these with information from papers prepared for the 2021-22 Biophysical Environment and Environmental Health Uplift Studies (EDFE 2022) and other data. Additional qualitative information comes from reviewing the minutes from HPC Environmental Monitoring quarterly reports 2022-2023, HPC Forum meetings and local parish council meetings. Other key sources of monitoring information are the various reports of SEAG and TRG, supplemented where available by information from various other community fora and local authority data.

The EDF uplift papers considered whether the environmental impact from the change in workforce numbers is significant in comparison to the assessments within the DCO ES. Another key consideration was to determine whether the existing approved mitigation that is in place to reduce impact would be sufficient, and if not, to propose new or revised mitigation, which would ensure that effects were at least the same as those assessed within the DCO. The Environment Health Topic Paper set out the following as the environment foci: Noise & Vibration; Light Pollution; Air Quality; Waste; Waste Water; Sustainability and Ecology. The KPIs in Figure 8.2 are to be reported to the Environment Monitoring Group), then to SEAG, on a quarterly basis, to ensure that impacts are reported, addressed and ultimately impacts reduced as far as possible.

Figure 8.2: Environment KPIs

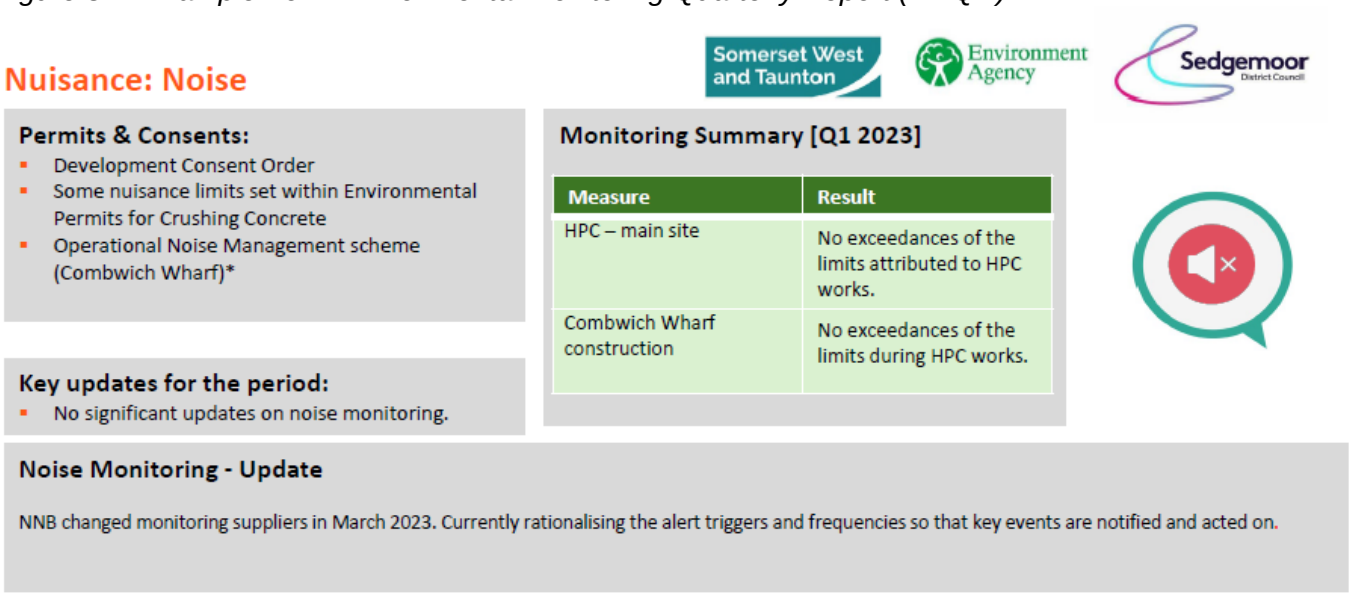
1. Noise - no. of noise level breaches attributable to the HPC project recorded at the HPC site within the quarter
2. Noise - no. of noise notifications attributable to the HPC project recorded at Combwich Wharf within the quarter
3. Air Quality - no. of AQ level breaches attributable to the HPC project recorded at the HPC site within the quarter
4. Lighting - % Actions completed in response to the previous Quarters lighting survey
5. Ecology - % Actions completed in response to the previous Quarters ecology survey at the HPC site
6. Ecology - % Actions completed in response to the previous Quarters ecology survey at AD Sites
7. Sustainability - % of diversion from landfill of inert and non-hazardous waste from construction activities and offices at HPC and AD Sites within the quarter
8. Sustainability/Air Quality - performance against target for Diesel consumption on the HPC Site
9. Reporting - no. of Medium/High/Very Serious Environmental Incidents within the quarter
10. Community - no. of environmental related complaints received within the quarter

8. 2. Monitoring Findings

The key Biophysical and Environmental Health issues identified are Noise & Vibration; Light Pollution; Air Quality; Waste; Waste Water; Sustainability; and Ecology. Management plans exist for these topics; it is assumed that mitigation and monitoring work is in hand. Following from the monitoring reporting gap identified in the 2019 HPC Study 1, an Environmental Monitoring Group was set up to report to SEAG on environmental indicators (see HPC Environmental Monitoring quarterly reports for 2022 and 2023). They report on Nuisance-Noise, Nuisance-Lighting, Air Quality and Emissions, Pollution Prevention and Incidence Response, Waste Management and Ecology. These reports largely describe relevant permits and consents and note key updates for the period, but are light on quantitative measures (See Figure 8.2). There is some data on Community Complaints, with noise being the key issue although at quite a low level.

However, currently, all the biophysical and environmental health impact topics addressed in this section lack the detailed publicly available impact information needed to complete an audit. Most environmental impacts are well regulated, with various standards and thresholds, and monitoring mainly relates to any exceedances of such standards and thresholds. It is assumed that there is appropriate monitoring for such environmental health impacts, such as noise and air for HPC construction, and these are likely within predicted thresholds. However, the IAU found little publicly available detailed information to confirm this, other than the relatively low level of local complaints detailed in the EMQR's. It is unclear how data is collated between the parties involved (Council, EDFE, and EA) and if the sum of these add up to more significant impact on the public.

Figure 8.2: Example from Environmental Monitoring Quarterly Report (EMQR)



For context, the construction activities which were going to cause the most significant environmental effects on receptors have been completed by the time of reporting, including the main civil stage earthworks, the works to the southern landscape area and the construction of the emergency access road. The suite of environmental management plans were principally designed to address impacts during these activities. The one current material change, the proposed removal of the acoustic fish deterrent and addition of compensatory offset measures, will require new monitoring (Environment Agency 2024). Site control measures such as noise monitors and air quality monitors remain in place until the end of construction as well as the best practice methodologies set out in the suite of management plans. EDFE are committed to continuing to report any breach of noise, air quality or other limits and will provide information via the new Environment Monitoring Group. If monitoring reveals that any amendments to the Environmental Management Plans would be appropriate, EDFE will revise them as required.

8. 3. Auditing of Findings

As noted, detailed environmental monitoring information is currently not publicly available or has not been located, although there is fragmented evidence on various outcomes in the Environmental Monitoring quarterly reports (EMQR). Overall, there is a major problem of data analysis and availability in relation to the impacts of HPC construction. This relates to both LAs and EDFE. The RAG audit below draws largely on the partial information in the EMQR documents and a few examples of audited impacts are noted. The split cells (including blue) indicate that auditing is very limited due to the absence of detailed monitoring data.

Table 8.1: Audit of actual against predicted Biophysical and Environmental Health impacts

Impact sector	Commentary on actual vs predicted impacts Commentary on performance in relation to objectives and targets (as available)	Summary RAG colour coding

Noise and vibration impacts	Environmental Monitoring quarterly reports (EMQR) indicate there were no exceedances. A small number of complaints on noise. No complaints highlighted on vibration.	LG	B
Air quality and dust	EMQR notes no breaches of air quality levels attributable to the HPC project recorded at the HPC site within the quarter.	LG	B
Light pollution	EMQR notes actions completed but no publicly available data has been located relating to light pollution and therefore the accuracy cannot be audited	A	B
Water quality	EA permits are in place. No publicly available data has been located relating to water quality and therefore the accuracy cannot be audited	A	B
Waste management	100% diversion of non-hazardous and inert (construction & office) waste from landfill; duty of care audits undertaken on all main civils Tier 1's; focus on waste segregation and waste reduction continues..	LG	B
Ecology	EMQR notes scheduled monitoring and habitat enhancement works undertaken. AD ecology audits: mitigation habitat continuing to establish really well across the AD sites. Water voles have moved into ditches at Junction 23; also recorded increase in signs of badger and otter at some of the AD sites.	LG	B

9. Overview and Implications for HPC Project

9.1 Overview of Refresh of Indicator Ratings for Peak Construction

Auditability of predictions

Auditing of predictions needs clear indicators and good monitoring information for those indicators. The research has shown considerable variation in both the provision of indicators and flows of monitoring data over the peak construction period to date. The various uplift papers have introduced, in some cases, revised targets. Where not, the default position is the original targets/KPIs. However, indicators are still sparse in some sectors. As for the early construction impact study HPC Study 1, publicly available monitoring information is generally better for the employment, transport, and social and community impacts sectors than for accommodation, and especially for biophysical and environmental health. Explanations of variations include the relative efficiency and organisation of the various monitoring groups involved in the HPC project, the relative quantitative nature of some of the sectors (e.g traffic flows, employment numbers), and the ES/DCO/S106/Uplift specificity of indicators and targets as noted. It is important to note that 'peak construction' focus for these findings is a somewhat flexible concept for the HPC project. The report has focused on trends in data over the period from 2021 onwards, with employment numbers of over 7000, and rising to over 11000 in 2024, but the absolute peak may be higher still, partly depending on workforce definitions.

Summary assessment of predictions

Table 9.1 provides a summary of the audited peak construction predictions for the various sectors, gained as far as possible from the publicly available monitoring data. The table also includes summary RAG colour codings for each sector, although these may cover some detailed variations across sector indicators. For comparison, the RAG codings from the early construction study are also included in the table.

Table 9.1: Summary of the audited peak construction predictions for the various sectors

Impact sector	***Commentary on actual vs predicted impacts***	***Summary RAG colour coding – peak construction stage***			*Comparative Summary RAG colour coding – early construction stage (Study1)*	
Economic development	**At the current, peak construction stage, the project is performing very well against predictions in many impact areas**, including local employment content, training and education, apprenticeships, jobs brokerage, local supply chain inputs and tourism. Mitigation and enhancement measures appear to be working well. **However, the actual level of total workforce numbers quickly and greatly exceeded Uplift 1 predictions**. Information also continues to be lacking on disaggregated employment impacts (eg skills analysis for HB and NHB workforce and opportunities for various disadvantaged or under-represented groups).	DG	O		LG	A
Accommodation	Recent findings reinforce the predictions of a concentration of the NHB workforce in the former Sedgemoor District, partly reflecting the location of the large Bridgwater Campus. Similarly, peak findings for the distribution of the HB workforce are similar within Somerset to the original default Council predictions, and Uplift Spatial Distribution estimates. The mix of NHB housing type was skewed more to PRS than predicted. **The housing support strategy, and the resultant delivery of bedspaces, appears to be working well.** It is difficult within the constraints of publicly available data, to identify housing impacts on local vulnerable groups, although there does not seem to have been to date a noticeable impact.	LG	A		A	
Social and community	**Overall, there is a continuation of good performance against many of the impact indicators**. For health, the staffing growth of the on-site Hinkley Health Medical Campus has provided a high level of medical treatment and advice for the workforce, taking the pressure off the local NHS services. For community safety, there appears to be good management of potential project impacts through a combination of mitigation measures,	DG	A		LG	

	including the implementation of the Worker's Code of Conduct. Data reported to SEAG on crime linked directly to HPC show no major changes, relative to workforce numbers, on the outcomes for early construction. Schoolchildren numbers are becoming much higher than the original DCO predictions, and the EDFE funded/Somerset mitigation provision may not be adequate, depending on family distribution. Some construction impacts affect community wellbeing; the Community Impacts Mitigation (CIM) fund provides some examples of compensatory measures although it is difficult to evidence a direct link from these to wellbeing. Levels of complaints remain low, with the exception of fly parking (covered under transport).					
Transport	**There is a continuation into the peak period of good performance against predictions for many transport indicators**. These include the key indicators of mode share for workforce journey to the main site, with the bus system working well, and the Delivery Management System (DMS) actuals v HGV limits. However, some breaches in terms of HGV limits, timing restrictions, routing violation have increased over time from initially very low figures. **Less positively, the car share system for worker journeys to the P&R sites, continues to be less effective than predicted, and there is the continuing issue of fly parking**. However, management responses are in hand for both issues. Key transport infrastructure, including the jetty and P&R sites, are now in place in comparison with early stages of the project.	DG	O		LG	A
Biophysical and Environmental Health	In contrast to the early stage construction study, the biophysical and the environmental health impacts of the development on the local area (eg. noise, waste) are considered together. Other Environmental Health impacts, of the workforce on local health services and on the local population, are in the Social and Community section. It is good to see a new set of KPIs to be reported to a new Environmental Monitoring Group, **However, as for the early study, the topics addressed in this section still lack the detailed publicly available impact information needed to complete an audit.** Most environmental impacts are well regulated with various standards and thresholds, and monitoring mainly relates to any exceedances of such standards and thresholds. It is assumed that there is in place appropriate monitoring for such environmental health impacts, such as noise and air	LG	B		A	B

	for HPC construction, and these are likely within predicted thresholds.					

9.2 Impact Assessment, Monitoring, Adaptive Management and Uplifts 1 and 2

Impact assessment should be an iterative learning process, rather than a one-off linear process. The need for such a process is compelling considering the limitations to predicting complex impacts prior to the beginning of a project. This is particularly so when we are dealing with the assessment of the socio-economic and biophysical impact of major projects where uncertainty and complexity are key features, as for HPC (Glasson 2022). This was noted in the generic recommendations for future new nuclear projects in the earlier HPC Study 1 (IAU/NNLG 2019), as follows:

- *It should be recognised that some construction impact predictions (eg workforce labour demand curve, and accommodation tenure mix) may require a refresh against a timeline to review and update baseline conditions, actions and project evolution (especially moving towards peak construction). This should be part of an effective* ***adaptive impact assessment process*** *(plan, monitor and manage).*
- *KPIs need to be clearly set out and consistently monitored. There will be a need for changes to some KPIs, and the need for new ones as the project unfolds; these changes and additions need to be transparent and agreed in a consistent way by monitoring bodies.*

As noted in s3.1, Uplift 1 (EDFE 2022) provided a major review, 2019-2022, of the likely size of the peak construction workforce and associated socio-economic indicators. **This update followed from an EDFE '*internal review of the project in 2019 that revealed that in order to maintain safety and quality standards and the construction programme, there was a need to increase the peak number of workers on site from 5,600 to 8,600'*.** EDFE produced a set of six Uplift Topic Papers, covering the six sectors of this and previous reports, to assess the local impacts of this uplift. The conclusions of the review revealed that in order to maintain safety and quality standards and to maintain the programme, the number of workers at the peak of construction will need to be increased above the number that was originally assessed within the DCO application. The review highlighted that there would need to be a greater overlap between the Mechanical Electrical and Heating (MEH) and Civils phases of the project and that the number of support and professional/management roles based at the HPC site would be significantly above the number anticipated in the DCO application. The various uplift papers have been built into each sector refresh study; in some cases, they introduce revised targets. Where not, the default position is the original targets/KPIs.

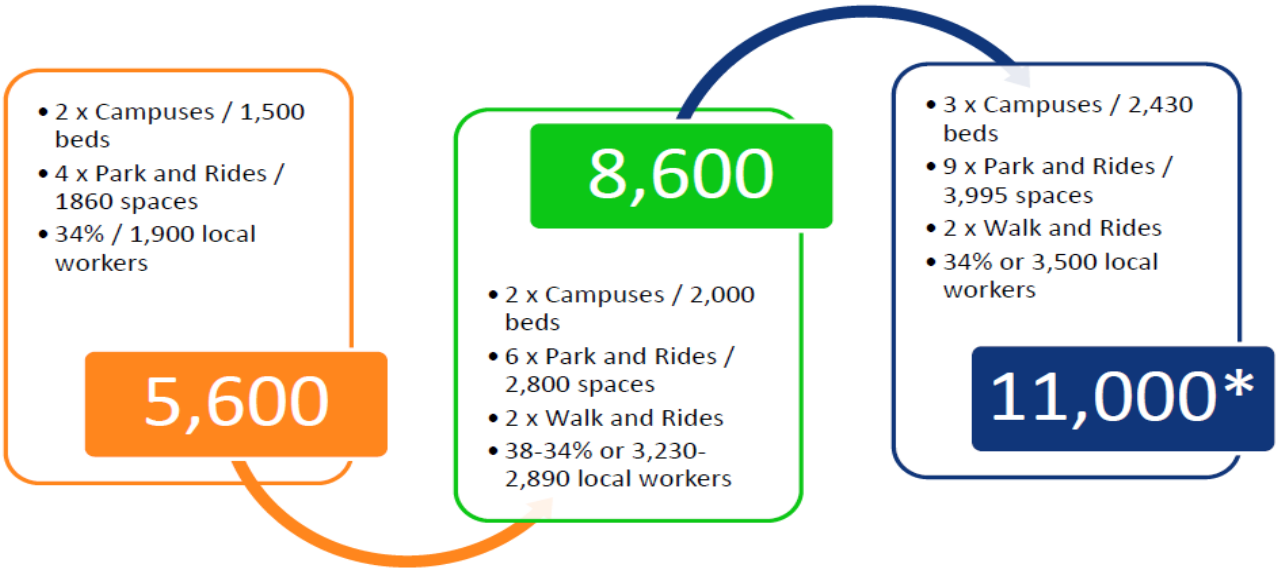
Whilst this report has sought to include predictions and indicators for Uplift 1, which were publicly available during the study period, the review team were aware of a further complexity introduced in 2023-24+ with work by EDFE on a further uplift plan (Uplift 2). This is likely to increase peak employment to over 12,000 (and possibly much higher still), with additional mitigations on the anticipated changes in accommodation, transport, health and other impacts. The detailed papers underpinning Uplift 2 were not publicly available for this study, but some likely assessments of implications are included here drawing primarily on an EDFE public presentation made to the HPC

Community Forum in May 2024. The reasons given for this subsequent uplift, so soon after the first one, were:

- *Organisational: a wider overlap between the Civils and Mechanical and Electrical phases of construction.*
- *Speed: aim to complete HPC around the end of the decade and to commission unit 1 in 2029.*
- *Clarity: following their mobilisation there is a better forecast from the MEH Alliance on the workers they will require in the years ahead.*

A number of scenarios are being tested in Uplift 2, including: understanding that there are limits to workforce expansion both at HPC itself and in the community, and minimising who needs to come to site and how to best utilise modern ways of working at site and at other project locations. Associated with the latter is a scenario considering an 8-day (rather than 5-day) rule being the appropriate means to understand true workforce impact in some of the topic areas. It is noted that all developing scenarios will have the benefit of the real life, practical experience and evidence (i.e adaptive management approach). The Topic Papers are being updated to test the scenarios and agree the package of mitigation measures (EDFE Community Forum May 2024).The presentation to the Community Forum also included some interesting graphics neatly summarising some of the management mitigation responses to the various uplift cycles (see Figures 9.1, 9.2 and 9.3).

Figure 9.1: Changes to manage impacts following from Uplift (2) of peak employment numbers (EDFE 2024)



As noted in the Uplift 2 scenario approach, it is important to draw on practical experience and evidence. The May 2024 presentation also includes an outline of the monitoring and feedback organisational structure, with SEAG and TRG as key units, underpinned by various groups and community fora. This is little changed from that used in early project construction, but with the addition of an Environment Group, as proposed in the early construction report (IAU 2019). Of course, however, monitoring is only as good as the efficiency of the constituent elements. This auditing review suggests that there are still areas for improvement, including for example public access to some

disaggregated Workforce Survey data, detailed Environment data and the frequency and timeliness of publication of some data.

Figure 9.2: Some initial mitigation responses (EDFE 2024)

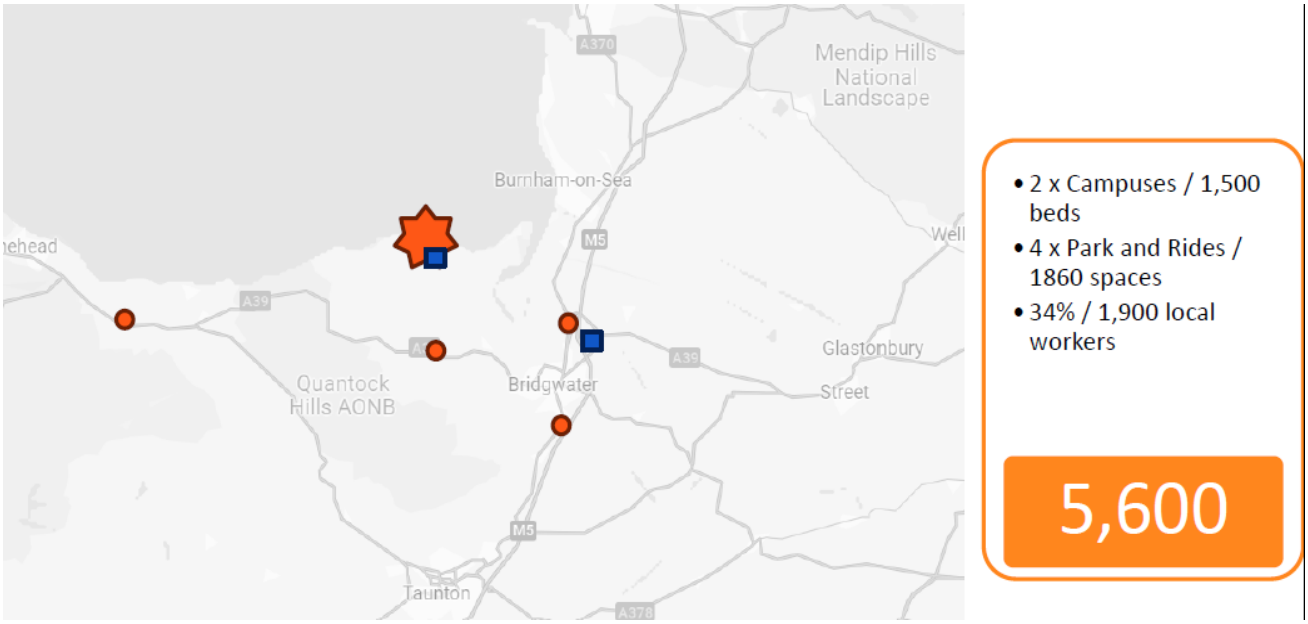


Figure 9.3: Latest mitigation responses (EDFE 2024)

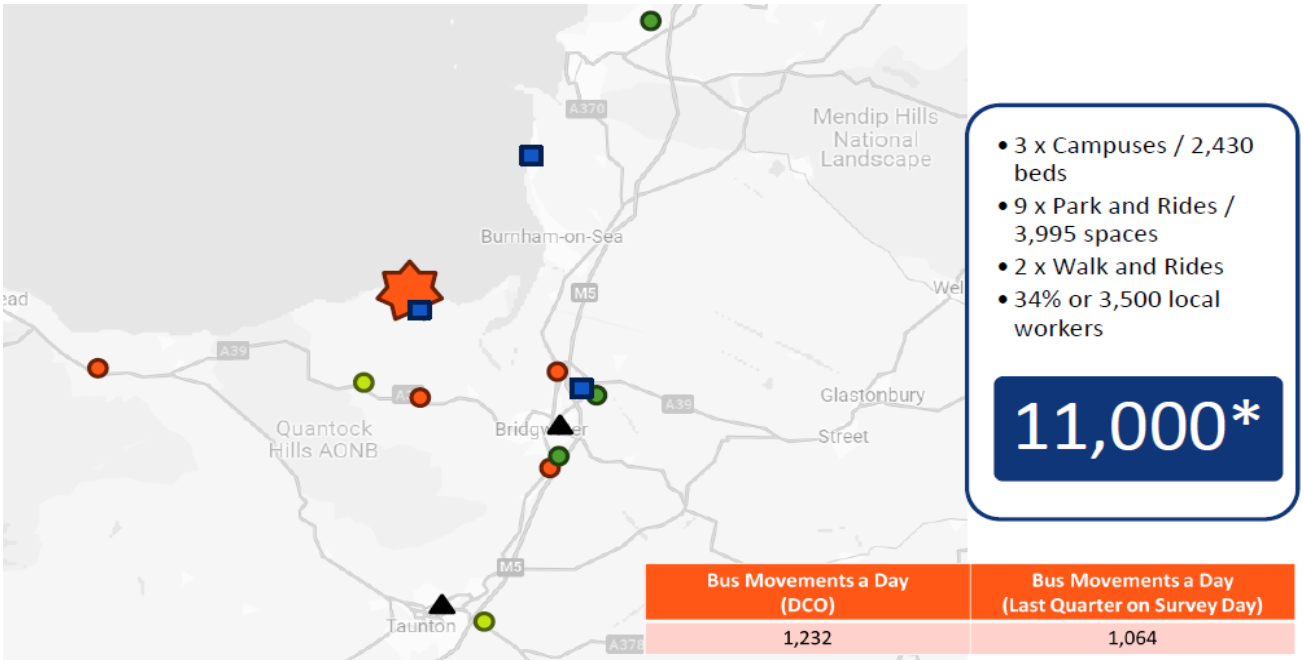
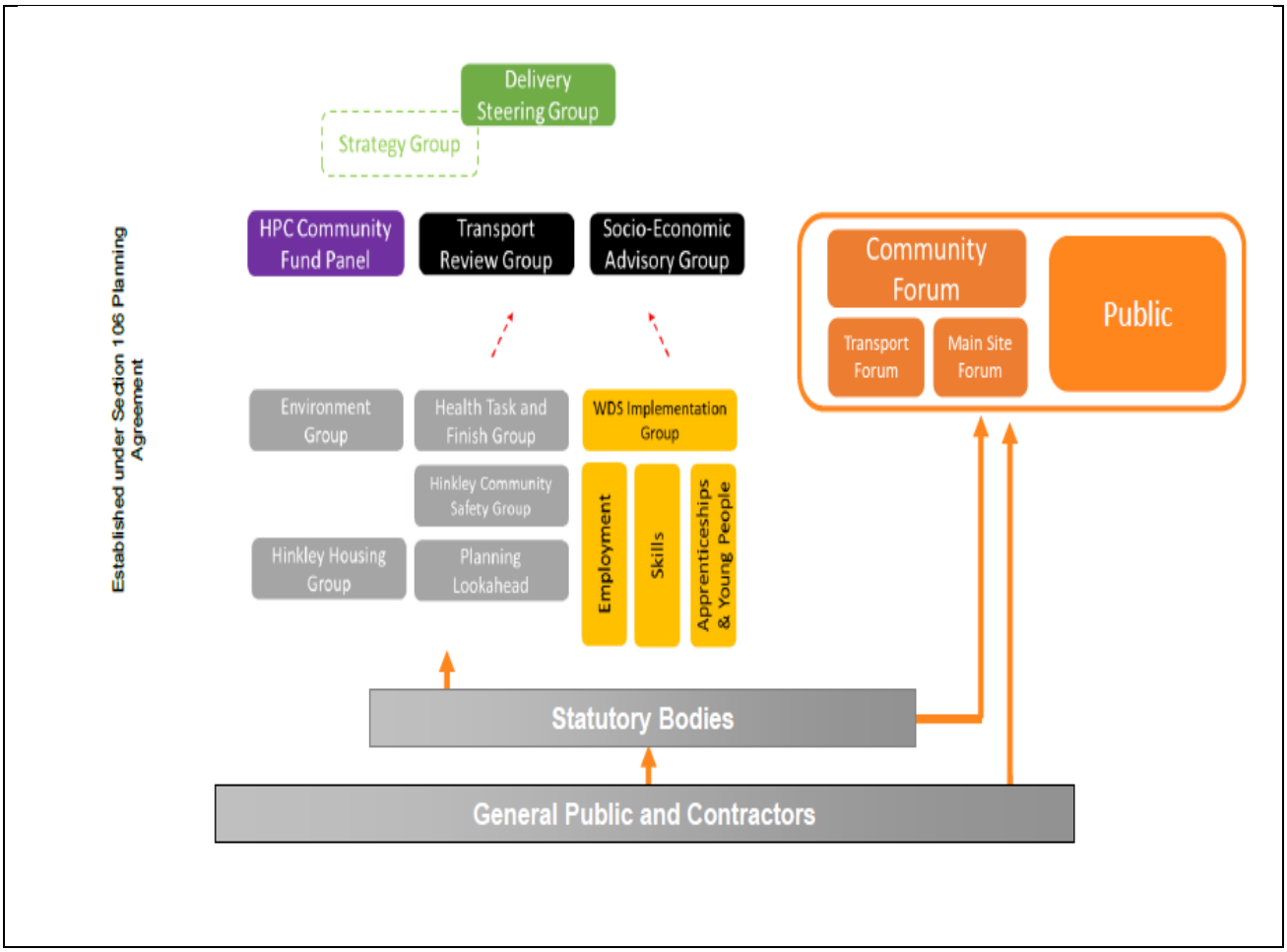


Figure 9.4: Monitoring and Feedback structure


Established under Section 106 Planning Agreement
Delivery Steering Group
Strategy Group
HPC Community Fund Panel
Transport Review Group
Socio-Economic Advisory Group
Environment Group
Health Task and Finish Group
WDS Implementation Group
Hinkley Community Safety Group
Hinkley Housing Group
Planning Lookahead
Employment
Skills
Apprenticeships & Young People
Community Forum
Transport Forum
Main Site Forum
Public
Statutory Bodies
General Public and Contractors

PART 3: RELEVANCE FOR OTHER STUDIES

10. SZC Proposed NNB

10.1 Brief consideration of HPC experience for SZC construction and operation

This section reviews the coverage of the HPC Study 1 2019 findings and recommendations in the SZC proposals, and conditions and requirements (e.g. in proposed project governance and monitoring). Key SZC sources reviewed, relevant findings and recommendations, and some comments on implications for SZC construction, are set out in Table 10.1. Some overall conclusions and a summary of some considerations for the project governance and monitoring of the SZC construction stage, distilled from the table contents, follow on in s 10.2.

Table 10.1: Sources and some relevant information findings

Key sources	Findings and recommendations	Some comments and potential issues re SZC
EDF Environmental Statement (ES) for SZC (EDF 2020)	There is some limited reference to the 2019 HPC Study 1, for example in the ES Economic Statement (8.9 2020). There is also reference to earlier IAU research (Glasson and Chadwick 1995) on the local socio-economic impacts of the construction of SZB.	Concern that little reference to the HPC Study 1; however, acknowledged that it came out after most SZC ES work completed.
LA Local Impact Report (LIR), East Suffolk Council and Suffolk County Council (May 2021).	There is considerable reference to 2019 HPC Study 1 in the LIR, relating to particular sectors of impacts – e.g. economic, skills and employment, accommodation and housing. The IAU HPC Study 1 identifies (page 62) that *"the monitoring system is not delivering enough accurate and disaggregated employment information, especially on local content by skill category and by disadvantaged and under-represented groups.* *23.34. Similarly, there is a lack of disaggregated data on supply chain impacts in Somerset and districts.* *23.35. Improved, full, transparent and publicly available Workforce Survey needed to underpin the better auditing of many socio-economic impacts."* *23.36. These are important observations which need to be addressed when setting up the monitoring framework*	The LIR was obviously very keen that the lessons from the monitoring of HPC were considered in the SZC examination and built into recommendations and conditions in the SZC DCO (see below section on SZC DCO) From LIR --- *directed primarily at the developer, the report recommends (page 63): "It should be recognised that some construction impact predictions (e.g. workforce labour demand curve and accommodation tenure mix) may require a refresh against a timeline to review and update baseline conditions, actions and project evolution (especially moving towards peak construction). This should be part of an effective adaptive impact assessment process (plan, monitor and manage).* EDFE HPC has indeed used, very substantially, an adaptive impact assessment approach in its major workforce uplift in 2022. However, it is of some concern that only 12 months later there is a further substantial workforce uplift proposal for HPC. This begins to cast doubt on the SZC peak workforce prediction – is it too low?

	It also refers more generally to implementation and deliverability risks. *The (IAU) study compares actual impacts with those predicted in the Hinkley Point C DCO, seeks to explain factors for differences, and provides recommendations for future NSIP DCOs.* *Many of the factors identified related to implementation and deliverability, including long time delays in commencement of construction project; project modifications; changes in baseline conditions; inadequate resourcing of monitoring; lack of trigger points in DCO/s106 obligations and requirements; lack of clarity in definition of some indicators; over-focus on peak construction impacts; and inadequacies of predictive techniques. Some of these categories overlap; for example, project and baseline changes are more likely with a lengthy authorisation process*	
Development Consent Order (DCO) Conditions and Requirements (2022)	There is considerable reference in the approved SZC DCO to Requirements and Conditions related to monitoring and mitigation of various project impacts, including to the monitoring methodology, frequency of monitoring and format of monitoring reports. Details of coverage will be in various plans (e.g. Terrestrial Ecology Monitoring and Mitigation Plan). Overall construction must be carried out in accordance with the Code of Construction Practice (CoCP) and subsequent plans under this Code. *CoCP (2.3.1) Sept 2021 Monitoring, management and mitigation plans then provide ESC (as discharging authority) and the Ecology Working Group, the Environment Review Group and Delivery Steering Group (established by the Deed of Obligation) appropriate oversight of the implementation of the project in order to review the effectiveness of mitigation, and where this is not effective, provide further remedies that would be agreed and implemented by SZC Co* *(2.4.10) Monitoring, environmental performance and formal compliance auditing will be conducted throughout the duration of the construction of Sizewell C in order to demonstrate the effectiveness of the measures set out in the CoCP and related construction controls, monitor the impact of construction works and recommend actions that may be necessary to ensure compliance with the CoCP. This approach will ensure that appropriate reporting is provided*	From Vol 4 of Examining Authority (ExA) report (PINs 2022), the ExA noted the importance of monitoring for the project: *The monitoring of potential effects of the construction workforce would be needed to identify where and which mitigation measures need to be enacted. The Applicant would continue to agree relevant indicators of effects with local authorities responsible for services that may be affected. From time to time, East Suffolk Council and the Applicant would propose relevant indicators to a Socio-Economic Advisory Group for its approval. The establishment of the Socio-Economic Advisory Group would be secured through an obligation in the DCO.*

Sizewell C 8.4 Planning Statement Appendix 8.4J Section 106 Heads of Terms	Monitoring requirements figure clearly in this document e.g. *6.9 Monitoring (Workforce and Socio-economic Impacts)* *6.9.1 SZC Co. shall undertake monitoring of the impacts of the Sizewell C Project on the local community, including workforce surveys and any other monitoring as may be agreed between SZC Co. and the Socio-economic Advisory Group. A number of sub-groups, such as the Community Safety Working Group and Sizewell C Health Working Group, will be responsible for monitoring effects related to their area of expertise.* *6.9.2 SZC Co. will monitor the construction workforce and the accommodation being used by workers. Regular workforce surveys would be undertaken, fixed to a statistically significant sample size, and with consistent survey questions that can provide longitudinal data.* There is also reference to more specific monitoring activities e.g --workforce and freight traffic movements --impacts on European sites Other contents also build on HPC construction initiatives, and relate to some of the IAU Study findings e.g. *-- Sizewell C Community Fund: would be available to be spent on measures which the community consider could enhance the quality of life in the local area or enable people to make the most of the opportunities offered by the Sizewell C Project* *-- Part of the Housing Fund would be set aside to support the supply, capacity and resilience of the tourist accommodation sector and latent accommodation. Another part of the housing fund would be provided as a reactive contingency which ESC could draw upon to mitigate any potential effects of the construction workforce on vulnerability to housing need and homelessness*	It would still be useful to see an overall construction stage-monitoring plan, bringing together key KPIs/indicators for all socio-economic, traffic and environmental impact sectors, and setting out the organisational framework for collecting and reporting data. There does not seem to be any reference to an independent auditing of the findings from the proposed monitoring studies. As for the HPC project, and especially for the Sizewell B project, such auditing can provide a valuable check on findings and a neutral position between the various agencies involved in the project. All monitoring findings and any auditing activities should be publicly and efficiently available. It is also unclear whether some of the identified limitations of HPC monitoring will be adequately covered at SZC, for example relating to *--lack of disaggregated employment information, especially on local content by skill category and by disadvantaged and under-represented groups; and* *--. lack of disaggregated data on supply chain impacts at county and district level* *-- Issue of concern at HPC about wellbeing of older residents. Case for more emphasis on this in the SZC Community Fund?* Good example of learning from HPC and the particular case of the Suffolk tourism industry.
8.4 Planning Statement Sizewell C Appendix 8.41 Implementation Plan (May 2020)	The Implementation Plan sets out clearly the indicative phasing schedule for key elements of Main Site and Associated Development (AD) construction activities. For example, the Main Site Accommodation Campus will be built in Year 2 and be available from year 3 onwards.	The delayed triggering of some AD projects for HPC (e.g Bridgwater Campus, and Site Jetty) were cause of some impact issues. Hence, it is important to monitor closely the phasing of such key works.

Other documentation: Hinkley Point C Socio-Economic Impact Reports (EDF 2022, 2023)	As noted in IAU 2019 HPC Study 1 and current Study 2 reports, these reports and monitoring data show what is possible in terms socio-economic benefits – including: • Apprenticeships: HPC has exceeded targets with over 1300 to date, and SZC aiming for 1500. Key is the percentage of local recruits – c 70% in CDCZ for HPC, and c 20% female at HPC. • Local supply chain benefits: HPC has also exceeded well the target of £1.5bn to SW industries (now over £5bn); which shows what might be possible for SZC. John Dugmore, Chief Executive of Suffolk Chamber of Commerce, said: *"These latest figures from Hinkley Point C show what we can achieve here in Suffolk and East Anglia regarding supply chain opportunities to support economic growth. Our Supply Chain engagement team are working with almost 2000 businesses, who are eager to get started, to get them fit and ready to seize the huge supply chain opportunities that the Sizewell C project will bring to our region."*	Should SZC be aiming higher still on some indicators—e.g. local apprenticeships, and female recruitment? Will the SZC project receive the same levels of education, skill and training initiatives and funding as received by HPC?

10.2 Some overall conclusions and a summary of some considerations for the project governance and monitoring of the SZC construction stage.

Some overall conclusions

There appears to have been only very limited reference to the IAU 2019 HPC Study 1 in the developer's Environmental Statement, although not all the wide array of documents have been reviewed here. This contrasts with the content in the local authorities' Local Impact Report that shows that the Suffolk authorities were very keen for a consideration of the findings from the HPC monitoring and auditing study in the SZC examination and in recommendations and conditions in the SZC DCO. The Examining Authority also noted the importance of impacts monitoring for the SZC project; this is developed in the DCO Requirements and Conditions, in various project construction Management Plans, and in the Planning Statement. These include, for example, referencing to the monitoring organisation, including the establishment of the Socio-Economic Advisory Group and its various sub-groups, and to the key regular Workforce Surveys.

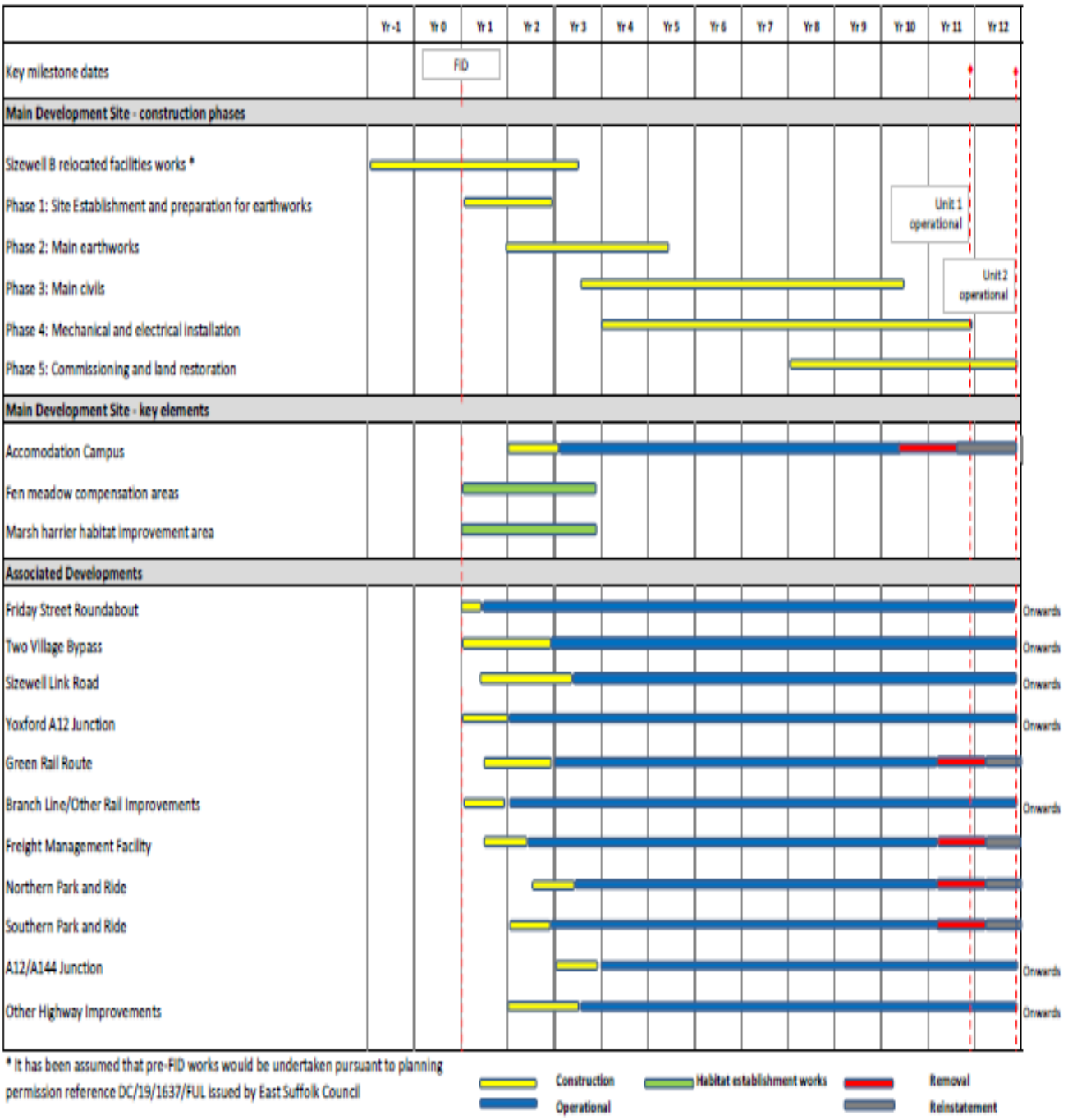
Some considerations for the SZC project

Notwithstanding the valuable learning from the HPC project for Sizewell C, there are a number of recommended considerations for the project governance and monitoring of the SZC construction stage including:

- The further substantial workforce uplift proposal for HPC begins to cast doubt on the SZC peak workforce prediction – is it too low?
- It would still be useful to see an overall construction stage-monitoring plan, bringing together KPIs/indicators for all socio-economic, traffic and environmental impact sectors, and setting out the organisational framework for collecting and reporting data.
- There does not seem to be any reference to an independent auditing of the findings from the proposed monitoring studies. As for the HPC project, and especially for the Sizewell B project, such auditing can provide a valuable check on findings and a neutral position between the various agencies involved in the project.
- All monitoring findings and any auditing activities should be publicly and efficiently available on local authority websites.
- It is also unclear whether some of the identified limitations of HPC monitoring will be adequately covered at SZC, for example relating to lack of disaggregated employment information, especially on local content by skill category and by disadvantaged and under-represented groups, and lack of disaggregated data on supply chain impacts at county and district level.
- The delayed triggering of some Associated Development projects for HPC (e.g Bridgwater Campus, and Site Jetty) were cause of some impact issues. Hence, it is important to monitor closely the phasing of such key works. Figure 10.1 does helpfully provide an indicative phasing schedule for SZC AD projects.
- Should SZC be aiming higher still on some indicators—e.g. percentages of local apprenticeships, and female recruitment?
- Will the SZC project receive the same levels of education, skill and training initiatives and funding as HPC?

Figure 10.1: Indicative phasing schedule for SZC AD projects

Plate 1.1: Indicative phasing schedule



11. New Nuclear Technologies – the potential Local Impacts of Small Modular Reactors (SMRs)

11.1 Introduction and context

The topic of Small Modular Reactors (SMRs) as an important element in the future energy mix is not new and there has been interest for well over a decade. However, interest has accelerated over the last five years, perhaps partly due to some of the perceived problems with large reactors (LRs), including construction complexity, escalating costs, inflexibility to meet more specific needs/locations, long construction periods and local resistance. The approach here is to compare potential local impacts with those with which we are familiar with LR new builds. The study will also consider any implications of 2019 HPC Study 1 and current HPC Study 2 HPC monitoring findings and recommendations for future SMRs impact assessment and management.



Figure 11.1: Sketch of prototype Rolls Royce SMR (Source: Rolls Royce)

11.2 Nature of SMR projects to consider in impact assessment

What is the MW output size? There is a general view that an SMR is up to 300MW although some are somewhat larger (e.g. current Rolls Royce design at 470 MW). Above that and up to 700MW they are more medium sized reactors. This compares with English new build LRs of 3200MW (2x1600). There is a view that many of the advantages of SMRs reduce when size increases into the medium range.

There are currently two main categories of SMR projects – those based on Gen III+ technologies, which are relatively close to commercial readiness and using a LWR (Light Water Reactor – predominantly a PWR, for example the Rolls Royce SMR PWR). The term advanced modular reactor (AMR) usually refers to a variety of Generation IV reactor technologies that are at an earlier stage of development using different coolants (e.g. sodium–cooled, heavy metal - cooled). The focus here is on the Gen III+ technologies. There are also developments in some parts of the world of marine-based floating and submersible power plants, with multiple reactors relocatable from one potential site to another. *Table* 11.1 sets out some of the claimed advantages of SMRs compared with LRs that might affect a planning and assessment process. However, it is also important to note some of the potential disadvantages of SMRs compared with LRs as set out in Table 11.2.

Table 11.1: Claimed advantages of SMRs compared with LRs

- Modular off-site construction (RR argues c90% of their SMR power plant will be built or assembled in factory conditions, and around 80% could be delivered by a UK supply chain); also smaller construction infrastructure needed.
- Reduced upfront investment needs, reduced financial risk, more manageable capital costs (the RR-SMR is now targeting a delivery price of £40–60/MWh for its power station, a similar price to offshore wind generation); however, recent US figures suggest much higher rates of c£300 per MWh (BloombergNEF 2023).
- Flexibility for new markets, for example powering data processing hubs, desalination plants, green hydrogen, combined heat and power schemes, remote mining sites; and also old markets -- with the size of SMRs providing a greater opportunity to repower existing coal and natural gas stations as nuclear ones.
- Also more flexible re locations, for example on land and sea, in more remote locations but also closer to urban areas; not as tied to large water resources as LRs.
- Much smaller impact footprint (e.g RR design equivalent to 2 football pitches on a larger site of approx 12 acres) with smaller security zones, reduced offsite emergency planning zones (EPZ) etc; although may wish to include a larger site option to allow for series of connected SMRs.
- Because of smaller output, also fewer emissions (e.g. warm cooling water).
- The enhanced safety features of SMR designs provide assurance that there will not be significant adverse transboundary impacts, especially if situated far enough from the border.
- Possible partial underground construction, with safety advantages.
- Longer refuelling periods compared with LRs; in extremis, possible replacement of whole reactor.

Sources: IAEA (2020), OECD (2021), and AMRC (2022).

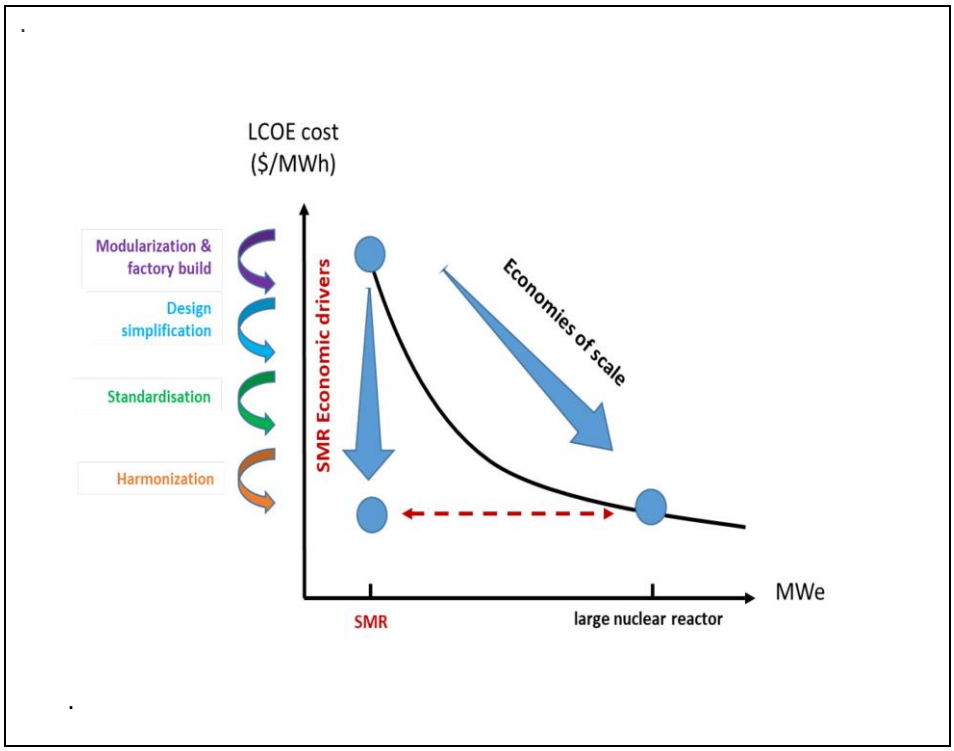
Table 11.2: Some potential disadvantages of SMRs compared with LRs

- Will not benefit from economies of scale of LRs, but might with series of linked SMRs—but then raises cumulative impact issues. Figure 11.2 sets out some of key drivers that may offset diseconomies of scale.
- More spread of waste fuel across more small sites.
- New designs may have teething problems.
- Need programme of several SMRs to reap production efficiencies, highlighting need for some stability of design and a more than national market.
- Need key economic drivers of design simplification, standardisation and modularisation, while maximising factory fabrication and minimising on-site construction, to reap economies of scale (see Fig 1).
- Modular construction likely to have considerable up-front engineering costs for First of a Kind (FOAK) SMR.
- Successful siting of SMR-based plants will require close attention to the preferences of host communities. The need to build on (i) the enhanced safety features of SMRs and (ii) on the opportunities for local and regional job creation such that SMRs are seen as attractive to local communities as large reactors will also be crucial to avoid negative issues.

Sources: as in Table 11.1.

A recent study (Institute for Energy Economics and Financial Analysis 2024) highlights some of these potential disadvantages. Drawing on experience of the only current SMR projects, two operational in Russia, one in China and one under construction in Argentina, the conclusion is they are expensive and slow to build, and overall risky propositions. Cost escalation has been of the order of 300-700% of the original cost estimates for these projects, and similar significant cost increases have occurred at proposed projects in the US. Similarly, three to four years planned construction periods have ballooned out to over thirteen years. Such overruns then increase the risk to the long run financial viability of such projects.

Figure 11.2: Key drivers to offset diseconomies of scale



11.3 Nature of possible localities

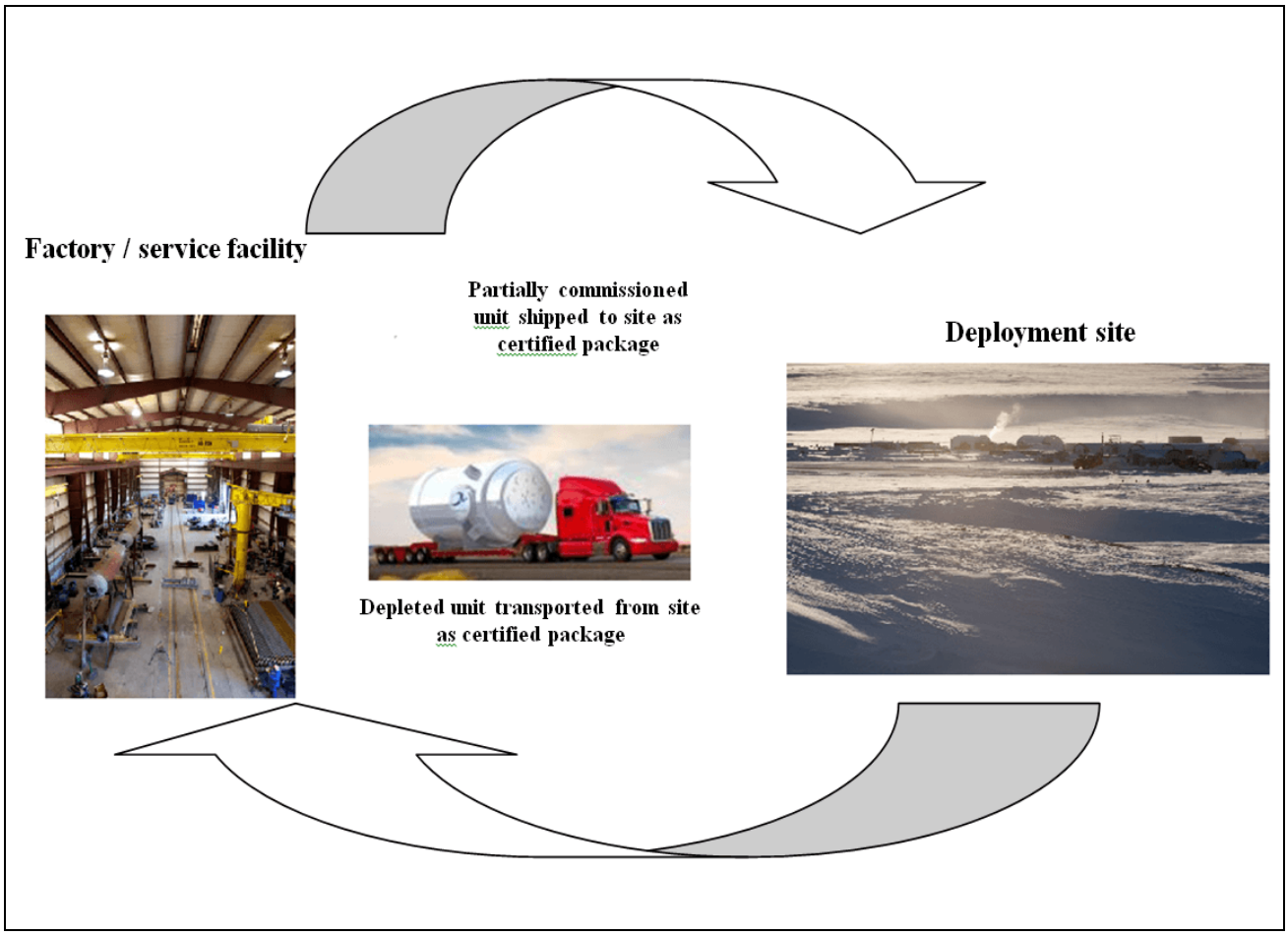
As noted above, SMRs are likely to be more flexible re locations, for example on land and sea, in more remote locations, but also closer to urban areas; not as tied to large water resources as LRs. There will also be links to fabrication facilities – as in Figure 11.3 below. Key elements in the SMR process include:

Deployment site: This is where the facility would be ultimately assembled and come into service. The site would likely have civil structures and supporting systems constructed in advance to support safe operation of the facility. The licensee then would procure reactor modules from the factory / service facility for installation at the site, and then oversee/perform commissioning activities before assuming operation of the facility. There would be regular refuelling of the reactor, or in some cases once the fuel in a reactor module is spent, a new reactor module would be delivered and placed into service. The spent reactor module may remain on the site for a period to cool before there is shipment back to the factory / service facility in a certified transport package.

*Factory/service facility***:** The facility would receive reactor module sub-components from suppliers and assemble them, in a controlled environment, into a reactor module. In some cases of SMRs fresh fuel would then be loaded into the core, with limited commissioning and system integration testing done to confirm the module meets specifications and is ready for shipment.

*Transpo*rt: This will likely involve the transport of substantial modular components. In some cases, it could include the physical movement of a pre-configured and fuelled reactor core and transport of a core's inventory of irradiated fuel.

Figure 11.3: Elements in SMR lifecycle



11.4 Comparative impact by type

Most impact literature has focused to date on risk and safety issues. There seems to have been little work on impacts, social acceptance, and community capacity issues (e.g. staffing and availability of qualified personnel), location challenges for operating a complex technology, and the potential for automation. Materials and manufacturing implications of SMRs appear more advanced than impact assessment and acceptability issues. The nature of environmental impacts originating from SMRs or LRs may not differ greatly, but it is likely that there will be differences in magnitude (Hanna et al, 2019, IAEA 2020).

- *Atmospheric and aquatic emissions*: the modularity of some SMR designs may result in lesser impacts to air and water quality during the construction phase. For the operational phase, the amount of environmental releases are expected to be roughly proportional to the generated power and size of the footprint and hence less than for LRs – unless there is a series of linked SMRs .Partial underground designs may have more implications for ground water layers.
- *Geology, hydrology and soil:* there are no key issues due to characteristics of an SMR that is based either on land or at sea that would differentiate it from a LR during the construction, operation or decommissioning project phase.

- *Terrestrial and aquatic wildlife and habitats*: includes impacts to wildlife through changes in air and water quality, physical disturbance etc. Likely to be largely related to project size in relation to comparisons with LRs. Terrestrial impacts are obviously less regarding sea based SMRs and vice versa.
- *Human health*: radiological and non-radiological issues are related to the nature of SMR designs and will be subject to the same level of regulation and monitoring as LRs. With more modular construction, there may be lower risk of construction site injuries.
- *Landscape and culture*: visual impacts may be proportionately lower than for LRs, and will vary if some undergrounding, or at sea. However, there will still be impacts of transmission lines.
- *Transport and traffic*: will vary between transport of loads and workers. For loads, modular deliveries may need some special infrastructure, especially if the site is remote. For workers, numbers are likely to be proportionately less for both construction because of off-site fabrication, and operation because of potential for more off-site maintenance.
- *Socio-economics*: following from previous transport point, there is likely to be proportionately less employment than for LRs during construction (because of modularity) and for operation (because of more off-site maintenance facilities). In addition, whilst there will still be a need for a range of construction jobs for local people, the scope for local employment may be proportionately less as some of the civil engineering construction employment, which normally provides more local job opportunities, may be internalised in off-site fabrication tasks. All this will have lower knock-on effects for other socio-economic impacts such as on workforce accommodation, health and other facilities. On the one hand, lesser impacts might be welcome locally; on the other hand lower local employment benefits may be less welcome. An exception to all this would be where SMR development was located in remote sites. Then any socio-economic impact could be locally very significant bringing not only the project and jobs, but also associated infrastructure to access the area – eg improved transport access.

11.5 EIA/regulatory regime

In the UK, there has been considerable recent activity on government funding support for SMR design initiatives, and on the regulatory (policy and project) impact assessment regime.

A FOAK SMR is likely to need public sector funding support, and there have been several UK initiatives. For example, in July 2019, the UK government committed £18m as part of the Industrial Strategy Challenge Fund to support the development of the UK SMR proposed by a Rolls-Royce-led consortium. In its 10-Point Plan for a Green Industrial Revolution released in November 2020, the UK government announced an additional £215m for the development of this domestic SMR design (S&P Global Platts, 2020). Already completed under Phase 1 are feasibility studies of 8 Generation IV (Gen IV) SMRs, and there are 3 designs selected for Phase 2, each will receive up to an additional £10m. Another possible £5m was available to regulators to support this initiative.

In March 2023, the UK budget announced funding for competition for SMR designs. By October 2023, the UK Dept for Energy Security and Net Zero had identified six companies to advance to the next phase of the SMR competition for innovative nuclear technologies (EDF, GE-Hitachi Nuclear Energy, International LLC, Holtec Britain Limited, NuScale Power, Rolls Royce SMR and Westinghouse Electric Company UK Limited). Five companies submitted bids in July 2024 and decisions on which designs to take forward are due by the new government by the end of summer 2024. The government's objective is to select technologies that offer the greatest confidence in being able to make a final investment decision in 2029 and be operational in the mid-2030s.

The UK government is also committed to streamline planning, environmental permitting and regulation to speed up new power stations, while maintaining its excellent regulatory framework. There is planning for a new nuclear NPS (EN7) in 2025. The government issued an initial consultation document in Jan 2024 -- *A National Policy Statement for new nuclear power generation: Consultation on the new approach to siting beyond 2025 (*UK Dept for Energy Security and Net Zero, 2024). This might provide the opportunity to include a more streamlined regulatory process and tests (e.g EN-6 lite) that could apply to SMRs and other advanced nuclear projects that are smaller in scale and impacts compared to the large Hinkley Point and Sizewell type LR projects. It may also lead to some opening up of more potential nuclear power locations. At present, new nuclear plants are limited to eight named sites. An opening up of locational criteria, with only population density and proximity to military activities absolutely ruling out development, would lead to a wider range of possible sites. However, this may also lead to locational challenges if key areas of, for example, natural beauty, ecological importance or cultural heritage, are potentially compromised by SMR development.

Elsewhere in the world, for example in Canada in early 2021, the Canadian Nuclear Safety Commission began reviewing a company called Global First Power to build a nuclear reactor at the Chalk River Laboratories site about 200 kilometres NW of Ottawa. This project is an example of a small modular reactor. The Canadian government has exempted such small modular reactors from full federal environmental assessment under the *Impact Assessment Act*. Many civil society groups have condemned this decision because it allows SMRs to escape the public scrutiny of environmental, health and social impacts. The proposed new SMR in Chalk River, like the existing nuclear facilities, would be located on First Nation territory, which is raising major issues about lack of consultation.

In the EU, a Press Release from the European Commission in Nov 23 announced the creation of an industrial alliance dedicated to accelerating the deployment of SMR technologies and ensuring a strong EU supply chain, including a skilled workforce. Earlier, in Aug 2023, Romania's nuclear regulatory commission issued an approval for a US NuScale Power SMR with a gross installed capacity of 462 MW.

11.6 Conclusions and cautions

SMRs do seem to have many advantages over LRs, and potentially there may be fewer local impacts. The UK government is putting considerable faith in their development over the next decade, partly as an alternative to the expensive LR projects. This involves funding support to reach an agreed design, plus ways to speed up the regulatory regime. However, as FOAK new projects, SMRs also face many challenges, indeed challenges similar to those of LRs in terms of escalating construction costs and timescales. At this stage, the future is uncertain. Hopefully, a standardised design outcome might soon help, but this is unlikely to be a quick fix to net zero, and renewables (especially on-and especially off - shore wind, and solar) will be very much needed to help deliver a timely energy transition.

12. New Nuclear Technologies – Fusion Projects

12.1 Introduction

What is fusion? Fusion is the process that takes place in the heart of stars and provides the power that drives the universe. When light nuclei fuse to form a heavier nucleus, they release bursts of energy. This is the opposite of nuclear fission – the reaction that is used in nuclear power stations today – in which energy is released when a nucleus splits apart to form smaller nuclei. To produce energy from fusion here on Earth, a combination of hydrogen gases – deuterium and tritium – are heated to very high temperatures (over 100 million degrees Celsius). The gas becomes a plasma, the nuclei combine to form a helium nucleus, and a neutron, with a tiny fraction of the mass converted into 'fusion' energy. A plasma with millions of these reactions every second can provide a huge amount of energy from very small amounts of fuel. One way to control the intensely hot plasma is to use powerful magnets. The most advanced device for this is the 'tokamak', a Russian word for a ring-shaped magnetic chamber.

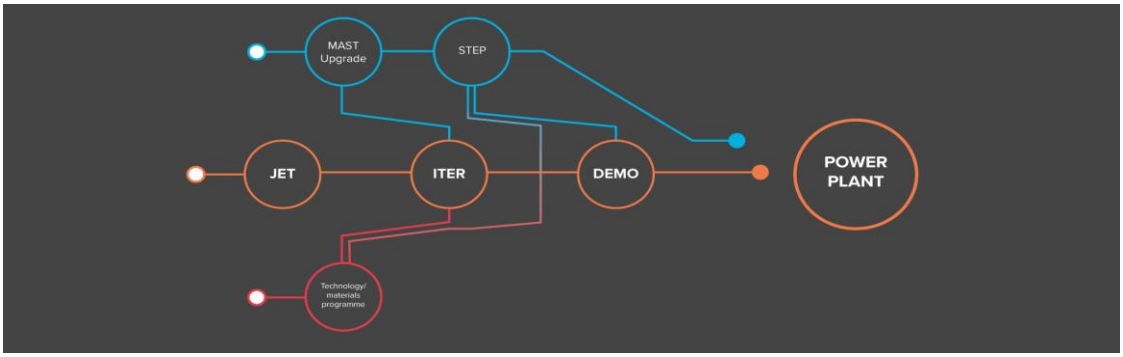
*Advantages of fusion power***.** With increasing concerns over climate change and finite supplies of fossil fuels, we need new, better ways to meet our growing demand for energy. The benefits of fusion power make it an extremely attractive option:

1. *No carbon emissions.* The only by-products of fusion reactions are small amounts of helium, an inert gas that can be safely released without harming the environment.
2. *Abundant fuels.* Deuterium can be extracted from water and tritium will be produced inside the power station from lithium, an element abundant in the earth's crust and seawater. Even with widespread adoption of fusion power stations, these fuel supplies would last for many thousands of years.
3. *Energy efficiency.* One kilogram of fusion fuel could provide the same amount of energy as 10 million kilograms of fossil fuel. A one Gigawatt fusion power station will need less than one tonne of fuel during a year's operation.
4. *Less radioactive waste than fission.* There is no radioactive waste by-product from the fusion reaction. Only reactor components become radioactive; the level of activity depends on the structural materials used. Research is being carried out on suitable materials to minimise decay times as much as possible.
5. *Safety.* A large-scale nuclear accident is not possible in a fusion reactor. The amounts of fuel used in fusion devices are very small (about the weight of a postage stamp at any one time). Furthermore, as the fusion process is difficult to start and keep going, there is no risk of a runaway reaction which could lead to a meltdown.
6. *Reliable power.* Fusion power plants will be designed to produce a continuous supply of large amounts of electricity. Once established in the market, costs are predicted to be broadly similar to other energy sources.

12.2 Fusion in the UK and EU

The United Kingdom's fusion research programme is based at the Culham Centre for Fusion Energy (CCFE) in Oxfordshire, the fusion research arm of the UK Atomic Energy Authority (UKAEA). The Joint European Torus (JET) research projects is funded by the Engineering and Physical Sciences Research Council (EPSRC) and by the European Union under the Euratom treaty. European fusion research is following a roadmap to achieve power generation around the middle of this century (Figure 12.1).

Figure 12.1: European fusion road map



Beyond JET, the programme focusses on four main projects**:**

- ***ITER*** – a large multinational tokamak being built in the south of France. ITER aims to produce 500 megawatts of fusion power and to be an important step towards demonstrating the viability of fusion on a commercial scale, but has suffered many delays and not likely to be fully operational until at least 2035.
- ***A parallel technology programme*** to develop and test robust materials that can withstand the harsh environment expected inside a fusion power plant.
- ***DEMO*** – the EU's demonstration power station design – that aims to supply fusion electricity to the grid around 2050.
- ***STEP*** – a new UK power plant design activity based on the compact 'spherical tokamak' reactor concept, which aims to deliver net electric power output on a timescale of 2040s.

*Nuclear fusion has produced more energy than ever before in an experiment, bringing the world a step closer to the dream of limitless, clean power***.** The new world record was set at the UK-based JET laboratory. The experiments produced 69 mega joules of energy over five seconds. That is only enough energy for four to five hot baths - so not a lot. The JET facility was constructed in Culham in Oxford in the late 1970s and until the end of last year was the world's most advanced experimental fusion reactor. All experiments ceased in December 2023, and the future role of the UK in European fusion research has been unclear. Since Brexit, the UK has been locked out of the Euratom programme and last year the government made the decision not to re-join. Instead it said it would commit £650m to a national research programmes

12.3 Towards Fusion Energy October 2023: the next stage of the UK's fusion energy strategy – Department of Energy Security and Net Zero

In 2021, the UK published its first fusion energy strategy. This set out a vision for UK fusion that focussed not just on the UK's unique scientific and technical expertise, but also on commercialising that technology by developing a thriving UK fusion sector and collaborating internationally. The updated 2023 strategy gives details of the new programmes that will be put in place to secure the future of the UK fusion sector as part of Fusion Futures, the UK's alternative programme to Euratom R&T. It includes new capabilities, such as a new fusion fuel-cycle facility, enhanced support for fusion R&D and engineering firms, and dedicated funding to grow engineering and science skills. The three core areas of the Fusion Futures programme are:

Infrastructure

- Funding to develop further the UK's fusion cluster, providing infrastructure and facilities for fusion companies that want to be part of that growing community.
- Development of a new facility to support research and innovation in fusion fuels generation, to be used by public and private sector alike.

Skills

- Creation of a new Fusion Skills Centre that will work with universities, colleges and employers, to provide a pipeline of highly skilled scientists, engineers and technicians at all career levels, from apprentice to postdoctoral fellow.

Industrial and commercial opportunities

- An expansion of the Fusion Industry Programme providing a wider range of challenges across multiple technological approaches to fusion.
- The UK is open to finding new ways to collaborate and share expertise with ITER. Exploring the development of a UK fusion investment fund, working with potential investors to provide patient capital to the growing number of UK fusion firms and suppliers.

The Fusion Futures programme represents up to £650m of new investment, subject to business case approval, between now and 2027 on top of the existing fusion programmes. It sets out the evolution of the UKs approach to fusion energy. Having invested in creating a uniquely strong foundation in fusion R&D the government is now hoping to build the world's first fusion power plant in Nottinghamshire with operations beginning in the 2040s. A new nuclear body, the UK Industrial Fusion Solutions, will deliver the Spherical Tokamak for Energy Production (STEP) project.

The government shortlisted five sites for a prototype commercial nuclear fusion reactor plant and in late 2022 confirmed that it would be West Burton in Nottinghamshire. The site will replace West Burton A coal-fired station. The plant should be operational by the early 2040s, according to the UK Atomic Energy Authority (UKAEA), although there are still major technical and regulatory hurdles to overcome. It is difficult to speculate on likely local impacts. Compared to SMRs there may be more onsite construction and less scope initially for a modular approach, which could mean more opportunities for local and non-local employment impacts, but with associated impacts on transport, accommodation and other services. The location of the new national Fusion Skills Centre will also be significant. The lower radioactivity risk will have implications for site management. Nottinghamshire County Council see great potential for the future at West Burton: *"STEP will bring incredible benefits to the county and wider region, including millions, if not billions worth of investment, putting it at the heart of the government's plans to revolutionise the way we generate energy in the UK. The site will be the international hub for carbon-neutral, fusion development, attracting the brightest minds locally and from across the world, creating thousands of highly skilled jobs.*" (NCC Newsroom 20/10/23).

In May 2024, the Government issued a Consultation draft on a Fusion Energy National Planning Policy Statement ("FENPS") (DESNEZ, 2024), to provide a policy framework for the subsequent assessment of an actual fusion power station proposal as an NSIP under the 2008 Planning Act. This will be a new bespoke FENPS for the sector alongside the existing suite of energy NPSs. The draft FENPS promotes an open site policy which allow developers to identify, shortlist, assess, select and promote those sites which are best placed to meet the technical requirements of the specific fusion technology selected and potential cluster, and co-location. The draft NPS sets out a whole host of factors for consideration when siting a fusion station including, for example: flood risk, population densities, transport infrastructure, grid connection, biodiversity net gain, climate change, groundwater, proximity to civil aircraft movements, military activities and hazardous waste, and sites of ecological importance, cultural heritage and landscape value. **However – a considerable weakness in the**

draft is the failure to consider socio-economic impacts in their many dimensions. As our research has shown, the consideration of such impacts is crucial for major energy projects. New fusion will be no exception; indeed, such impacts and public perceptions are likely to have a very high profile for such a new technology.

Figure 12.2: A draft illustration of a fusion prototype power station



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13. Other Major Projects

13.1 Assessing and advising on the pipeline of major projects

Infrastructure and Planning Authority (IPA)

The IPA is part of the UK Cabinet Office and HM Treasury. It provides expertise in infrastructure financing, delivery and assurance of major projects to support more effective management and delivery across government. The IPA produces the National Infrastructure Delivery Plan (NIDP); this includes major infrastructure and construction schemes funded by the public and private sectors that exceed certain capital thresholds. It collates data from multiple sources to form the pipeline including the public sector, private sector and regulators. The pipeline is mainly for England and does not include devolved spending in Scotland, Wales and Northern Ireland and by Local Authorities. The 2023 pipeline included £379bn of planned investment, £164bn of which is scheduled to occur by 2024/25. Future government Spending Reviews will determine longer-term public investment, where it is not already committed. To enable the construction industry to have confidence in longer term strategic planning, the IPA uses data from previous years and its own assessment of current trends to provide a 10-year pipeline projection including planned and forecast spend. For the 2023 pipeline, this amounted to an estimated £700-775 bn. Despite the apparent strength of the planned pipeline, there is a challenging environment for infrastructure projects with a major growth in construction material prices of over 40% between 2020 and 2023, driven primarily by Russia's invasion of Ukraine and the COVID pandemic.

Delivery of the pipeline requires a significant workforce with the right skills and experience and IPA's assessment is that availability of labour, especially in relation to specific skills, is essential. Improving

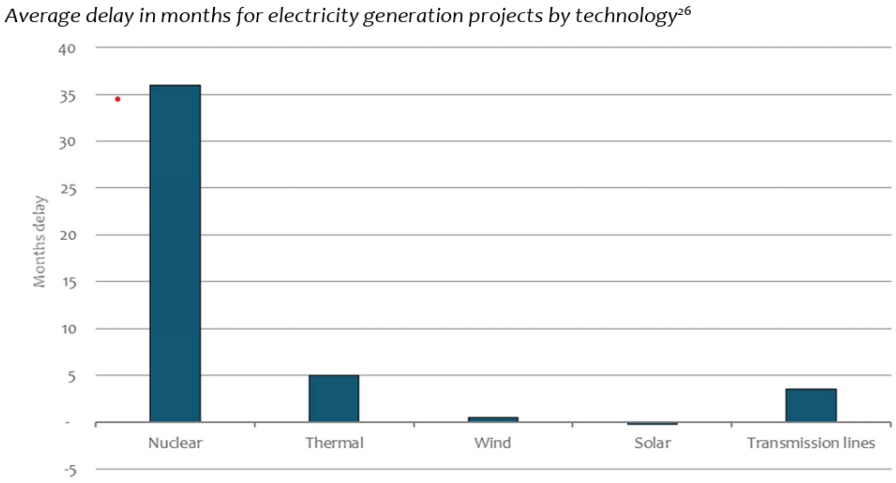
productivity will be an important factor to help manage delivery. The focus on sustainability, innovation and productivity is more important than ever given the highly challenging economic and delivery environment, impacts of climate change and the drive to Net Zero. IPA's flagship programme *Transforming Infrastructure Performance (TIP)* is reforming the design and delivery of government's infrastructure projects -- drawing a direct line between citizen benefits and impact on the built and natural environments. This step change in performance will be supported through application of the *Construction Playbook* (HMG 2022*)* provisions, project data analytics, modern construction methods including platform delivery, and other approaches that deliver greater sustainability and efficiency. IPA intends to embed TIP practices as Business as Usual by 2025.

National Infrastructure Commission (NIC)

The NIC provides the UK government with impartial, expert advice on major long-term infrastructure challenges, with the aims of supporting sustainable economic growth across all regions of the UK; improving competitiveness; and improving quality of life. The NIC produces a National Infrastructure Assessment once in every Parliament, setting out its assessment of long-term infrastructure needs with recommendations to the government. It also provides In-depth studies into the UK's most pressing infrastructure challenges, making recommendations to the government and monitors the government's progress in delivering infrastructure projects and programmes recommended by the NIC.

In July 2021, the government asked NIC for advice on whether an additional new nuclear plant, beyond Sizewell C project, was needed to deliver the sixth Carbon Budget. The NIC concluded that such a new plant was not necessary to achieve the rapid deployment of new low carbon capacity over the next 15 years. As noted in this report on HPC, nuclear projects are megaprojects; they take a long time to build and are highly complex. Moreover, because of the correlation between size of project and cost and delivery overruns nuclear projects often face the greatest challenges of all megaprojects. The median overrun for a PWR is 40%. Nuclear projects also face longer delays than other power projects globally. Having highly technical project needs, stringent regulatory requirements and public opposition are key contributors to nuclear time and cost overruns (Figure 13.1).

Figure 13.1: Average delays in types of energy projects



Note: Data for the chart is based on 401 electricity projects from around the world installed between 1936 and 2014.

Most electricity projects deliver more reliably than nuclear and the likelihood of a nuclear project delivery on time is not increasing. Since 1990, nuclear projects have faced significant delays all around the world. Even just in Europe, around half of all plants have faced at least a 50% delay in construction, and 1 in 4 plants have faced at least a 90% delay in construction. Notwithstanding such trends, the last and current UK governments are planning to build more nuclear reactors than comparable countries and committing to a third new large scale plant would make the UK a notable outlier. This raises the issue as to whether reform of the planning and assessment regulatory regime could help.

13.2 Potential reforms to the Nationally Significant Infrastructure Projects (NSIPs) regime

The NSIP process, introduced under the 2008 Planning Act, has been very successful, in many respects, in delivering decisions on a wide range of major projects, with energy projects being the largest group. However, over time there has been growing concern that the regime is in need of reform. Environmental Statements (ESs) have become voluminous, as have the number of issues examined in the process. Pre-application consultation has grown in length, government reviews of recommendations have also taken longer and there are more challenges to decisions. In addition, there has been increasing concern that the various sector policy frameworks set out in the National Planning Policy Statements (NPSs) are out of date. The government is taking steps to address wider systemic issues by updating and simplifying National Policy Statements, improving pre-application advice, building greater capability in planning authorities and the Planning Inspectorate and simplifying processes, including through introducing a “fast track” planning route for some infrastructure projects. More projects may also be included in the NSIPs regime under possible reforms by the new Labour Government, including perhaps major housing developments and onshore wind.

Additionally to such reforms, we should be learning from experience of what causes delays in project construction, and mismatches between project construction predictions and outcomes in practice. This has been the focus of this HPC research. The delivery of a decision on a project is only one-step on the road. In the spirit of adaptive assessment and management, monitoring and auditing of impacts are essential, and can lead to management responses that can speed up infrastructure delivery. This is relevant to all major projects and is discussed further in the final section of this report.

14. Overall Conclusions – Findings and Recommendations

14.1 Review of implementation of HPC Study 1 recommendations

The review of follow-up on the 2019 HPC Study 1 recommendations covers both gaps in the HPC monitoring organisation and in data sources. In summary, there is continuing good availability and continuity of data on many key impacts of the HPC project primarily through EDFE reporting via SEAG and TRG, and through the various community fora. However, on some 2019 recommendations progress appears more mixed. For example whilst there appears to be some progress on the organisation of the monitoring of accommodation and environmental monitoring, there is still little publicly available environmental data. There are also continuing limitations on the availability of disaggregated employment information from the six-monthly Workforce Surveys. Administrative

issues, including the reorganisation of the Somerset authorities, initially delayed the public availability of data, but these now appear to be largely resolved.

14.2 Refresh of HPC Sector Impacts for HPC Peak Construction

This is the main section of the report. The refresh of the HPC Sector Impact Indicators uses the same three- step approach as in the early construction impacts HPC Study 1: impact identification, assembly of monitoring information for key indicators/KPIs and auditing of findings against targets. As for the initial 2019 HPC Study 1, this new peak construction study is also based on information and data that is already or can be made publicly available, to maximise its credibility and to allow NNLAG to make the study publicly available and utilise it as evidence in support of consultation responses/ evidence at examination for other projects. The main sources of such data for the refresh are again the quarterly reports of SEAG and TRG, plus the Minutes of the various community fora (Community, Site and Transport). The peak construction period to date, as defined by workforce numbers was the 2023-2024 period, although the peak is likely to run for longer, and probably even higher, for several more years. As for the first study, the main spatial scope of the local impacts assessment is the 90 minutes commuting time CDCZ (Construction Development Commuting Zone), and various local authority areas – although the various Somerset districts merged in the April 2023 reorganisation into Somerset Council.

An additional complexity to this study has been a major review, 2019-2022, by EDFE of the likely size of the peak construction workforce and associated socio-economic indicators (Uplift 1). This revealed that in order to maintain safety and quality standards and the construction programme, there was a need to increase the peak number of workers on site from 5,600 to 8,600**.** EDFE produced a set of six Uplift Topic Papers, covering the various sectors, to assess the local impacts of this uplift. The various uplift papers are built into each of the report's sector refresh study; in some cases, there are revised indicator targets. There was a further complexity in 2024 with work by EDF on another uplift plan (Uplift 2) that is likely to increase peak employment to over 12,000, with additional mitigations on the anticipated changes in accommodation, transport, health and other impacts. The detailed papers underpinning Uplift 2 were not publicly available at the time of this report and there is only limited coverage of possible impact implications.

The audited findings of the 2023-2024 peak period impacts have a similar overall pattern to those of the early construction stage, but with some changes of note as follows:

- *Economic Development:* good performance against many indicators including local employment content, training and education, apprenticeships, jobs brokerage, local supply chain inputs and tourism. Mitigation and enhancement measures also appear to be working well, including the very significant maintaining of the local content percentage as total numbers rise fast. Yet, on the other hand, the Uplift 1 construction totals are badly out after only a very short period after the new predictions.
- *Accommodation:* findings on the spatial distribution of both NHB and HB workforce appear improved against predictions, compared with the early construction stage. There is still some skew in the tenure mix towards PRS, but the increase in campus provision has been significant. The housing support strategy, and the resultant delivery of bedspaces, appear to be working well.
- *Social and Community:* continuation of good performance against many of the impact indicators. For health, the staffing growth of the on-site Medical Campus has supported well the growth in workforce. For community safety, mitigation measures, including the Worker's Code of Conduct appear to be working well in controlling crime, relative to workforce numbers. There are some possible issues with schoolchildren numbers becoming much higher than the original predictions.

- *Transport:* There is a continuation into the peak period of good performance against predictions for many transport indicators, including workforce journey by bus to the main site, and the freight Delivery Management System. More mitigation measures, including the jetty and more P&R sites, are also now in place. Less positively, the car share system to P&R sites continues to be less effective than predicted, and there is the continuing issue of fly parking.
- *Biophysical and Environmental Health:* It is good to see a new set of KPIs to be reported to a new Environmental Monitoring Group. However, as for the earlier study, the topics addressed in this section still lack the detailed publicly available impact data to complete an audit. It must be assumed that HPC environmental impacts are well regulated with monitoring mainly related.to any exceedances of standards and thresholds. However, there may be a need for additional monitoring in relation to potential impacts of a currently proposed material change.

A number of factors influence such findings, some positively, others less so, as briefly noted here:

- *Positive factors* include the implementation of the transformational array of skill training measures, accommodation campus developments (including the Medical Centre), P&R and the site bus service, Workers Code of Conduct and community safety initiatives, and the implementation of many management plans and EDFE funding initiatives (including for housing and community impact mitigation).
- *Factors that are more negative* include the failure of Uplift 1 to anticipate the scale of the overlap between the Civils and Mechanical and Electrical phases of construction and the MEH worker requirements for future years. Monitoring and reporting of some impacts, especially some disaggregated workforce details and environmental impacts are sparse. The definitions of some indicators, especially '*what is a worker'*, has been under debate.

14.3 Relevance for Other Studies

Sizewell C and other NNB

The Suffolk local authorities' Local Impact Report made particularly good use of the findings of the 2019 HPC Study 1 as a basis for supporting arguments in the SZC examination and in recommendations and conditions in the SZC DCO. The Examining Authority also noted the importance of impacts monitoring for the SZC project, as developed in the DCO Requirements and Conditions, in various project construction Management Plans, and in the Planning Statement. These include, for example, referencing to the monitoring organisation, including the establishment of the SEAG and its various sub-groups, and to the key regular Workforce Surveys. Both the early study and this current study raise further considerations for the project governance and monitoring of the SZC construction stage, such as: the need to revisit the SZC peak workforce predictions and to clarify the nature of an overall construction stage-monitoring plan. Others for example include the scope for independent auditing of project impacts; and the level of target for some indicators (e.g aiming higher still on local apprenticeships, female employment and skill training provision). Such findings are also relevant for other NNB, which may initially be for Wylfa on Anglesey.

Small Modular Reactors (SMRs)

There is considerable interest in SMRs as part of the future UK energy mix, and as a possible complement and/or substitute for large nuclear reactors (LRs) such as HPC and SZC. They have many claimed advantages, but also potential disadvantages compared with LRs. A standardised design outcome will help progress, and offset some cost/time and risk concerns, although this is

unlikely to be a quick fix to net zero. Renewables (especially on - and off - shore wind, and solar) will be very much needed to help deliver a timely energy transition. Most impact literature on SMRs has focused to date on risk and safety issues. There seems to have been little work on other impacts, social acceptance, and community capacity issues. Whilst the nature of environmental impacts originating from SMRs or LRs may not differ greatly, and our findings are relevant, it is likely that there will be differences in magnitude. UK government consultation on new nuclear NPSs beyond 2025 might provide the opportunity to include a more streamlined regulatory process and tests (e.g EN-6 lite) that could apply to SMRs and other advanced nuclear projects that are smaller in scale and impacts compared to the LR projects. It may also lead to some opening up of more potential nuclear power locations from the present eight named sites, but this should not weaken the consideration of essential biophysical and socio-economic impacts considerations.

Nuclear Fusion Projects

Operational nuclear fusion power station projects are much further in the distance in terms of contributing to the UK energy mix. However, the UK government is committed to building on the pioneering JET project research and in its latest 2023 strategy has set out a vision for UK fusion that is focussed not just on the UK's unique scientific and technical expertise, but also on commercialising that technology by developing a thriving UK fusion sector. The government has chosen West Burton in Nottinghamshire as the initial fusion power site. The government is also consulting on an NPS for fusion energy. The draft FENPS promotes an open site policy that allows developers to identify, shortlist, assess, select and promote those sites which are best placed to meet the technical requirements of the specific fusion technology selected. It sets out a whole host of factors for consideration when siting a fusion station including, for example: flood risk, population densities, transport infrastructure and grid connection, but it currently fails to consider socio-economic impacts. As our research has shown, the consideration of such impacts is crucial for major energy projects, and new fusion will not be an exception.

14.4 Generic recommendations

These generic recommendations focus on the theme of this research -- that for an effective and efficient adaptive approach to impact assessment, good monitoring of actual impacts and auditing of these against predicted impacts are essential. Flowing from this, the research report recommends:

Preliminaries

- A monitoring and auditing framework covering key socio-economic and biophysical indicators should be an integral, clear and easily identifiable element in each of the project Environmental Statement, Development Consent Order and in S106 agreements (as appropriate).
- In addition to covering socio-economic and biophysical impacts, it should cover key stages in the lifecycle of the project, and not just focus on peak construction.
- A clear set of KPIs agreed pre-application (primarily between the developer and local authorities) and easily located in the documentation, provide the essential first step to monitoring and auditing. It is important that key definitional questions, such as 'what is a worker,' are addressed at an early stage.

Responsibilities

- Monitoring is a prime responsibility of the developer, in association with the local authorities, the community, and other relevant agencies and formal data sharing agreements are recommended.

- Quantitative data should be collected on a consistent basis; there is a need to avoid potential bias in content from proponent–led data, and use should be made of community stakeholder knowledge and opinions, which may be qualitative in content.
- An independent body preferably provides the auditing of the monitoring information against predictions. Such auditing can provide a valuable check on findings and a neutral position between the various agencies involved in the project.

Managing and resourcing

- All monitoring and auditing information should be publicly available, and 'published' on a regular basis in an agreed online format based on the initial monitoring and auditing framework. Annual Monitoring and Auditing reports are recommended.
- A rigorous approach to monitoring and auditing, involving primary information collection, can be resource intensive. A monitoring light and proportionate approach, using publicly available data and focusing on significant impacts, as in this latest HPC study, can provide a useful way forward, given developer and local authority co-operation.
- Findings from monitoring and auditing can provide the building blocks for any additional impact mitigation and enhancement measures, and updating of predictions in an adaptive assessment and management approach.
- Monitoring and auditing reports provide a vital resource for future major project developments in all their various sectors. There should be a repository for such reports (PINs re NSIPs—although recent activity not encouraging?)

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With in-kind support by:

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Appendix I 1ECOL6 Annotated Aerial Photograph Showing an Indicative Vegetation-free Construction Traffic Route



Plate I.1 Area of open tarmac across site- Example 1



Plate I.2 Area of open tarmac across site- Example 2



Plate I.3 Area of open tarmac across site- Example 3



Plate I.4 Area of open tarmac across site- Example 4



Plate I.5Area of open tarmac across site- Example 5



Plate I.6Indicative traffic route through Hoverport

Appendix J Illustrative Lux Plots for the Proposed Substations and Converter Stations in Suffolk and Kent

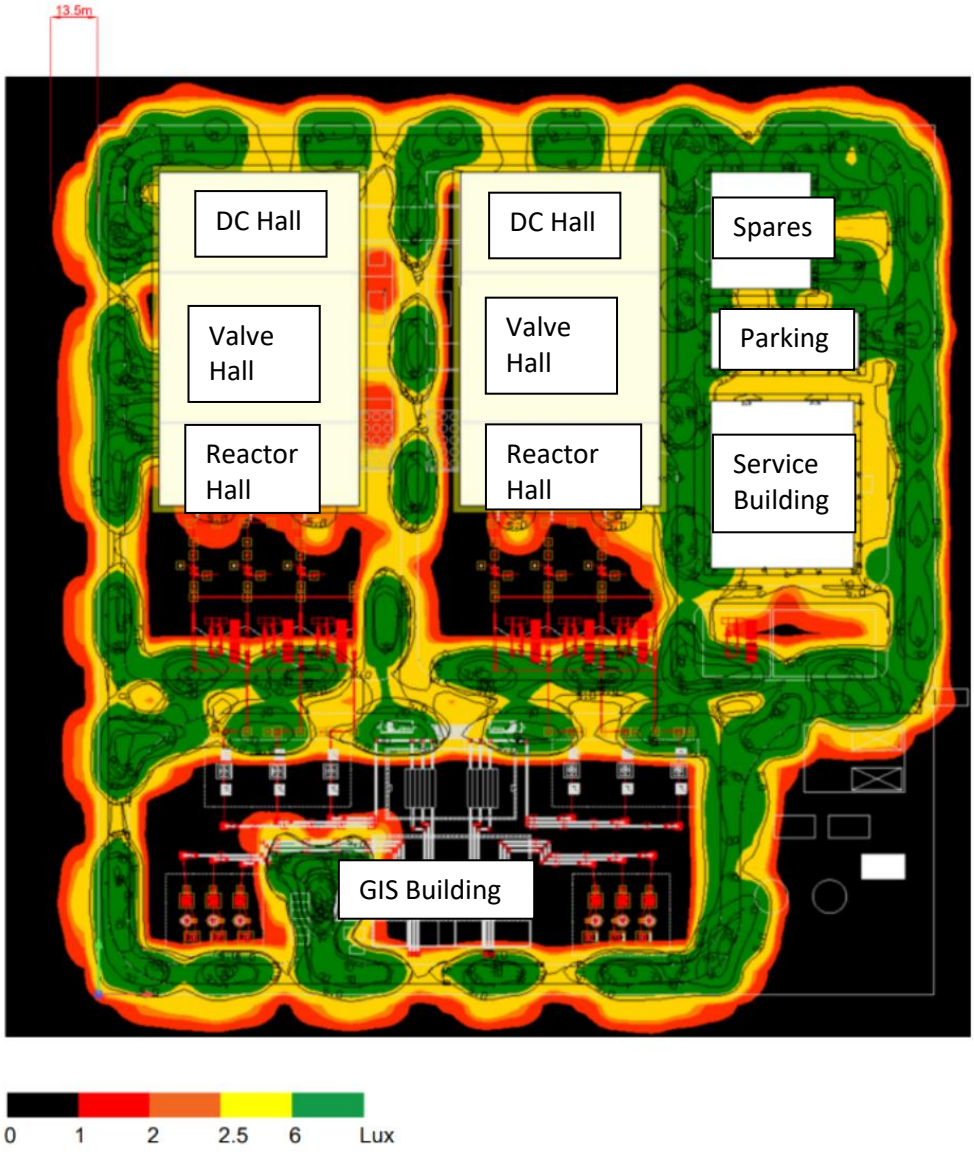


Plate J.1 Illustrative Lux Plot for Saxmundham Converter Station

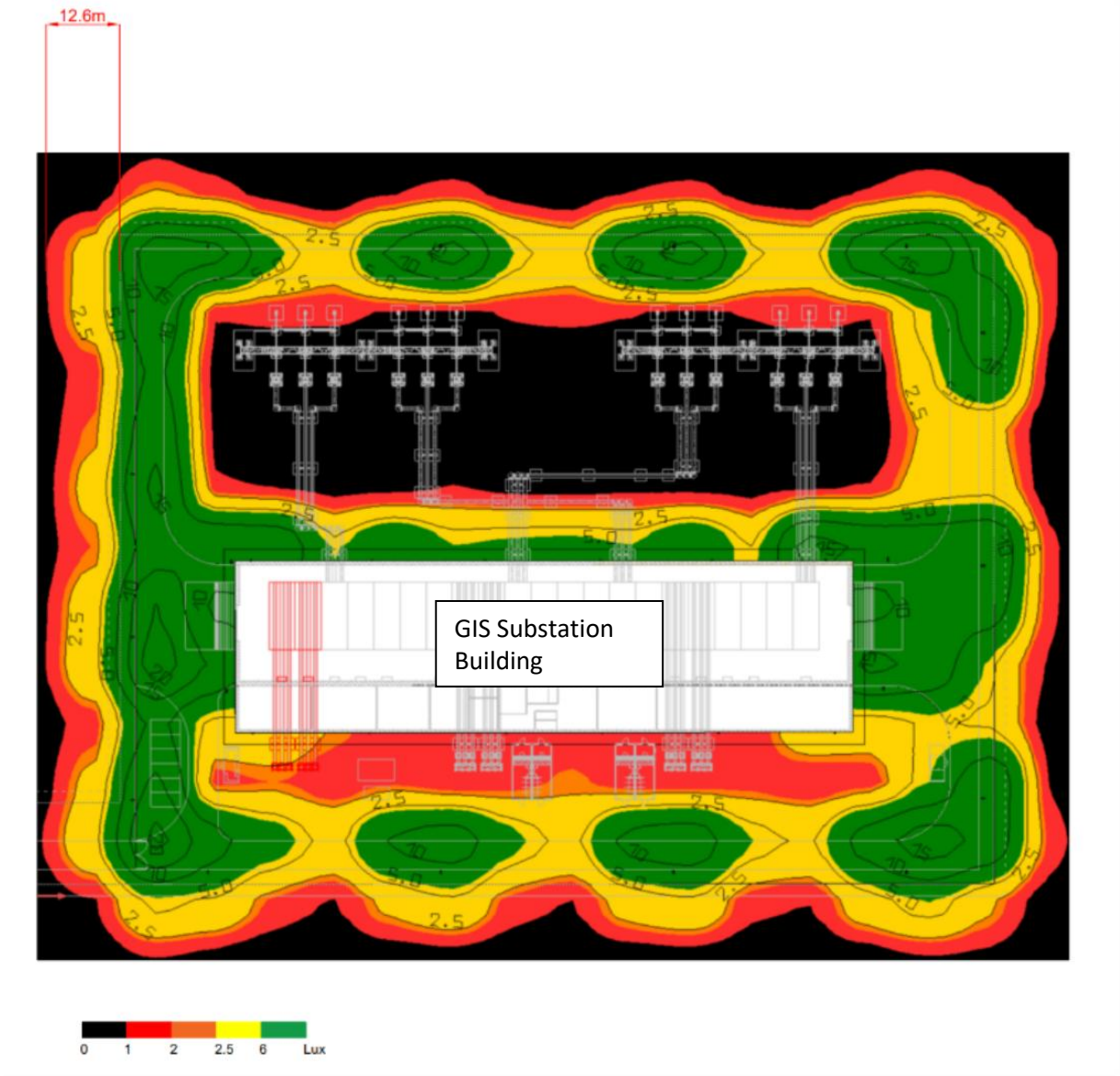


Plate J.2 Illustrative Lux Plot for Friston Substation (Friston Scenario 2)

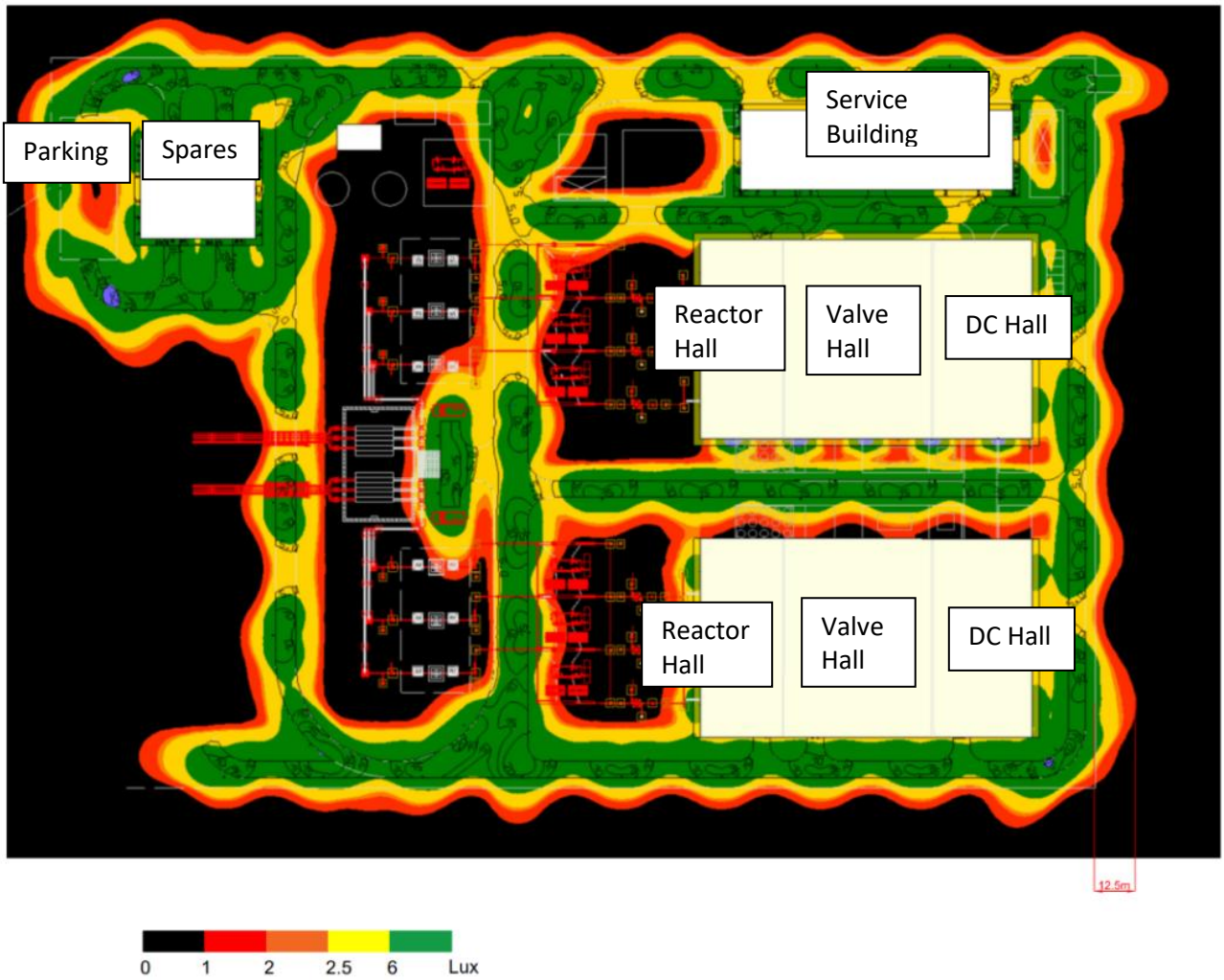


Plate J.3 Illustrative Lux Plot for Minster Converter Station

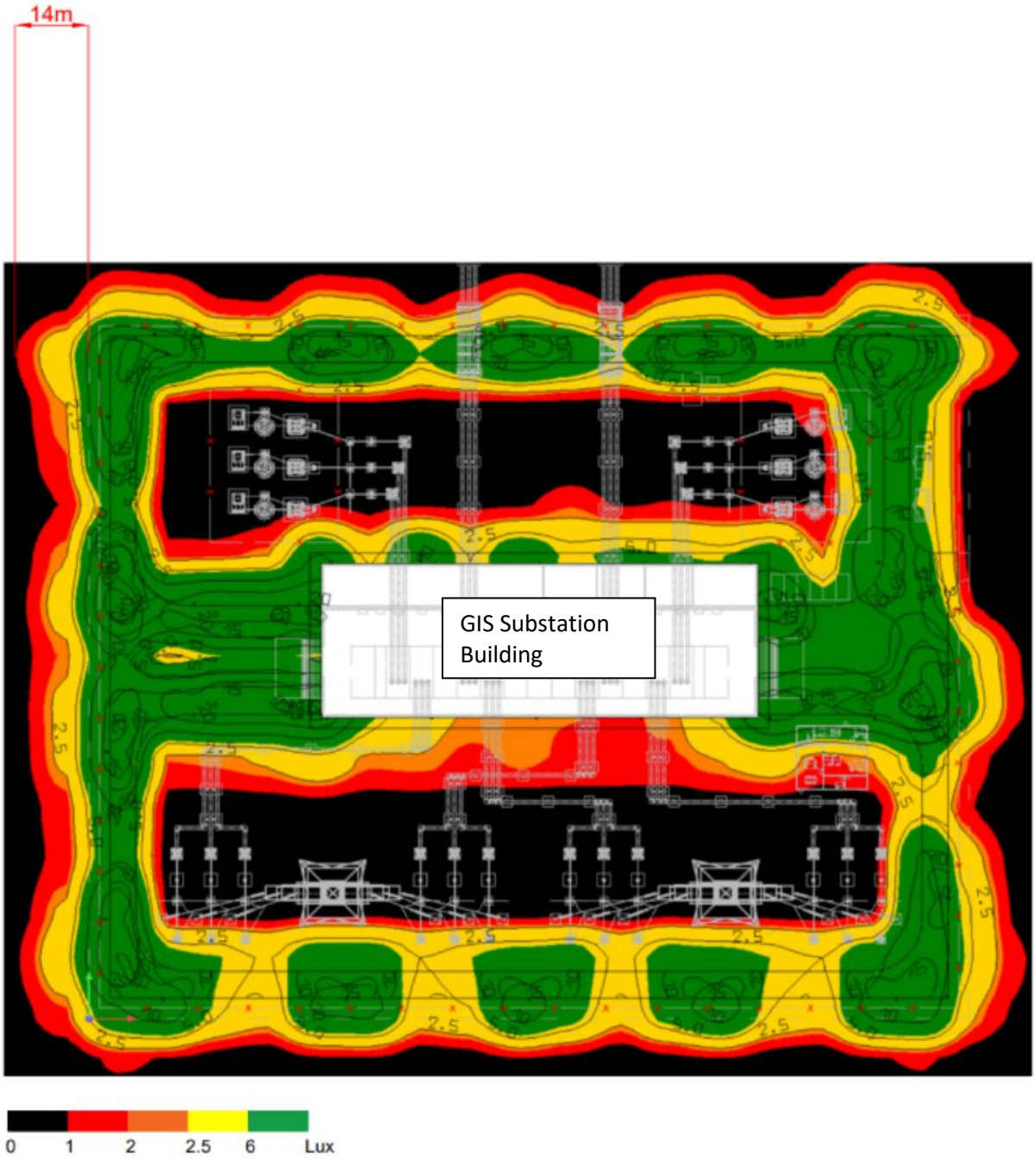


Plate J.4 Illustrative Lux Plot for Minster Substation

Appendix K Detailed Unexploded Ordnance Risk Assessments

SAFELANE
GLOBAL







Detailed Unexploded Ordnance Risk Assessment

In Respect Of:
Friston 1

For:
Mott MacDonald Ltd

Report Reference:
9758-1 RA



safelaneglobal.com

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This Report has been produced in compliance with the Construction Industry Research and Information Association guidelines for the preparation of Detailed Unexploded Ordnance Risk Assessments in the management of UXO risks in the construction industry.

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Executive Summary

The Site	
Address:	The site spans a large area, roughly centred on Fitches Lane, Aldringham, East Suffolk, IP16 4QQ
OS National Grid Reference:	TM 44479 60460
Site Description:	• The site is irregular in shape, mostly comprising open agricultural ground. • The northern extent is located to the south of Sizewell, encompassing a large portion of Sizewell Gap. • The site then extends south to Aldringham, containing part of the B1353, several buildings and the Old Vicarage, and part of Aldeburgh Road. A small section of Hundred River also crosses the site within this central section. • The western arm of the site extends north-west towards Friston, mostly comprising fields and some small sections of roadways. • The south-eastern arm of the site extends towards the north of Aldeburgh, again mostly comprising fields and small sections of roadways. • The south of the site encompasses a small section of the A1094 and a pond. • The extension area comprises part of a nature reserve, encompassing open ground, marsh and ponds, before leading out to the beach.
Proposed Works	
• Ground investigation at all areas will comprise boreholes to a depth of between 15 and 35m bgl and trial pits to max. 4m depth. • Construction will comprise Horizontal Directional Drilling from offshore to onshore where the cable will be installed in an open cut trench to a max depth of 2m bgl. There will be some shallow earthworks carried out for temporary construction compounds and construction of the permanent substation/ convertor station platform. There is the possibility of piles for heavy equipment at the substation/ convertor station location and where a new bridge is required to cross the River Frome.	
Risk Assessment	
Risk Assessment Methodology: In accordance with CIRIA guidelines this assessment has carried out research, analysed the evidence and considered the likelihood that the site has been contaminated with unexploded ordnance; that such items remained on site; the risk that they could be encountered during any intrusive works and the consequences that could result. Appropriate risk mitigation measures have been proposed.	
UXO Risk Rating **Risk Map: Annex F**	**High Risk Zone 1:** • High risk from Land Service Ammunition • Medium Risk from German HE bombs, Anti-Aircraft Shells and Small Arms Ammunition • Low Risk from German 1kg Incendiary Bombs.

	High Risk Zone 2: • High risk from Land Service Ammunition and Landmines. • Medium Risk from German HE bombs, Anti-Aircraft Shells and Small Arms Ammunition • Low Risk from German 1kg Incendiary Bombs.
	Medium Risk Zone 1: • Medium Risk from German HE bombs and Anti-Aircraft Shells • Low Risk from German 1kg Incendiary Bombs, Small Arms Ammunition and Land Service Ammunition
	Medium Risk Zone 2: • Medium Risk from German HE bombs, Anti-Aircraft Shells, Small Arms Ammunition and Land Service Ammunition • Low Risk from German 1kg Incendiary Bombs
The full UXO Risk Assessment and a breakdown of the UXO Risk Level can be found in Section 11.	
Maximum Bomb Penetration Depth	It has been assessed that a 500kg bomb would have had an approximate maximum bomb penetration depth of between **9-11m** below WWII ground level. Penetration depth could potentially have been greater if the UXB was larger (though only 4% of German bombs used in WWII over Britain were of that size). Note that UXBs may be found at any depth between just below the WWII ground level and the maximum penetration depth.

Recommended Risk Mitigation		
Risk Level	**Planned Site Activity**	**Recommendations**
Medium / High	**Shallow Intrusive Works eg excavations**	UXO Safety & Awareness Briefing (Toolbox Brief, TBB) Site Specific Safety Instructions (SSSIs) Training Course Non-Intrusive (NI) Magnetometer Survey (Greenfield areas only) Target Investigation (Required as a follow-on from NI magnetometer survey) Search & Clear Explosive Ordnance Disposal (EOD) Engineer Watching Brief (for brownfield areas unsuitable for NI magnetometer survey)
	Deep intrusive works (eg piling)	UXO Safety & Awareness Briefing (Toolbox Brief, TBB) Site Specific Safety Instructions (SSSIs) Training Course Intrusive Magnetometer Survey of pile/borehole positions

	Offshore works	Appropriate risk mitigation measures can be provided for any works taking place in marine (coastal or offshore) parts of the project site if necessary. These can usually include the following: • UXO Safety & Awareness Briefing (Toolbox Brief, TBB) • Client threat briefing • Authorities engagement where required • Non-Intrusive (NI) High-Resolution Marine Survey – Area specific to each project module • Assessment and production of a Master Target List • Target Investigation (Required as a follow-on from NI Marine Survey) • ROV/Diver Investigation / Survey • Disposal if requested
In making this assessment and recommending these risk mitigation measures, the proposed works outlined in the 'Scope of the Proposed Works' section were considered. Should the planned works be modified, or additional intrusive engineering works be considered, SafeLane Global should be consulted to see if re-assessment of the risk or mitigation recommendations is necessary.		

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Glossary of Terms

AAA	Anti-Aircraft Artillery
ARP	Air-raid Precautions
BDO	Bomb Disposal Officer
EOD	Explosive Ordnance Disposal (current term for "bomb" disposal)
HE	High Explosive
HG	Home Guard
IB	Incendiary Bomb
Kg	Kilogram
LM	Land Mine
LSA	Land Service Ammunition (includes grenades, mortars, etc.)
Luftwaffe	German Air Force
m bgl	Metres Below Ground Level
MoD	Ministry of Defence
OB	Oil Bomb
PM	Parachute Mine
RAF	Royal Air Force
SI	Site Investigation
SAA	Small Arms Ammunition (small calibre cartridges used in rifles & machine guns)
UXB	Unexploded Bomb
UXO	Unexploded Ordnance
V-1	"Doodlebug" the first cruise type missile, used against London from June 1944. Also known as 'Flying Bomb'
V-2	The first ballistic missile, used against London from September 1944
WWI	First World War (1914 -1918)
WWII	Second World War (1939 – 1945)

Detailed Unexploded Ordnance Risk Assessment

In Respect of

Friston 1 Revision

1 Introduction

Groundsure Ltd, on behalf of Mott MacDonald Ltd has commissioned SafeLane Global to conduct a Detailed Unexploded Ordnance Risk Assessment of the Friston 1 Revision project site.

Unexploded Ordnance (UXO) presents a significant risk to construction projects in parts of the UK as a result of enemy actions during the two 20th Century World Wars and historic British and Allied military activity.

One of the legacies of this conflict is buried unexploded air-dropped bombs or anti-aircraft projectiles resulting from the failure of a proportion of the weapons to function as designed. It is commonly accepted that the failure rate of these munitions was approximately 10% and, depending on their shape, weight, velocity and ground conditions, many penetrated the ground and came to rest at depth.

In addition, it is estimated that over 20% of the UK landmass has been used by the military at some point and between 2006 and 2009, over 15,000 items of British / Allied ordnance (excluding small arms ammunition) were found on UK construction sites (CIRIA).

Intensive efforts were made during and after the war to locate and render safe all UXO but, unsurprisingly, not all were found and dealt with. This is evidenced by the regular, on-going discoveries of UXO during construction-related intrusive ground works.

As a result of a generally increased risk awareness amongst professionals involved in ground engineering works and proactive health and safety measures, the risk to life and limb from UXO has been minimised. However even the simple discovery of a suspected device during on-going works can cause considerable disruption to production and cause unwanted delays and expense.

Such risks can be more fully addressed by a better understanding of the site-specific risk and the implementation of appropriate risk mitigation measures.

2 Construction Industry Duties and Responsibilities

2.1 The UK Regulatory Environment

There is no legal requirement for the control and mitigation of UXO risk in the construction industry, but guidelines for good practice, information, and solutions with regards to UXO risk are detailed within CIRIA (C681): Unexploded Ordnance (UXO) A Guide for the Construction Industry.

These guidelines provide the construction industry with a set process for the management of risk associated with UXO, from preliminary risk assessment to implementation of site-specific risk mitigation strategies.

Specific legislation does however exist for health and safety, and is addressed under a number of regulatory instruments, as outlined below.

In practice, the regulations impose a responsibility on the construction industry to ensure that they discharge their obligations to protect those engaged in ground-intrusive operations (such as archaeology, site investigation, drilling, piling or excavations) from any reasonably foreseeable UXO risk.

2.2 The Health and Safety at Work Act, 1974

The Act places a duty of care on an employer to put in place safe systems of work to address, as far as is reasonably practicable, all risks (to employees and the general public) that are reasonably foreseeable.

2.3 Construction (Design and Management) Regulations 2015

CDM 2015 ensures that health and safety within the construction industry is continually improved:

- Works are sensibly planned and managed.
- Competent staff are engaged in the works.
- Risks are identified and managed.
- All parties cooperate and coordinate activities.
- Communication flows to those who require it.
- Workers are consulted and engaged about risks and how they are being managed.

In line with CDM 2015 legislation, SafeLane Global are able to assist parties in their discharge of CDM duties as follows:

- Assist Principal Designers with pre-construction information and risk assessments.
- Assist the Designer with the Designer's Risk Assessment.
- Issue UXO risks as have been identified and manage risks accordingly.
- Assist the Principal Contractor with the construction phase information, in particular risk assessments and mitigation strategies.
- Plan, manage and monitor survey and clearance works under SafeLane Global's control.

2.4 Other Legislation

Other relevant legislation includes the "Management of Health and Safety at Work Regulations 1999" and "The Corporate Manslaughter and Corporate Homicide Act 2007".

3 The Role of the Authorities and Commercial Contractors

3.1 The Authorities

The Police have the responsibilities for co-ordinating the emergency services in the case of an ordnance-related incident on a construction site. They will make an initial assessment (i.e. is there a risk that the find is ordnance or not?) and if they judge necessary impose a safety cordon and/or evacuation and call the military authorities (JSEODOC - Joint Services Explosive Ordnance Disposal Operations Centre) to arrange for investigation and/or disposal. In the absence of an EOD specialist on site many Police Officers will use the precautionary principle, impose cordon(s)/evacuation and await advice from the JSEODOC.

The priority given to the request by JSEODOC will depend on their judgement of the nature of the risk (ordnance, location, people and assets at risk) and the availability of resources. They will respond immediately or as resources are freed up. Depending on the on-site risk assessment the item of ordnance may be removed or demolished (by controlled explosion) in situ. In the latter case additional cordons and/or evacuations may be necessary.

Note, that the military authorities will only carry out further investigations or clearances in very high profile or high-risk situations. If there are regular ordnance finds on a site, the JSEODOC may not treat each occurrence as an emergency and will encourage the construction company to put in place alternative procedures (i.e. the appointment of a commercial contractor) to manage the situation and relieve pressure from the JSEOD disposal teams.

3.2 Commercial Contractors

In addition to pre-construction site surveys and follow-on clearance work, a commercial contractor is able to provide a reactive service on construction sites. The presence of a qualified EOD Engineer with ordnance recognition skills will avoid unnecessary call-outs to the authorities and the contractor will be able to arrange for the removal and disposal of low risk ordnance. If high risk ordnance is discovered actions will be co-ordinated with the authorities with the objective of causing the minimum possible disruption to site operations whilst putting immediate, safe and appropriate measures in place.

4 This Report

4.1 Aims and Objectives

The aim of this report is to examine the possibility of encountering any explosive ordnance during any intrusive works at the site. Risk mitigation measures will be recommended in line with the CIRIA C681 guidelines, to reduce the risk of initiating UXO, and the subsequent risk of harm / damage during the envisaged works to as low as reasonably practicable (ALARP).

4.2 Risk Assessment Methodology

The following issues will be addressed in the report:

- The likelihood that the site was contaminated with unexploded ordnance.

- The likelihood that unexploded ordnance remains on site.
- The likelihood that ordnance may be encountered during any intrusive works.
- The risk that ordnance may be initiated.
- The consequences of initiating or encountering ordnance.

Risk mitigation measures, appropriate to the assessed level of risk and site conditions, will be recommended.

4.3 Approach

In preparing this Unexploded Ordnance Risk assessment, SafeLane Global has considered general and, as far as possible, site specific factors including:

- Evidence of German bombing and delivery of UXBs.
- Site history, occupancy and conditions during WWII.
- The legacy of Allied military activity.
- Details of any known EOD clearance activity.
- The extent of any post war redevelopment.
- Scope of the current proposed works.

4.4 Sources of Information

SafeLane Global has carried out detailed historical research for this Unexploded Ordnance Risk Assessment including accessing military records and archived material held in the public domain and in the MoD.

Material from the following sources has been consulted:

- The National Archives.
- Historic England.
- The GeoInformation Group.
- National Collection of Aerial Photography.
- Groundsure Limited.
- Relevant information supplied by the client.
- Available material from 33 Engineer Regiment (EOD) Archive.
- SafeLane Global's extensive archives built up over many years of research and hands-on Explosive Ordnance Disposal activities in the UK.
- Open sources such as published books, local historical records and the internet.

4.5 Reliability of Historical Records

4.5.1 General Considerations

This report is based upon research of historical evidence. Whilst every effort has been made to locate all relevant material SafeLane Global cannot be held responsible for any changes to the assessed

level of risk or risk mitigation measures based on documentation or other information that may come to light at a later date.

The accuracy and comprehensiveness of wartime records is frequently difficult or impossible to verify. As a result, conclusions as to the exact location, quantity and nature of the ordnance risk can never be definitive but must be based on the accumulation and careful analysis of all accessible evidence. SafeLane Global cannot be held responsible for inaccuracies or gaps in the available historical information.

4.5.2 Bombing Records

During WWII, considerable efforts were expended in recording enemy air raids. Air Raid Precautions (ARP) wardens were responsible for making records of bomb strikes either through direct observation or by post-raid surveys. However, their immediate priority was to deal with casualties and limit damage, so it is to be expected that records are often incomplete and sometimes contradictory. Record keeping in the early days of bombing was not comprehensive and details of bombing in the early part of the war were sometimes destroyed in subsequent attacks. Some reports may cover a single attack, others a period of months or the entire war.

Records of raids that took place on sparsely or uninhabited areas were often based upon third party or hearsay information and are not always reliable; records of attacks on military or strategic targets were often maintained separately from the general records and have not always survived.

5 The Site and Scope of Proposed Works

Site Address	The site spans a large area, roughly centred on Fitches Lane, Aldringham, East Suffolk, IP16 4QQ
OS National Grid Reference	TM 44479 60460
Site Description	• The site is irregular in shape, mostly comprising open agricultural ground. • The northern extent is located to the south of Sizewell, encompassing a large portion of Sizewell Gap. • The site then extends south to Aldringham, containing part of the B1353, several buildings and the Old Vicarage, and part of Aldeburgh Road. A small section of Hundred River also crosses the site within this central section. • The western arm of the site extends north-west towards Friston, mostly comprising fields and some small sections of roadways. • The south-eastern arm of the site extends towards the north of Aldeburgh, again mostly comprising fields and small sections of roadways. • The south of the site encompasses a small section of the A1094 and a pond. • The extension area comprises part of a nature reserve, encompassing open ground, marsh and ponds, before leading out to the beach.
Proposed Works	• Ground investigation at all areas will comprise boreholes to a depth of between 15 and 35m bgl and trial pits to max. 4m depth. • Construction will comprise Horizontal Directional Drilling from offshore to onshore where the cable will be installed in an open cut trench to a max depth of 2m bgl. There will be some shallow earthworks carried out for temporary construction

	compounds and construction of the permanent substation/ convertor station platform. There is the possibility of piles for heavy equipment at the substation/ convertor station location and where a new bridge is required to cross the River Frome.	
References	**Site Location Maps**	**Annex A**
	Recent Aerial Photograph	**Annex B**

6 Ground Conditions

Data Source		Description
British Geological Survey Mapping	**Superficial Deposits**	Parts of the site have recorded no superficial deposits. The remainder of the site contains areas of the following superficial deposits: - Lowestoft Formation (Sand & Gravel) - Lowestoft Formation (Diamicton) - Lowestoft Formation (Clay & Silt)
	Bedrock	From north to south: - Crag Group (Sand) - Chillesford Church Sand Member (Sand) - Coralline Crag Formation (Calcarenite)

7 Site History

7.1 General Overview

The site was located local to several military features, comprising training areas, airfields and anti-invasion defences. Suffolk's coastline was heavily utilised during WWII for these purposes, due to the strategic location.

During WWII, the Suffolk coastline underwent drastic change as the threat of invasion increased. Large complexes of anti-invasion defences were installed across the shoreline and the countryside, particularly following the Emergency Coastal Defence Battery programme in 1940. Pillboxes, trenches, minefields, barbed wire entanglements, beach scaffolding, artillery, anti-tank features and more were constructed within the general project area.

Anti-tank obstacles and anti-landing ditches were dug on areas of open flat lane (such as that within the site), examples of which could be found at Aldringham Common and Sutton Common.

Large areas of heathland were also used for WWII training grounds, usually located further inland. Large training areas were installed on Dunwich Heath (immediately north of the site), Sutton Common and at Aldeburgh. A large area was also given over for training to the north of Orford.

Vulnerable ports and beaches were most heavily defended, including Sizewell, Thorpeness and Aldeburgh.

7.2 Dunwich Heath

During WWII, Dunwich Heath (immediately north of the site) was one of the most heavily defended parts of the Suffolk coastline with a radar station, coastal artillery battery and anti-invasion defences.

In May 1941, a coastal artillery battery was built on the cliffs at Dunwich comprising 2 x 6" guns and was operational for around 2 years. In order to protect this site, along with the radar station, Dunwich Heath was covered with infantry positions and defences. One spigot mortar emplacement still survives today, which was constructed along with other defences.

By 1944, the final defences to be constructed at Dunwich were "Diver" anti-aircraft batteries, which were tasked with defending from the threat of V1s.

In the early stages of the war, an important training ground was established, within which the north of the project site was located. The training area was used throughout the conflict, whereby hundreds of troops and tanks used the heath for live firing practice. It was particularly important in the lead up to D-Day. In 1943, it was used for the exercise 'Kruschen' which was one of the first exercises to trial the specialised equipment that would be needed to break the concrete defences for the German Atlantic Wall.

7.3 Pre and Post-WWII OS Mapping

Section	Pre-WWII		Post-WWII		Reference
	Date	Observations	Date	Observations	
1	1938	The site comprises open fields, adjacent to coastal embankments. *Sizewell Farm* is located immediately south, with small ancillary buildings and access path leading into the site. The surrounding area is predominantly rural, with the coastline immediately east and *Sizewell Common* to the south.	1946-47	Two small ancillary buildings within the site appear to have been removed. A field to the north of the site appears to be wooded. A small area which resembles a military compound of rectangular huts has been constructed to the south of the site. No other significant changes are visible on site or in the surrounding area.	Annex C-1 and C-2
2	1938	Most of the site comprises agricultural / rural fields and rough pasture. A rail line crosses the site from north to south. *Halfway Cottages* are located on site, adjacent to a roadway,	1946-47	To the south of *Halfway Cottages,* a number of small structures have been installed within the site. Several more have been constructed in the field to the north of the cottages.	Annex C-3 and C-4

		access paths and another building. The surrounding area is a mixture of rural and urban, with the town of *Leiston* located immediately north-west.		Additional structures have been constructed to the south of the site. No other significant changes are visible on site or in the area.	
3	1938	The northern portion of the site as shown within this map is predominantly rural, comprising fields, footpaths and *Aldringham Green*. A *School* is present within this section, as well as a *School Plantation* and two roads. A section of the *Hundred River* flows through this section of the site. The southern portion of the site shown within this map consists of a field.	1947	No significant changes are visible on site or in the surrounding area. However, a previously wooded area adjacent to the site now appears to have been cleared.	Annex C-5 and C-6
4	1938	The majority of this section of the site encompasses rural fields. *Owl's Hole,* a small woodland area, is located within the western arm. *Ten Acre's Covert* and *Five Acres Pickle*, two woodland areas are located in the central portion. Several *footpaths* are identified across the site, in addition to a number of roads. Part of the southern portion is not covered by this map.	1945-47	No significant changes are identified on site. This map shows the missing section on the previous map, indicating that the southern extent is occupied by *Lily Pond* and roadways.	Annex C-7 and C-8
5	1938	The southern extent of the site is occupied by a road, surrounding fields and a pond.	1945-47	No significant changes visible.	Annex C-9 and C-10
6	1938	This part of the site is occupied by rural open fields.	1946	No significant changes visible.	Annex C-11 and C-12

7	1938	This part of the site is occupied by rural open fields.	1946-47	No significant changes visible.	Annex C-13 and C-14
8	1938	This part of the site is occupied by rural open fields.	1945-46	No significant changes visible.	Annex C-15 and C-16
9	1938	The majority of this section of the site was occupied by rural open fields. Towards the south, the site was occupied by rough pasture and furze, within a *Golf Course*. *Warren House* is present in the south-eastern extent, as well as roadways and a *Crag Pit*. The eastern site is bounded by the railway line. The extension area encompasses open ground, drainage channels and a section of the shoreline.	1947	A compound containing several rectangular buildings has been constructed immediately south of the site, with access and another structure within the site boundary. Some clearance is visible to the south of the site, along with some redevelopment and clearance immediately north. No significant changes are visible within the site itself.	Annex C-17 and C-18
Source	**Groundsure Ltd**				

8 The Threat from Allied Military Ordnance

The following potential historical and modern sources of UXO contamination on site or in the surrounding area have been considered:

Potential Source of Contamination on Site	
Army, Navy and RAF Bases / Installations	✓
Military Training Areas / Weapons Ranges	✓
Ordnance / Explosives Factories and Storage Depots	✓
Sites Requisitioned for Military Use	✓
Sites Used or Occupied by the Home Guard	✓
Military Fortifications and Coastal Defences	✓
Locations of Army Explosive Ordnance Clearance Tasks	✓
WWII Anti-Aircraft Batteries	✓
WWII Pipe Mined Locations and Beach Minefields	✓

The frequency and intensity of combat operations during WWII, coupled with a generally more relaxed attitude towards matters of health and safety, meant that during this conflict UXO contamination was more likely. This is evidenced by the regularity of UXO finds (of WWII vintage) on former military sites by the public and the construction industry. Note, peacetime military activity at such sites is far less likely to have resulted in significant contamination of larger, more hazardous British / Allied UXO.

In the immediate aftermath of WWII, the vast quantities of surplus equipment resulted in an "out of sight out of mind" attitude on many military bases, which led to a culture of onsite burial.

While health and safety regulations became more rigorous following WWII, health and safety policy at military facilities up until relatively recently (~1990s) was still not as stringent as it is today. Consequently, the risk from post-WWII UXO, particularly LSA/SAA, cannot be discounted.

8.1 Live Fire Range, Weapons Testing / Training

Dunwich Training Area was in use throughout WWII, along with several other military facilities, batteries and defensive positions.

Potential contamination associated with these facilities includes live rounds (bullets of various calibre) and heavy metals such as Lead, Antimony and Barium. The hazard associated with small arms ammunition (SAA) is relatively low, however, due to the fact that such ammunition is solid shot and does not contain any explosive fill.

However, historically, ranges were not always used for one type of weapons training. Particularly during times of war, when training facilities were in much greater demand, it is conceivable that peripheral sections of the ranges and the surrounding area were also used for training with other weapons / items of Land Service Ammunition (grenades, mortars, rockets etc). Furthermore, such variety in activity would not have necessarily been recorded in official documentation. Potential contamination at such localities could include unspent smoke, phosphorus, fragmentation or blast grenades, as well a partially expended or faulty grenades.

It is known that historical health and safety policy at military facilities has not been as stringent as it is today. Munitions expended on land, whether they functioned as designed or not, are likely to have been abandoned rather than recovered, therefore increasing the likelihood that items of UXO still remain in-situ today.

In the past, SafeLane Global has encountered a wide variety of pre-WWI projectiles at comparable locations within the Shoeburyness Range (Essex), another 20th – 21st Century firing practice area.

8.2 Ordnance / Ammunition Storage, Use and Disposal

8.2.1 WWII Storage and Disposal

During WWII, a wide range of ordnance and ammunition was stored, handled and disposed of at military training sites. Broadly speaking this would have included:

a) Land Service Ammunition: Grenades, Mortars

b) Small Arms Ammunition: machine gun / canon, rifle, pistol

c) Anti-Aircraft Artillery shells

d) Bombs and Rockets: High Explosive, Incendiary, Shot, Smoke, Flares, Photoflash

e) Air-Delivered Maritime Weapons: Depth Charges, Torpedoes, Mines

f) Practice Bombs

Anecdotal accounts suggest that faulty or surplus ordnance / ammunition on WWII military sites would often be burnt, buried or otherwise disposed of locally. In many cases designated burning pits were sited at peripheral open ground within the site perimeter.

At the former locations of bomb stores and / or ammunition stores there is a higher likelihood of UXO contamination as such items would have frequently transited to and from / been handled within these areas.

8.2.2 Post-WWII Storage and Disposal

In the immediate aftermath of WWII, the armed forces were left with a vast quantity of surplus ordnance and ammunition. Within wartime airfields, for example, several RAF Maintenance Units (MUs) specialising in weapons servicing were tasked with their long-term storage and eventual disposal. Bombs and ammunition were stacked up on the runways and in any spare buildings at a number of military airfields in Britain.

Although the quantities were vast, these large-scale storage activities are unlikely to have resulted in UXO contamination, partly due to the secure nature of the dumps (being guarded by armed troops) and also due to the size of the stored items; relatively large individual bombs and crates of ammunition / sub-munitions.

8.3 WWII Ground Defence

If a military site was constructed either prior to WWII or during 1940 / 1941 (the period of anticipated German invasion), provision was made for ground defence.

8.3.1 Coastal Defence and Defensive Fortifications

Following the evacuation of Allied troops from Dunkirk in June 1940, Britain was under threat of German invasion from occupied France. Indeed, Germany began planning an intended amphibious invasion, codenamed Operation Sealion.

The Emergency Coastal Defence Battery programme, from 1940, saw a surge in the construction of fortifications and defences along the coast. This included, but was not limited to, concrete structures such as pillboxes, trenches, minefields, barbed wire, beach scaffolding, artillery and associated structures, anti-tank ditches and anti-tank blocks.

Pivotal locations all across Britain were designated as Nodal Points, and defensive stop lines were installed across the country in preparation for an invasion. Leiston and Saxmundham were main nodal points close to the study area.

Open flat land was also subject to defensive fortification, with the installation of anti-tank obstacles and anti-landing ditches, usually close to potential invasion beaches.

During the period when the threat of enemy invasion was high, such positions would have been manned by armed troops and therefore the likelihood of UXO contamination is locally higher at these places.

8.3.2 Home Guard Activity

The Home Guard (HG) was a defence organisation of the British Army, operational between 1940 and 1944. It comprised 1.5 million local volunteers, otherwise ineligible for military service and acted as a secondary defence force in case of enemy invasion. The HG guarded the coastal areas of Britain and other important facilities such as airfields, factories and explosives stores. They were also active in county towns and cities.

Official records were rarely kept by the HG and therefore any present-day evidence is usually anecdotal. However, it is known that HG personnel often carried out training (including weapons training) in open countryside on the outskirts of cities / towns. Today, items of ordnance related to the HG are occasionally encountered by members of the public and the construction industry in the British countryside. This suggests a culture of ill-discipline regarding live ammunition within HG units.

HG personnel are known to have purposefully buried caches of ammunition and weapons in tactical positions, to be exhumed and used in case of invasion. Records of such caches were not rigorously kept, and some were therefore forgotten about. This is substantiated by several HG UXO finds over recent years. The below table shows just a handful of examples:[1]

[1] Various News Sources

Home Guard UXO Finds:	
	Unexploded Spigot Mortar Round, used by the Home Guard in WWII, found and disposed of in Hayle, Cornwall – January 2021
	24 x WWII grenades found buried in a field in Sibton, Suffolk – May 2019
	A cache of 80 phosphorous grenades buried by the Home Guard found in Eastbourne – September 2015
	Home Guard Phosphorous Grenades found buried beneath a bridge in Herne Bay – July 2015

8.3.3 Soldier Accommodation

During WWII Army, Royal Marine and Home Guard detachments were temporarily accommodated at sites requisitioned by the military for training and / or defence purposes. Soldiers could face serious disciplinary action if found to have misplaced ammunition, therefore it was not uncommon historically for troops to hoard extra items of ammunition to make up for any lost during exercises. Once these surplus items became redundant, they were often buried or hidden.

This is substantiated by anecdotal evidence, for example, a grenade was found in an accommodation block drainpipe within the Rowcroft Barracks (Ashford, Kent). Also, whilst SafeLane Global carried out EOD clearance works at Church Crookham Barracks near Fleet, a search and clear dog team sent into a disused barracks building discovered a grenade. In 2003 SafeLane Global encountered a grenade hidden in the roofing of another disused barrack block at Colchester Garrison. Thus, such a scenario cannot be discounted.

8.3.4 Battle Training

Anti-invasion exercises were frequent at WWII military sites operational during the period of anticipated German invasion. It was not uncommon for Allied Army or Marine units to visit such sites to test the base's defences during mock attacks.

Such exercises were both beneficial to the Home Guard / Army troops manning the defences as well as the attacking forces who were often in training for upcoming combat tours overseas. During these attacks live ammunition was sometimes used, as were pyrotechnic training aids to create realistic battle conditions.

This is substantiated by an eyewitness account associated with a WWII-era RAF Bomber Command airfield. A young boy who moved to Methwold village in 1942 notes that whilst exploring the areas around RAF Methwold, he would 'sometimes come across live ammunition'.[2]

8.4 Anti-Aircraft Defences

At the start of WWII, two types of AAA guns were deployed: Heavy Anti-Aircraft Artillery (HAA), firing large shells (3.7" plus calibre) and Light Anti-Aircraft Artillery (LAA) employing smaller calibre weapons, firing .303", 20mm and 40mm shells.

8.4.1.1 LAA Guns

Most important military sites were defended by light anti-aircraft batteries (as a minimum) which were usually dispersed around the site in isolated positions, giving them some protection during aerial attack.

These batteries were intended to engage the fast, low flying German fighter bombers that operated against strategic locations, such as airfields, depots etc. These batteries were mobile and could be moved to new positions with relative ease when required.

Most extensively used were 20mm Oerlikon guns in the anti-aircraft role, until the introduction of the Bofors 40mm gun from 1943, although many Army / RAF units retained a mix of both types until the end of WWII.

The 40mm Bofors gun could fire up to 120 x shells per minute to over 1,800m. The Oerlikon canon could fire up to 330 rounds per minute to over 4,000m.

8.4.1.2 HAA Guns

During the early war period there was a severe shortage of AAA available and older WWI 3" and modified naval 4.5" guns were deployed alongside those available 3.7" weapons. The maximum ceiling height of fire at that time was around 11,000m (for the 3.7" gun and less for other weapons).

As the war progressed, improved variants of the 3.7" gun were introduced and, from 1942, larger 4.5 and 5.25" weapons began to be brought into service. These had significantly improved ceiling heights of fire, reaching over 18,000m.

[2] https://joemasonspage.wordpress.com/2013/07/16/memories-of-methwold/

Before the war all the clockwork fuses used by the Royal Artillery had come from Switzerland. When that source of supply was cut off, Britain had been forced to make its own. After four years of war, the country still lacked the engineering skills to produce a reliable fuse.

This resulted in a considerable number of AA projectiles exploding prematurely, killing the gunners or failing to explode at all; falling to the ground as UXBs. For instance, In January 1944 more people in London were killed by HAA shells than by German bombs.

WWII military sites were not defended by static HAA batteries as standard, however the 3.7" was a mobile weapon and it is known that these guns were temporarily stationed at some of the more important and vulnerable bases during the German bombing campaign.

Note, any site located close to a city or large town would have also been vulnerable to HAA fire from the static gun batteries constructed around these neighbouring urban areas during 1939.

Each weapon could fire between 10 and 20 rounds per minute and so multiple gun HAA batteries could expend numerous shells in even short engagements. Any unexploded HAA projectiles could then land several kilometres away.

8.5 Mustard Gas

Britain stockpiled large quantities of Mustard Gas during WWII. In 1940-41, plans were put in place to use chemical weapons to help repel any German invasion of the Britain. More stocks were amassed in 1942-43, in case they were needed to bomb Germany and then again in 1944, in the lead up to the D-Day landings, as a deterrent and for retaliation. More stocks were produced after the war, in response to the Soviet threat, however the build-up ceased from the mid-1950s, when nuclear weapons became readily available to Britain.

Historically there were four Mustard Gas production facilities in the UK, four forward filling facilities and >60 storage sites, mainly former RAF and USAAF bases, where operational records show Mustard Gas was stored and then disposed of. However, some of these latter sites, declared as clear / safe by the MOD have since yielded up to 120 Mustard Gas artillery shells.

Note, due to the secrecy and sensitivity relating to chemical warfare during WWII, information relating to such matters was not always put on public record, hampering present day research.

Attempts to clean up the 60-plus sites over the last 40 years were often botched, leaving significant amounts of the highly corrosive, persistent chemical agent in the soil. Furthermore, detailed records of the chemicals stored at the sites appear to have been misplaced.

8.6 Generic Types of WWII British / Allied Unexploded Ordnance

8.6.1 Land Service Ammunition (LSA)

8.6.1.1 General

The term Land Service Ammunition covers all items of ordnance that are propelled, placed or thrown during land warfare. They may be filled or charged with explosives, smoke, incendiary or pyrotechnics. They can be broken into five main groups:

a. Mortars

b. Grenades

c. Projectiles

d. Rockets

e. Landmines

Unexploded or partially unexploded Mortars and Grenades are among the most common items of UXO encountered in the UK and therefore the possibility cannot be discounted that they were stored on site. They are commonly encountered in areas used by the military for training and are often found discarded on or near historic military bases.

Examples of the most commonly used British / Allied Land Service Ammunition types are presented in the *Ordnance Specifications and Information* appendices, at the end of this document.

8.6.1.2 Mortars

A mortar bomb is a fin-stabilised munition, normally nose-fuzed and fitted with its own propelling charge (primary cartridge). Range is increased by adding extra propellant (augmenting charges). They are either HE or Carrier and generally identified by their tear-dropped shape (older variants however are parallel sided) and a finned 'spigot tube' screwed or welded to the rear end of the body housing the propellant charge.

A mortar relies on a striker hitting a detonator for explosion to occur. It is possible that the striker may already be in contact with the detonator and that only a slight increase in pressure would be required for initiation. Discarded augmenting charges are often encountered around mortar firing areas/bases.

8.6.1.3 Grenades

A grenade is a short-range weapon which may be thrown by hand, fired from the end of a rifle or projected/propelled from a special purpose grenade launcher. They are divided into two categories; HE and Carrier (generally smoke). As with mortars, a grenade striker may either be in contact with the detonator or still be retained by a spring under tension, and therefore shock may cause it to function. A grenade can have an explosive range of 15-20m. Common older variants have a classic 'pineapple' shape; modern grenades tend to be smooth-sided.

8.6.1.4 Pyrotechnics

This group of LSA are mainly used for battle simulation training within Army training areas. Although they do not contain significant quantities of HE they do have small burster charges and incendiary charges which have the potential to cause serious injury.

- **The Signal Kit 16 mm (Mini Flare)** consists of a green rectangular pack containing eight flare cartridges. Each cartridge can be fired from a straight tubular pistol complete with striker, spring and thumb stud.

- **Simulator Battle Sound L35A1 (SBS)** area explosives used during exercises and demonstrations to simulate the noise of mortar fire, shell fire or Claymores. They are powerful explosives and can cause injuries to soldiers and damage to equipment.

  It consists of a cardboard tube 160mm long and 23mm in diameter which weighs 65g. One end is sealed by a removable top which serves to protect the igniter and charge. This also has the friction striker attached to the outside. The other end is the handle and is open. The handle is filled with sand to provide weight to assist in the throwing process. The SBS is waterproof and can be used in wet conditions. The SBS is coloured blue. A label with user instructions is wrapped around the tube. The charge and igniter are coloured red as is the friction striker. The removable top is sealed by a white label.

- **Schermuly Parachute Rocket**. This flare is used as an illuminating device. It comprises a small rocket which releases a flare suspended on a parachute. The flare produces a white light of about 60,000 candle power and burns for 30 – 35 seconds. It can reach a maximum height of about 350m and the rocket casing has green and white markings. There are various types with different illuminating colours.

- **Flare Tripwire Kit L10A1**. The flare may be initiated by trip wire or electrical means. It comprises three pickets, one spring-arm with spring and clamp, 20m spool of wire, an anti-glare shield and a flare pot. Eye damage can occur from the high intensity light emitted by an ignited flare tripwire. On no account should anyone continue to look directly at an ignited Flare Tripwire with unprotected eyes.

8.6.2 Small Arms Ammunition (SAA)

The most likely type of ordnance to be encountered on site are items of SAA (bullets), especially .303" ammunition which was the standard British and Commonwealth military cartridge from 1889 until the 1950s.

However even if an item such as this functioned, the explosion would not be contained within a barrel and detonation would only result in local overpressure and very minor fragmentation from the cartridge case.

Some LAA guns and RAF fighter cannons in use with British forces during WWII utilised the 20mm round. These bullets had a small fuse and a ~4gram HE or incendiary charge. Although small, this fill quantity still has the potential to cause serious injury.

Examples of the most commonly used British / Allied Small Arms Ammunition types are presented in the *Ordnance Specifications and Information* appendices, at the end of this document.

8.6.3 Anti-Aircraft Shells

At the start of the war two types of AAA guns were deployed: Heavy Anti-Aircraft Artillery (HAA) using large calibre weapons such as the 3.7" QF (Quick Firing) gun and Light Anti-Aircraft Artillery (LAA) using smaller calibre weapons such as 40mm Bofors gun which could fire up to 120 x 40mm HE shells per minute to over 1,800m. During the early war period there was a severe shortage of AAA so older WWI 3" and modified naval 4.5" guns were also deployed.

These shells are frequently mistakenly identified as small German air-delivered bombs but are differentiated by the copper driving band found in front of the base. Although the larger unexploded projectiles could enter the ground, they did not have great penetration ability and are therefore likely to be found close to WWII ground level. With a HE fill and fragmentation hazard these items of UXO also present a significant risk if encountered.

The smaller 40mm projectiles are similar in appearance and effect to small arms ammunition and, although still dangerous, present a lower risk. Details of the most commonly deployed WWII AAA projectiles are shown below:

Gun type	Calibre	Shell Dimensions	Shell Weight	HE Fill Weight
3.7 Inch	94mm	94mm x 438mm	12.7kg	1.1kg
4.5 Inch	114mm	114mm x 578mm	24.7kg	1.7kg
40mm	40mm	40mm x 311mm	0.84kg	70g

Examples of the most commonly used British / Allied Anti-Aircraft Ammunition types are presented in the *Ordnance Specifications and Information* appendices, at the end of this document.

8.6.4 Miscellaneous

When working on land used currently or historically by the military, all manner of explosive ordnance related items dating back over 100 years could be encountered. These may include practice (dummy) items, experimental weapons and other miscellanea such as detonators, pyrotechnics and fuzes. Although small, detonators and some fuzes contain enough primary explosive to cause serious injury.

All RAF aircraft were issued with distress flares stored in an inflatable dinghy. Flares are a type of pyrotechnic that produces a brilliant light or intense heat without an explosion. WWII RAF flares did not contain explosives material however produce their light through the high temperature combustion of a pyrotechnic composition. Therefore, such an item could potentially cause injury.

8.7 Site-Specific Threat from Allied Military Ordnance

The following table identifies the potential threat to the site of contamination from British / Allied UXO. The approximate locations of all relevant features are presented at Annex D.

Potential Source	Details
Live firing ranges / weapons testing on site	The north of the project site extends into Dunwich Battle Training Area. It is known that training with live ammunition was undertaken within this area during WWII. A training range was located at Dunwich, with the firing arc facing east into the sea. As such, it is not likely that these ranges will have fired towards the site.
Ordnance / Ammunition storage on site	Several areas have been identified within the project site which indicate the presence of buildings / huts relating to military sites. It is possible that ammunition could have been stored at these locations, however no direct evidence has been found.
Ordnance / Ammunition disposal on site	No official disposal areas have been recorded or identified within the project site. However, disposal was often undertaken on peripheral parts of military facilities. Some parts of the site were located in such areas where burial or discarding of UXO could have occurred. This is substantiated by post-WWII UXO finds within previously military-owned land.
Nearest Home Guard Battalion to the site	8th Suffolk (Saxmundham) Battalion

Home Guard activity on site	It is likely that the local training areas were utilised for Home Guard training exercises. The significant concentration of anti-invasion defences along the coastline and within the general project site area means Home Guard presence and activity is likely to have been significant.
Troop accommodation on site	It is likely that troop accommodation will have been provided for personnel stationed at or training at the military facilities within the site and surrounding area. No recorded accommodation blocks have been found directly within the site boundary, however it cannot be discounted in the area.
Defensive features within the vicinity	The following features have been identified / recorded on site: - WWII Strong Point & Potential Radar Station - WWII Anti-Tank Ditch - WWII Strong Points & Training Areas - WWII Diver Battery - WWII Anti-Glider Ditches The following features have been identified / recorded in the surrounding area: - At least 50 pillboxes - At least 41 defence-related positions (inc. anti-tank and anti-landing trenches, ditches, cubes, blocks etc) - At least 15 gun posts, Leiston - WWII Anti-Tank Ditch - WWII Anti-Aircraft Batteries - WWII Strong Point & Possible Depot - WWII Practice Trenches - Beach Defences - Beach Minefields The extension area contains additional defence related positions, comprising a minefield and other anti-landing / anti-invasion fortifications. Reportedly, the defences were heaviest in between Aldeburgh and Sizewell (including part of the site), as it was low-level and would have been easily accessible for landing craft, infantry and tanks.[3]
Anti-invasion exercises on site	Dunwich Battle Training Area encroaches into the north of the site, and several anti-invasion features have been identified within the project site and the surrounding area. As such, it is likely that anti-invasion exercises will have been undertaken on site and in the vicinity.

[3] http://news.bbc.co.uk/local/suffolk/hi/people_and_places/history/newsid_8868000/8868937.stm

Mines on site	Beach minefields are recorded to have been in use throughout WWII on the beachfront. The extension area encompasses a section of the beach, which was reportedly defended by minefields in addition to other types of fortification. Since anti-landing trenches and other anti-invasion installations were recorded directly on site, mines would have been used to bolster these anti-landing features.[4] RAF aerial photography confirms the presence of beach defences on the coastline within this area. One photograph shows the area in which B Type C mines are believed to have exploded: 
Threat to the site from unexploded AA shells	At least 10 possible batteries have been identified within the site and the surrounding area, including Heavy AA and Diver AA Batteries. However, it is also possible that additional or temporary AA batteries will have also been brought to the area during periods of most significant threat. The majority of the site was occupied by rural / agricultural open ground, vegetation, woodland and beach. Had an unexploded AA shell landed within such ground types, it could have been left unnoticed, easily obscured within dense vegetation or unconsolidated material.
Practice bombing on site	None recorded.
Live Training on site	The site encroached onto a training area during WWII, and contained a number of other military sites. As such, it is likely that training exercises involving live ammunition will have taken place within these locations. The remaining areas of the site are occupied mostly by rural open ground. It is possible that training activity may also have taken place within these areas. However, it is likely that live munitions are most likely to have been used within designated live training areas.

[4] https://heritage.suffolk.gov.uk/Monument/MXS19737

Mustard gas production / storage on site	None recorded

9 The Threat from German Aerial Bombing

9.1 General Bombing History of Suffolk and the Project Site

9.1.1 First World War

London and Eastern England suffered aerial bombardment during WWI, beginning with indiscriminate night raids by Zeppelin airships. However as British defensive measures became more effective and aircraft development progressed, the German military switched to daylight raids by fixed-wing aircraft in June 1917.

Available bomb plot mapping indicate that at least one Zeppelin raid occurred directly over the general site area on 24th August 1916. Additionally, several aircraft crossed the Suffolk coast on their way to / from raids on London in October 1915. However, no recorded WWI bombs are confirmed to have fallen within the project site.

Furthermore, WWI bombs were generally smaller than those used in WWII and were dropped from a lower altitude, resulting in limited UXB penetration depths. Aerial bombing was often such a novelty at the time that it attracted public interest and even spectators to watch the raids in progress. For these reasons, there is a limited risk that UXBs passed undiscovered. When combined with the relative infrequency of attacks and an overall low bombing density the risk from WWI UXBs is considered low and will not be further addressed in this report.

9.1.2 Second World War

At the start of WWII, the Luftwaffe planned to destroy key military installations, including RAF airfields and Royal Navy bases, during a series of daylight bombing raids. After the Battle of Britain these tactics were modified to include both economic and industrial sites. Targets included dock facilities, railway infrastructure, power stations, weapon manufacturing plants and gas works. As a result of aircraft losses, daylight raids were reduced in favour of attacking targets under the cover of darkness.

Historically the north of the site was located within the Urban District of Leiston-cum-Sizewell while the remainder of the site was situated within the Rural District of Blyth.

The Ministry of Home security reported that 13 air raids were recorded over Leiston-cum-Sizewell with approximately 15 metric tonnes of ordnance dropped on the region. Targets would have included Garrets Engineering Works (approximately 1km north-west of the site) which had switched from peacetime production of agricultural plant and machinery to war time production of munitions and other military equipment.

Later in the war a number of Air stations, both British and American, became operational in East Anglia, including RAF Leiston (approx. 2.6km north of the site) and RAF Framlingham.

Airfields and radar stations such as RAF Leiston and RAF High Street would have been potential targets for the Luftwaffe and defensive measures were installed, including Light Anti-Aircraft guns, pill boxes, road blocks and air raid shelters. A Luftwaffe target identification photograph (not annexed) identifies RAF Leiston, to the north of the site, then under construction.

From mid-1944 the "V-weapon" (for Vengeance) campaign, using unmanned cruise missiles and rockets, represented Hitler's final attempt to reverse Germany's imminent defeat. The V1 (Flying

Bomb or Doodlebug) and the V2 (Long Range Rocket) were launched from bases in Germany and occupied Europe.

Although these weapons caused considerable destruction, their relatively low numbers allowed accurate records of strikes to be maintained and these records have mostly survived. There is a negligible risk from unexploded V-weapons on land today since, even if an unexploded 1,000kg warhead had survived impact, the remains of the munition's body would have left incontrovertible evidence of the strike and would have been dealt with at the time.

9.2 Generic Types of WWII German Air-delivered Ordnance

The nature and characteristics of the ordnance used by the Luftwaffe allows an informed assessment of the hazards posed by any unexploded items that may remain today.

- HE Bombs: In terms of weight of ordnance dropped, HE bombs were the most frequent weapon deployed. Most bombs were 50kg, 250kg or 500kg (overall weight, about half of which was the high explosive) though large bombs of up to 2,000kg were also used. HE bombs had the weight, velocity and shape to easily penetrate the ground intact if they failed to explode. Post-raid surveys would not always have spotted the entry hole or other indications that a bomb penetrated the ground and failed to explode, and contemporary ARP documents describe the danger of assuming that damage, actually caused by a large UXB, was due to an exploded 50kg bomb. Unexploded HE bombs therefore present the greatest risk to present–day intrusive works.
- Blast Bombs/Parachute Mines: Blast bombs generally had a slow rate of descent and were extremely unlikely to have penetrated the ground. Non-retarded mines would have shattered on most ground types, if they had failed to explode. There have been extreme cases when these items have been found unexploded, but this was where the ground was either very soft or where standing water had reduced the impact. SafeLane Global does not consider there to be a significant risk from this type of munition on land.
- Large incendiary bombs: This type of bomb ranged in size from 36kg to 255kg and had a number of inflammable fill materials (including oil and white phosphorus), and a small explosive charge. They were designed to explode and burn close to the surface, but their shape and weight meant that they did have penetration capability. If they penetrated the ground, complete combustion did not always occur, and, in such cases, they remain a risk to intrusive works.
- 1kg Incendiary Bombs (IB): These bombs, which were jettisoned from air-dropped containers, were just over 30cm in size and therefore highly likely to go unnoticed. They had the potential to penetrate soft ground and left a very small entry hole. Furthermore, if bombs did not initiate and fell in water or dense vegetation or became mixed with rubble in bomb damaged areas, they could have remained hidden to this day. Some variants had explosive heads, and these present a risk of detonation during intrusive works, particularly due to their shape, which leads them to often be misidentified.
- Anti-personnel (AP) Bomblets: AP bombs had little ground penetration ability and should have been located by the post-raid survey unless they fell into water, dense vegetation or bomb rubble.
- Specialist Bombs (smoke, flare, etc): These types do not contain high explosive and therefore a detonation consequence is unlikely. They were not designed to penetrate the ground.

Examples of the most commonly deployed German bombs are presented in the *Ordnance Specifications and Information* appendices at the end of this document.

9.3 Second World War Bombing Statistics

The site was located partially within the Urban District of Leiston-cum-Sizewell, and partially within the Rural District of Blyth. The following table summarises the quantity of German bombs (excluding 1kg incendiaries and anti-personnel bombs) falling on these locations between 1940 and 1945.

Record of German Ordnance Dropped		
Location	**Urban District of Leiston-cum-Sizewell**	**Rural District of Blyth**
Area Acreage	4,462	98,184
High Explosive Bombs (all types)	83	555
Parachute Mines	-	7
Oil Bombs	-	3
Phosphorus Bombs	-	12
Fire Pots	-	16
Pilotless Missile (V1)	-	14
Long Range Rocket (V2)	-	1
Total	83	608
Items Per 1,000 Acres	**18.6**	**6.2**

Source: Home Office Statistics

Detailed records of the quantity and locations of the 1kg incendiary and anti-personnel bombs were not routinely maintained by the authorities as they were frequently too numerous to record.

Although the incendiaries are not particularly significant in the risk they pose, they nevertheless are items of ordnance that were designed to cause damage and inflict injury and should not be overlooked in assessing the general risk to personnel and equipment. The anti-personnel bombs were used in much smaller quantities and are rarely found today but are potentially more dangerous. This table does not include UXO found during or after WWII.

9.3.1 Original ARP Bombing Incident Records

Throughout WWII, records of bombing incidents were kept by the ARP and Civil Defence Office. These records were kept in the form of typed or hand-written notes and/or presented on bomb plot maps. Some other organisations, such as port authorities and railways, maintained separate records.

Written ARP records were reviewed for	Sizewell, Leiston and surrounding area		
Source	Suffolk County Archives		
Records of bombing on / near the site were found			✓
Date	**Location**	**Weapon**	**Details**
06/10/1940	Wickham Market	Machine gun	Little damage caused
18/08/1940	Leiston and East Suffolk	Machine gun	Attacks to search light positions
	Leiston	15 x HE bombs	n/a
01/02/1941	Leiston	10 x UXB HE bombs	n/a
02/02/1941	Leiston	10 x HE bombs and machine gun	Attack on Garrett Engineering Works (approx. 1-1.2km north-west)
10/10/1941	Leiston	HE	24 houses and school damaged
01/06/1942	Leiston	9 x HE bombs and IBs	Believed to be an off shoot of raid over Ipswich.
01/02/06/1942	Sizewell	2 x 500kg HE bombs	One bomb fell 260ft south of Leiston-Sizewell Road and 400ft east of Halfway Cottages (on site). Severe damage to an Army hut and damage to Halfway Cottages, Leiston. The second bomb fell around 265ft to the south-east of the first. This incident occurred directly within the project site.
19/10/1942	Wickham Market	HE bomb	Damage to 114-118 High Street (>11km south-west). Resulted in the deaths of three civilians
03/10/1943	Leiston	SD2 'Butterfly' bombs	Crown Farm (immediately west of the site).
15/10/1943	Leiston	HE bomb	n/a

9.3.2 Home Office Intelligence Reports

The Home Office Intelligence reports document enemy action on British domestic soil and were prepared twice a day for the Home Security War Room. The summaries were prepared by intelligence staff, who compiled reports received from the twelve civil defence regions.

However, available records only document time and general location of attack and numbers of casualties. The intelligence officials generally only recorded locations on municipal level (town, village, or city), rarely providing specific addresses.

Date	Location	Details
18/08/1940	Leiston	No casualties
22/08/1940	Aldeburgh	No casualties
04/10/1940	Aldeburgh	6 injured
06/10/1940	Leiston	No casualties
03/11/1940	Aldeburgh	No casualties
06/11/1940	Aldeburgh	No casualties
25/11/1940	Friston	No casualties
15/12/1940	Sizewell	No casualties
21/01/1941	Aldeburgh	1 injured
02/02/1941	Leiston	No casualties
15/02/1941	Aldeburgh	No casualties, 2 raids
	Friston	No casualties
18/02/1941	Leiston	No casualties
20/02/1941	Leiston	No casualties
27/02/1941	Friston	No casualties
06/03/1941	Friston	No casualties
15/03/1941	Aldringham	No casualties
02/04/1941	Aldeburgh	No casualties
29/04/1941	Between Leiston and Aldeburgh	1 injured

09/05/1941	Aldeburgh	No casualties
12/05/1941	Aldeburgh	No casualties
13/05/1941	Leiston	No casualties
15/05/1941	Leiston	1 killed, 3 injured
02/06/1941	Sizewell	No casualties
22/07/1941	Aldeburgh	No casualties
24/07/1941	Leiston	No casualties
29/07/1941	Aldeburgh	No casualties
08/09/1941	Aldringham-cum-Thorpe	No casualties
07/10/1941	Aldeburgh	No casualties
11/10/1941	Leiston	2 killed, 2 injured
05/11/1941	Aldeburgh	No casualties
17/01/1942	Aldeburgh	No casualties
30/01/1942	Leiston	No casualties
02/06/1942	Leiston	Unexploded bomb – no casualties
27/07/1942	Aldeburgh	No casualties
02/08/1942	Aldeburgh	2 injured
19/10/1942	Aldeburgh	No casualties
15/12/1942	Aldeburgh	11 dead, 29 injured
25/04/1943	Sizewell	No casualties
14/05/1943	Leiston	No casualties
03/10/1943	Aldeburgh	No casualties
04/10/1943	Sizewell	No casualties
16/10/1943	Leiston	No casualties

19/04/1944	Leiston	No casualties
30/08/1944	Friston	No casualties
13/10/1944	Aldeburgh	No casualties
15/10/1944	Aldeburgh	No casualties
20/10/1944	Aldeburgh	No casualties
05/11/1944	Aldeburgh	No casualties
06/11/1944	Aldeburgh	4 injured
07/11/1944	Aldeburgh	No casualties
10/11/1944	Aldeburgh	No casualties
11/11/1944	Aldeburgh	No casualties
15/11/1944	Aldeburgh	No casualties
13/12/1944	Aldeburgh	No casualties
03/01/1945	Aldeburgh	No casualties

9.3.3 Secondary Source / Anecdotal Evidence

Anecdotal evidence of local bombing incidents was sought from publications and web resources. The following references to incidents on site or in the surrounding area were found.

Date	Weapon	Details
WWII	HE bombs	Several bomb craters were recorded approximately 1km north of the site, around Sizewell.[5]
08/09/1940	Incendiary bombs	Blyth Rural District[6]
20/09/1940	Parachute Mine	Blyth Rural District[7]
22/09/1940	Parachute Mine	Blyth Rural District[8]
06/10/1940	HE bomb	Plotted ~1.3km north-east of the site, within Leiston town.[9]

[5] https://heritage.suffolk.gov.uk/map
[6] Bowyer, 1986
[7] Bowyer, 1986
[8] Bowyer, 1986
[9] https://www.cambridge-news.co.uk/news/local-news/second-world-war-bombing-cambridge-20248474

05/11/1940	16 x HE bombs	Blyth Rural District[10]
11/11/1940	10 x HE bombs	Blyth Rural District[11]
24/11/1940	HE bomb	Plotted ~670m west of the site, within Friston town.[12]
14/12/1940	HE bomb	Plotted ~800m north of the site, within the current Sizewell nuclear power station facility.[13]
09/01/1941	4 x HE bombs	Blyth Rural District[14]
21/01/1941	HE bomb	Plotted ~1km south of the site, within Aldeburgh town.[15]

9.3.4 WWII-era RAF Aerial Photography

The following WWII-era aerial photography was reviewed for the site:

Date	26th August 1942	
Source	NCAP	
Image Type	Aerial	
Image quality	Partial coverage, small scale, high resolution	
Observations	• Within the north of the site, the site comprised rural open ground. • A number of structures are visible in the northern section. • Within the south-east, the site encroaches onto a golf course. • The remainder of the site (visible on the photograph) appears to comprise agricultural or rural open ground. • Within the surrounding area, the anti-glider defences are visible adjacent to the site.	
Reference		**Annex E-1, E-2**

[10] Bowyer, 1986
[11] Bowyer, 1986
[12] https://www.cambridge-news.co.uk/news/local-news/second-world-war-bombing-cambridge-20248474
[13] https://www.cambridge-news.co.uk/news/local-news/second-world-war-bombing-cambridge-20248474
[14] Bowyer, 1986
[15] https://www.cambridge-news.co.uk/news/local-news/second-world-war-bombing-cambridge-20248474

Date	Circa 1945
Source	The GeoInformation Group
Image Type	Aerial
Image quality	Partial coverage, small scale, low resolution
Observations	• The north-eastern extent of the site is shown to be occupied by rural open ground. • One roadway extends west to east to the coast. • Several small features are visible to the south of the road, which may contain some structures. Similar features are visible in the surrounding area. • The anti-glider ditches are visible in the fields to the south of the site. • The southern part of the site predominantly comprises rural / agricultural open ground, with the south-east extending into a golf course. • Within the south-east, the site extends into an area containing a military facility, consisting of huts and access roads.
Reference	**Annex E-3, E-4**

9.3.5 Abandoned Bombs

A post-air raid survey of buildings, facilities and installations would have included a search for evidence of bomb entry holes. If evidence was encountered, Bomb Disposal Officer teams would normally have been requested to attempt to locate, render safe and dispose of the bomb. Occasionally evidence of UXBs was discovered but due to a relatively benign position, access problems or a shortage of resources the UXB could not be exposed and rendered safe. Such an incident may have been recorded and noted as an Abandoned Bomb.

Given the inaccuracy of WWII records and the fact that these bombs were 'abandoned', their locations cannot be considered definitive, nor the lists exhaustive. The MoD states that 'action to make the devices safe would be taken only if it was thought they were unstable'. It should be noted that other than the 'officially' abandoned bombs, there will inevitably be UXBs that were never recorded.

SafeLane Global holds records of officially registered abandoned bombs at or near the site	✘
Additional Comments	n/a

9.4 UXB Ground Penetration

9.4.1 General Considerations

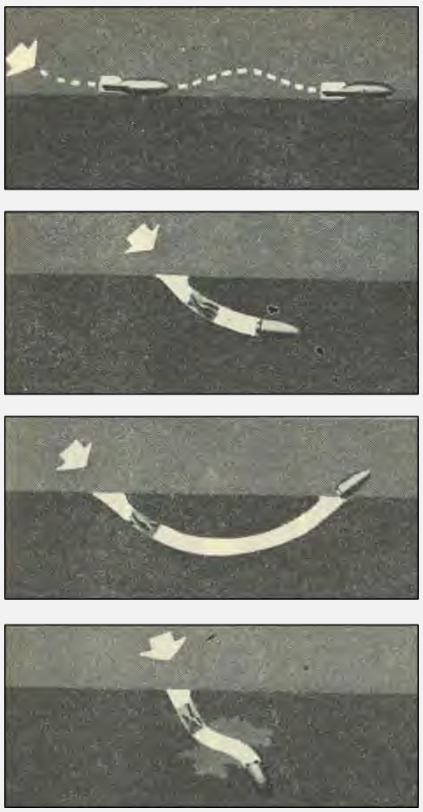
The actual penetration depth of aerial delivered bombs into the ground will have been determined by the mass and shape of the bomb, the velocity and angle of the bomb on impact (dependent on

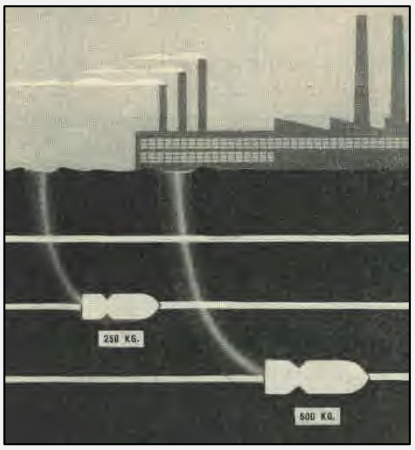
the height of release) and the nature of the ground and ground cover; the softer the ground, the greater the potential penetration. Peat, alluvium and soft clays are easier to penetrate than gravel and sand. Bombs are brought to rest or are commonly deflected by bedrock or large boulders.

9.4.2 The "j" Curve Effect

An air-dropped bomb released from normal bombing altitude (approx. 5,000m) on its curved trajectory can reach a terminal velocity of between 350-400 ms-1. In this case of high-level bombing, the angle of which the bomb enters the earth is approx. 15° from the perpendicular and its exact path is difficult to trace. The bomb is being driven by its kinetic energy can unless deflected, will continue its line of flight and can turn in an upwards curve towards the ground surface as it comes to rest. The upwards curve is caused by the transfer of energy as the bomb travels through the ground. The nose of the bomb travels slower than the rear of the bomb due to the drag/friction of it passing through the ground. The rear of the bomb, having more energy due to less drag/friction is travelling much quicker.

The location of the bomb is thus ''offset'' from the hole of entry. This ''offset'' from vertical is generally understood to be about one third of the penetration depth but can reach up to (and have been found at) 15m/50 ft from point of entry, dependent on ground conditions and the bomb's angle of impact. The figure below depicts the various paths of UXB through homogenous ground, showing how the J-curve effect can lead to a UXB coming to rest beneath undamaged buildings.





A UXB can come to rest beneath undamaged buildings due to the J-Curve effect if it lands in nearby soft ground.

Image source: Field Manual for Unexploded Bombs: Organisation and Operation For Disposal, United States War Department 1943

Left: Path of UXB in soft ground:

1. Ricochet resulting from low level attack: UXB stays perpendicular to ground and rests at surface.
2. Buried UXB with J-Curve: Bomb curves horizontally and rests perpendicular to surface.
3. UXB returning to surface due to J-Curve: Bomb points towards surface but may remain partially or completely below ground level.
4. UXB deflected by buried objects: Results in unpredictable path and unusual shift.

9.4.3 Second World War Bomb Penetration Studies

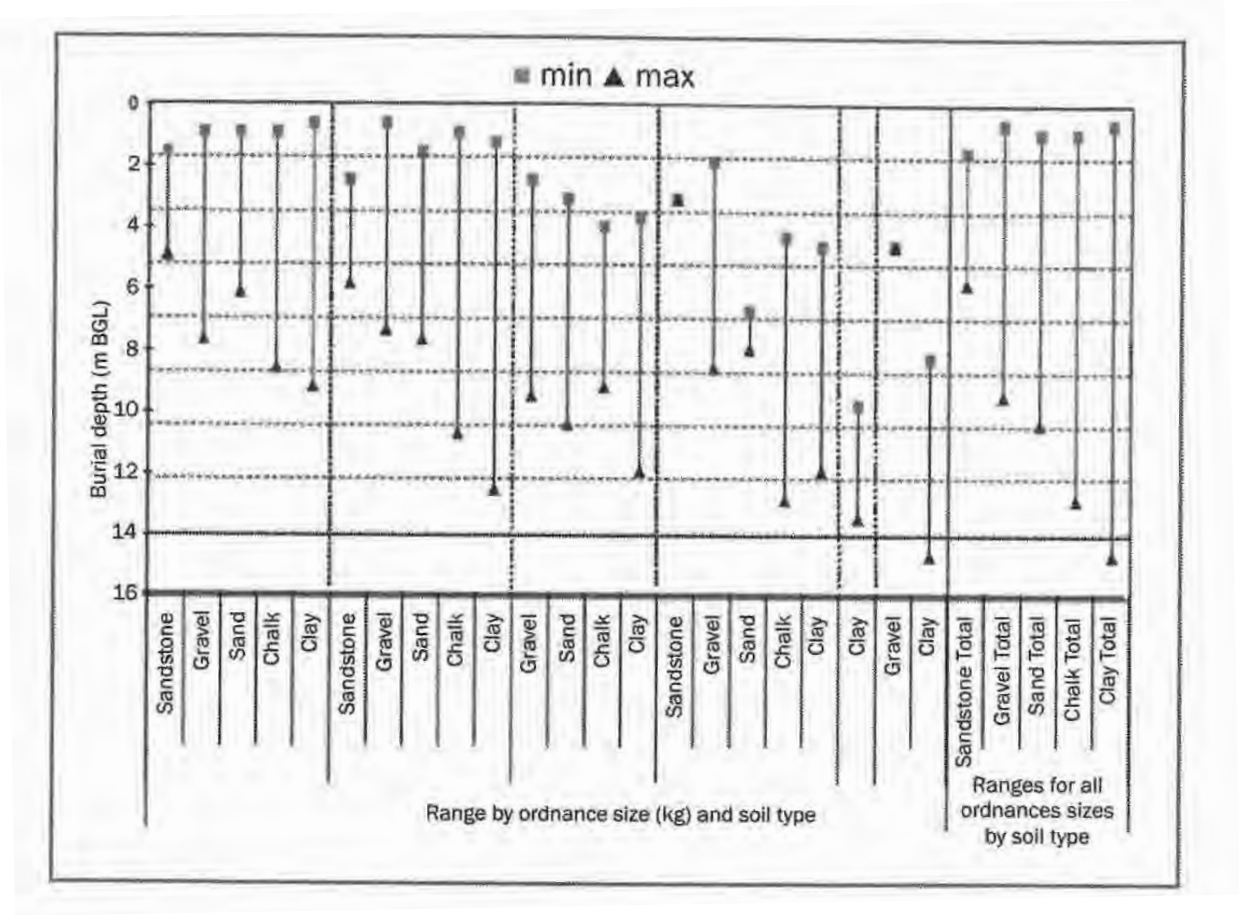
During WWII, the Ministry of Home Security undertook a major study on actual bomb penetration depths, carrying out statistical analysis on the measured depths of 1,328 bombs as reported by Bomb Disposal, mostly in the London area. They then came to conclusions as to the likely average and maximum depths of penetration of different sized bombs in different geological strata.

The median penetration of 430 x 50kg German bombs in London Clay was 4.6m and the maximum penetration observed for the SC50 bomb was 9m.

They concluded that the largest common German bomb, 500kg, had a likely penetration depth of 6m in sand or gravel but 8.7m in clay. The maximum observed depth for a 500kg bomb was 10.2m and for a 1,000kg bomb 12.7m. Theoretical calculations suggested that significantly greater penetration depths were probable.

9.4.4 CIRIA Bomb Penetration Depth Specifications

As stated within C681, the ground conditions at any individual site are likely to be highly variable and this results in a large range of burial depths for each different size bomb. The below chart shows the observed variation in burial depths of various sizes of air-delivered UXO for different ground conditions.



9.4.5 Site Specific Bomb Penetration Considerations

When considering an assessment of the bomb penetration at the site, the following parameters would be used:

- Geology – Bedrock varies across the site, but largely consists of Sand or Calcarenite. This underlies a range of Superficial Deposits, comprising Sand & Gravel, Diamicton and Clay & Silt, with some parts of the site recording no superficial deposits.
- Impact Angle and Velocity – 80-90° from horizontal and 267 metres per second.
- Bomb Mass and Configuration – The 500kg SC (General Purpose) HE bomb, without retarder units or armour piercing nose. This was the largest of the common bombs used against Britain.

Taking into account the above-mentioned factors it has been assessed that a 500kg bomb would have had an approximate maximum bomb penetration depth of between 9-11m below WWII ground level. Penetration depth could potentially have been greater if the UXB was larger (though only 4% of German bombs used in WWII over Britain were of that size). Note that UXBs may be found at any depth between just below the WWII ground level and the maximum penetration depth.

9.5 Likelihood of Post-raid UXO Detection

Utilising the available historical bombing records as reviewed in Section 9.3, it is possible to make an assessment of the likelihood that evidence of UXO would have been noted on a site during the war and the incident dealt with or recorded at the time. Factors such as bombing density, frequency of access, ground cover, damage and failure rate have been taken into consideration.

9.5.1 Density of Bombing

Bombing density is an important consideration for assessing the possibility that UXBs remain in an area. A very high density of bombs will have increased the likelihood of errors in record keeping at the time, as civil defence personnel and emergency services may have been overwhelmed. A higher density of bombing also increases the number of UXBs actually occurring in a given area.

The type and specific location of recorded bomb strikes is also an important consideration. If a stick of bombs (one individual aircraft's bomb load) is plotted in line with a site or is shown to straddle a site, then this raises the possibility that an unrecorded UXB from the same stick struck that site.

9.5.2 Bomb Damage

In Blitzed cities / towns throughout Britain, bomb sites were often not cleared of rubble until after the war and mid-war repairs to buildings were only carried out on the most vital facilities (power stations, gas works, weapons factories etc.). However, if a building only sustained bomb damage to its upper floors, any subsequent UXB strike to the structure will still have caused obvious damage, at ground floor level, which would have been reported and dealt with at the time.

HE bomb strikes to open ground will have resulted in a large crater and local soil disturbance. Any subsequent UXB strike will not have resulted in an easily identifiable entry hole and as such is likely to have gone unnoticed amongst the disturbed ground.

In London and south-east England, the German V1 Flying Bomb and V2 Long Range Rocket campaigns caused widespread devastation. However, as these weapons began to be utilised after the final significant Luftwaffe air raids had occurred, any serious damage caused by such weapons does not necessarily indicate an increased risk of Luftwaffe freefall UXB contamination. However, it is quite possible that serious damage inflicted during the 1940-1944 campaigns by Luftwaffe freefall bombs could have been erased by a subsequent V Weapon strike.

9.5.3 Frequency of Access

A UXB strike at a site where human access was infrequent would have had a lower chance of being observed, reported and recorded compared to a site which was developed and subject to regular access. UXB strikes during night time raids (when German planes could more easily evade anti-aircraft defences) are also more likely to have fallen unobserved than ones dropped during a daylight attack.

In frequently bombed cities / towns, ARP Wardens were tasked with carrying out searches for UXBs within recently bombed residential areas and schools. Similarly, many important home front facilities (factories, gas works, power stations, docks etc.) had their own dedicated ARP teams or Fire Watchers tasked with observing local air raids. Fire Watchers were mainly responsible for extinguishing 1kg

incendiary bombs as well as reporting any UXB strikes. Anecdotal evidence however indicates that Fire Watchers did not always turn up for their shifts and therefore such UXB mitigating activities should not be assumed in the absence of site-specific evidence. Less important buildings sustaining bomb damage would have been abandoned until after the German bombing campaign in that area had ceased and repairs could be made, greatly decreasing the level of access to that site.

Schools closed due to the evacuation of children were often requisitioned by the Civil Defence authorities to be utilised as night time First Aid posts and reception centres (providing emergency accommodation for bombed out civilians). Therefore, an increased level of access is likely at these locations.

9.5.4 Ground Cover

The entry hole of a 50kg UXB (the most commonly deployed German HE bomb) could have been as little as 20cm in diameter. Wartime records also confirm that small German Incendiary Bombs, weighing just 1kg, were capable of significant penetration into soil, resulting in very small entry holes (5cm) or complete burial.

The quantity and type of ground cover present on a site during WWII would have had a significant effect, at ground level, on the visual evidence of buried UXO.

Evidence of UXO could be obscured in dense vegetation, soft ground, rubble, railway ballast or amongst stockpiled material (such as aggregate, coal or refuse heaps). A UXB strike to waterlogged ground or open water would have been immediately obscured from view beneath the waterline. Had such an incident occurred within a tidal mudflat or river bank, the resulting entry hole will have remained only temporarily, before becoming in-filled by water and sediment. Any HE UXB strike to elevated risk ground cover could potentially have come to rest beneath neighbouring undamaged buildings or hard-standing due to the 'J-Curve' Effect.

UXB strikes to undamaged/superficially damaged buildings and hard-surfaced ground will still have caused substantial damage or an easily identifiable and persistent entry hole. Similarly, it is unlikely that an HE UXB entry hole on well-maintained / manicured lawns (tennis courts, bowling greens, golf course fairways / greens, gardens in affluent areas etc), would have been overlooked. Such incidents would have been reported and the UXB subsequently removed.

9.5.5 German Air-Delivered Ordnance Failure Rate

Based on empirical evidence, it is generally accepted that 10% of the German HE bombs dropped during WWII failed to explode as designed. This estimate is probably based on the statistics of wartime recovered UXBs and therefore will not have taken account of the unknown numbers of UXBs that were not recorded at the time and is probably an underestimate.

The reasons for failures include:

- Fuze or gaine malfunction due to manufacturing fault, sabotage (by forced labour) or faulty installation.
- Clockwork mechanism failure in delayed action bombs.
- Failure of the bomber aircraft to arm the bombs (charge the electrical condensers which supplied the energy to initiate the detonation sequence) due to human error or equipment defect.
- Jettison of the bomb before it was armed or from a very low altitude. Most likely if the bomber was under attack or crashing.

War Office Statistics document that a daily average of 84 bombs which failed to function were dropped on civilian targets in Great Britain between 21st September 1940 and 5th July 1941. 1 in 12 of these (probably mostly fitted with time delay fuzes) exploded sometime after they fell; the remainder were unintentional failures.

From 1940 to 1945 bomb disposal teams dealt with a total of 50,000 explosive items of 50kg and over (i.e. German bombs), 7,000 AAA shells and 300,000 beach mines. These operations resulted in the deaths of 394 officers and men. However, UXO is still regularly encountered across the UK.

Note, due to manufacturing fault or failure of the bomber crew to correctly arm their munitions, whole bomb loads often failed to detonate. Therefore, the presence of reported UXBs increases the likelihood of an additional unrecorded UXB in the vicinity.

9.5.6 Site Specific Analysis

The following table will place the site in context with these factors, in order to assess the likelihood of post-raid UXO detection within the project site.

Likelihood of Post Raid UXO Detection on Site			
Site-Specific Factors			Additional Comments
Density of Bombing Assessment	Based on wartime records or secondary source information, what was the bombing density over the site?	Moderate	
	Was the site ever subjected to one or more large-scale (>100 tons of ordnance) night time Blitz raids?	✘	
	Were any HE bomb strikes recorded on site?	✓	Bombing records over the general site location are not comprehensive, with many local bombing records only containing general incident locations. As such, it cannot be accurately determined how many bombs fell on site and their exact locations. However, bombing has ben confirmed near Halfway Cottages and Crown Farm, both within or adjacent to the site's northern section.
	How many HE, Parachute Mine, Oil Incendiary, Phosphorus Incendiary or Fire Pot bombs (large bombs) were recorded within a 300m radius of the site?	At least 2	
	Were any nearby sticks of large bombs recorded in line with the site?	✓	
	Were any 1kg incendiary bomb showers recorded over the site?	✘	None recorded, although the possibility cannot be discounted.
Bomb Damage	A comparison of the historical records confirms that buildings within the site boundary sustained serious bomb damage.	✓	Damage recorded to Halfway Cottages and an Army Hut (within north of the site).

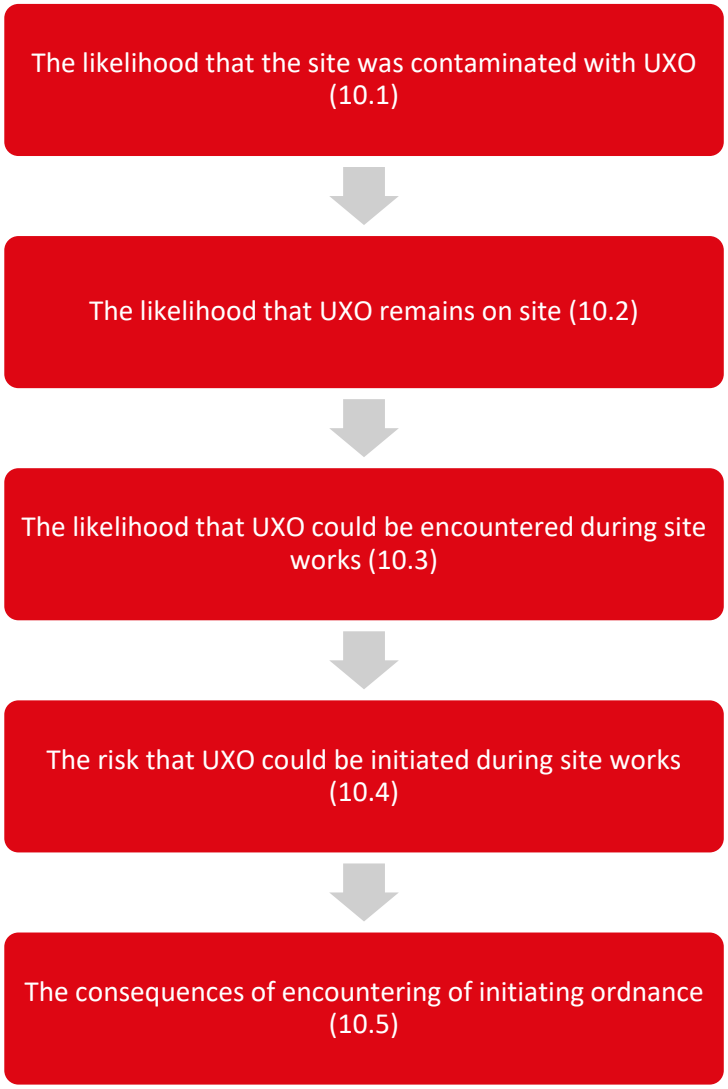
	Direct or indirect evidence of HE bomb craters in open ground (within the site boundary) has been found.	✖	
	Buildings on site were seriously damaged by a V1 and / or V2 strike.	✖	
	Buildings on site could have been seriously damaged prior to the nearby V1 or V2 strike?	✖	
Frequency of Access Assessment	The site was situated in a densely populated urban area during WWII and therefore would have been accessed at the outbreak of WWII.	✖	
	The site was exclusively or partially developed during WWII.	✓	
	Buildings on site survived WWII intact and therefore likely remained inhabited or in use, suggesting these localities and their immediate environs were accessed throughout the war.	✓	
	The site was crossed by roads / pavements or footpaths which would have been regularly used / subject to daily footfall.	✓	
	The site was occupied by small residential back yards / gardens, likely to have been put to use for cultivation as a result of the government's Dig for Victory Campaign.	✓	
	The site was occupied by a school during WWII.	✓	
	Part of the site is likely to have been subject to post-raid searches for UXO.	Possibly	The school and occupied buildings on site may have been checked for evidence of UXO.
	Buildings on site sustained serious bomb damage and as a result were likely abandoned (along with any associated gardens / open ground) for the remainder of the war.	Possibly	Following bomb damage to the Halfway Cottages / Army Hut, these locations may have been abandoned.
	The site was occupied by peripheral open ground / wasteland, with no apparent use, which may have been neglected.	✓	
	The site may have been occupied by recreational land / sports fields which may have only experienced seasonal access.	✖	

	The site was occupied by a graveyard which would have experienced limited access.	✗	
	The site was occupied by agricultural land, rural countryside or woodland which would not have been accessed in full, either regularly or frequently.	✓	
	The site was occupied by railway sidings which may not have been as regularly checked for buckling as mainline railway tracks.	✗	
	The site was occupied by soft railway embankments which are likely to have been neglected during the war.	✗	
Ground Cover Assessment	The site was partially or entirely abandoned, due to bomb damage, resulting in associated open ground likely becoming overgrown.	✗	
	The site was occupied by dense, inaccessible vegetation during WWII.	✓	
	The site may have been susceptible to waterlogged conditions during WWII.	✓	
	The site was occupied by (possibly) unmaintained grass field during WWII.	✓	
	The site was part occupied by a canal, river, dock basin, lake or reservoir during WWII.	✓	
	The site was occupied by tidal mud or marshland during WWII.	✓	
	The site was occupied by railway tracks crossing soft ground during WWII.	✓	
	The site was occupied by stockpiled material during WWII.	✗	
	The site was occupied by buildings, hard-standing or other manmade structures that did not sustain any degree of bomb damage.	✓	
	A comparison of the historical records confirms that buildings on site sustained inconsequential minor / moderate damage.	✓	
	The site was occupied by well-maintained, manicured lawn during WWII.	✗	

	Undamaged, developed parts of the site would have been vulnerable to the J-Curve Effect.	✓	Much of the site and it's vicinity was occupied by rural, agricultural or otherwise vegetated open ground during WWII. Had a UXB landed within this material, it could have come to rest up to 15m away from its original entry point due to the J-Curve Effect. This could have resulted in UXBs coming to rest elsewhere beneath the site.
Bomb Failure Rate	Evidence has been found which suggests that the bomb failure rate in the vicinity of the site would have been different from the "approximately 10%" figure normally used.	✗	

10 The Overall Unexploded Ordnance Risk Assessment Methodology

Taking into account the quality of the historical evidence, the assessment of the overall risk to any intrusive works from UXO must evaluate the following factors:



Each of these steps will be evaluated in the following sections in order to conclude the total risk from UXO to the proposed works to be undertaken within the project site.

10.1 The Likelihood that the Site was Contaminated with Unexploded Ordnance

10.1.1 General

The below is a generalised table of factors used to determine the likelihood that the site was contaminated with unexploded ordnance. Note that additional site-specific information can adjust UXO risk beyond these criteria:

Low Likelihood	Medium Likelihood	High Likelihood
German Air-Delivered Ordnance / Allied Anti-Aircraft Shells		
No evidence of bombing / bomb damage on site coupled with low local bombing density.	Moderate to High local bombing density or evidence of bombing / bomb damage on or close to the site.	High local bombing density or evidence of bombing /bomb damage on or adjacent to the site. Confirmed finds of WWII UXB.
Ground conditions that would prevent UXB penetration or lead to easily identifiable entry holes.	Ground conditions that allow for bomb penetration.	Ground conditions that would have immediately and completely obscured the existence of UXB.
Site was occupied and accessed fully throughout the bombing campaign.	Site located in an area that was infrequently observed or accessed, with a low likelihood that a UXB strike would have been noticed.	Site may be completely obscured from view or subject to very infrequent access.
British / Allied Ordnance		
No evidence of Allied military activity on or near the site. Or Military sites which have been cleared / redeveloped since their use Or Military-owned sites which have not been used for training with live munitions.	Clear evidence of military training activity on site involving live ammunition / munitions. Military sites which have not undergone clearance operations or redevelopment since use. Evidence of weapons storage on site.	Evidence of weapons testing or disposal on or adjacent to the site.
Developed areas that are unlikely to have been used for military exercises.	Open or unmaintained ground that may have been used for disposal or caching of munitions.	Evidence of UXO finds on or in the vicinity of the site.

The following sections assess the likelihood of contamination from German UXO and British / Allied UXO, based on the evidence discussed in the previous sections.

10.1.2 Likelihood of Contamination from British / Allied UXO

The following table discusses the overall likelihood of contamination from British / Allied UXO, based on the evidence discussed in Section 8.

Overview of the Potential Sources of British / Allied UXO	
Land Service Ammunition	• The north of the site extends into the site of Dunwich Training Area, which was used for live training exercises during WWII. • As such, it is possible that this part of the site was contaminated by land service or small arms ammunition as a result of training, storage or disposal. • Furthermore, within several parts of the site, military structures, buildings and facilities were present. It is also possible that the storage, use or disposal of munitions may have taken place at these locations. • Within the general site location, a large number of defensive features are present, several of which are located directly within the site boundary. Due to these features, military presence within the area will have been drastically increased, and anti-invasion sites will have been manned. • As such, the high-level military presence will have increased the possibility for LSA and SAA items to have contaminated the site and the surrounding area.
Small Arms Ammunition	
Anti-Aircraft Projectiles	• At least 10 possible batteries have been identified within the site and the surrounding area, including Heavy AA and Diver AA Batteries. However, it is also possible that additional or temporary AA batteries will have also been brought to the area during periods of most significant threat. • The majority of the site was occupied by rural / agricultural open ground, vegetation and woodland. • Had an unexploded AA shell landed within such ground types, it could have been left unnoticed, easily obscured within dense or unconsolidated material.
Landmines	• The extension area encompassed a section of the beach known to have been defended by a minefield, in addition to a range of other coastal fortifications. Although these were reportedly cleared during / post-WWII, it is known that these weapons were often left in place or lost due to tidal activity. • As such, the possibility that the site was contaminated by landmines cannot be discounted.
Overall Likelihood of Contamination	**Medium & High**

10.1.3 Likelihood of Contamination from German UXO

The following table discusses the overall likelihood of contamination from German UXO, based on the evidence discussed in Section 9.

Overview of the Potential Sources of German Air-Delivered UXO	
Bombing density	• Moderate bombing density over the general site area. • Bombing records over the general site location are not comprehensive, with many local bombing records containing only general incident locations. • As such, it cannot be accurately determined how many bombs fell on site and their exact locations. • The available records indicates over 55 separate air raids over the general area. It is possible that the site was affected during one or more of these raids. • Bombing was confirmed within the northern part of the site, damaging Halfway Cottages and an Army hut. • "Butterfly" Bombs recorded near to Crown Farm (immediately west of the site).
Bomb Damage	• The site was mostly occupied by open, rural, agricultural or vegetated ground. • Damage was reported to Halfway Cottages and an Army hut, located in the northern section of the site. • Available aerial photography only partially covered the site and was low resolution. As such, clear evidence of bomb craters in open ground or the extent of bomb damage to buildings was not visible. • Furthermore, it is possible that bombing incidents may have occurred after the 1942 photographs were taken.
Ground Conditions	• Rural, agricultural and vegetated ground within the majority of the site. • Parts of the site appear to be unmaintained.
Frequency of Access	• Seasonal access to agricultural land. • The location of the training area will have been accessed for military exercises, however, access to these peripheral sections may have been less common. • Less maintained or heavily vegetated areas may have been very infrequently accessed.
J-Curve Effect	• Had any UXB landed within the soft ground or vegetation on site / in the vicinity, it could have come to rest up to 15m from its original entry point due to the J-Curve Effect.
Overall Likelihood of Contamination	**Medium**

10.2 The Likelihood that Unexploded Ordnance Remains on Site

10.2.1 General

The extent to which any ordnance clearance activities have taken place on site or extensive ground works have occurred is relevant since they may indicate previous ordnance contamination but also may have reduced the risk that ordnance remains undiscovered.

10.2.2 EOD Bomb Disposal and Clearance Tasks

SafeLane Global holds a number of official records of explosive ordnance disposal operations during and following WWII, obtained from the Explosive Ordnance Disposal (EOD) Archive Information Office at 33 Engineer Regiment (EOD), British Army.

Potential Source	Details
Records of Army EOD tasks having taken place on site or in the vicinity	During the 1960s, a major heath fire at Dunwich caused large quantities of unexploded ordnance to detonate. As a result, a decision was taken to systematically clear the area of its WWII remains. During these operations, the wartime defence structures were also removed and the concrete used on other construction projects.[16] The image below shows an Army bomb disposal team clearing ordnance in the 1960s:  This area was located primarily to the north of the project site, however the site's northern extent encroaches into the area previously designated as Dunwich Training Area. Several WWII defences were positioned on or close to the site, and as such, it is possible that these clearance operations extended into the project site boundary. The table below details the available records from these operations. The requirement for these operations also illustrates how unexploded ordnance was still present after the end of WWII, and in significant amounts. At any location within the training area and local to the military sites / defences which was not subject to these clearance operations in the 1960s, the possibility that UXO remains cannot be discounted. SafeLane Global records also indicate that the WWII anti-invasion defensive minefields located at Sizewell (north of the site) were cleared on 5th January 1946 and 25th June 1946. Within the extension area, post-war clearance has been alluded. Available secondary sources also suggest that clearance operations along the shoreline were not always

[16] https://heritage.suffolk.gov.uk/dunwich-heath

	comprehensive. Several features were left in place, such as dragons teeth framework, and the success rate for removal of minefields and other fortifications was not entirely accurate or complete. *Further Bomb Disposal tasks have been undertaken within the wider area, and details are found in the tables below.*
Local ordnance finds	The following local finds have been reported: - April 2022, a WWII-era mortar was discovered on Dunwich beach, Suffolk.[17] - December 2013, WWII UXB and two mortars found on the beach over two days, near Dingle Marshes, Dunwich beach.[18] - November 2021, a WWII white phosphorous mortar was discovered near Beach Road, Dunwich.[19]

10.2.2.1 Clearance Operations at Dunwich

Date	Location	Site of Area (ha)	OS Grid Reference	No of Items Recovered	
				Live	Expended
11/03/1981	Dunwich Forest, Leiston	3.23	465640	0	0
15/08/1958	Dunwich Heath, Dunwich	41.29	465695	116	756
18/03/1971	Dunwich Heath, Dunwich	41.29	465695	7	56
09/02/1976	Scottshall, Nr Dunwich	188.66	460675	202	1,017
03/04/1979	Minsmere Nature Reserve, Dunwich	-	461676	5	19
12/02/1959	Dunwich Forest, Leiston	8.90	465645	9	0
04/03/1982	Dunwich Forest, Leiston	14	471645	6	5
01/05/1984	Thorpeness Meare, Thorpeness	1	472595	0	0
Total				**345**	**1853**

[17] https://www.eadt.co.uk/news/suffolk-bomb-disposal-unit-called-to-dunwich-beach-8909820
[18] https://www.eadt.co.uk/news/dunwich-second-unexploded-bomb-washes-up-on-beach-2118294
[19] https://www.bbc.co.uk/news/uk-england-suffolk-20180562

10.2.2.2 Bomb & Mine Disposal Incident Case File Sweeps

Date	Location	Comments
02/09/1963	The Old Abbey, Leiston	Area of Dyke cleared
25/06/1946	Sizewell	n/a

10.2.2.3 Demolition & Depth Charges Clearance

Date	Location	OS Grid Reference
04/09/1962	Crown Farm, Leiston	459628
	Halfway Cottage, Leiston	462623
	Sizewell, Leiston	472621
	Sizewell, Leiston	471625
	Sizewell, Leiston	470628
	Sizewell, Leiston	474627
	Sizewell, Leiston	472622
	Halfway Cottages	465623

10.2.2.4 Other Clearance Operations

Date	Location	Size of Area Searched (ha)	No of UXO Items	Comments
17/12/1958	Kenton & Goose Hills, Leiston	23	9	n/a
	Dunwich Forest	22	8	Drainage ditches and all areas permanently under water have not been searched, they should not necessarily be considered clear of UXO.

10.2.3 Post War Redevelopment

The nature of post-WWII ground works, redevelopment and construction has been considered. Significant structural redevelopment on site can, in some cases, provide a level of mitigation, particularly from shallow buried items. However, if a site has not undergone any extent of redevelopment, the likelihood of UXO remaining within its boundaries can remain.

The site has been redeveloped post-WWII	✘
Further Details	Aside from agricultural ground works, no known significant redevelopment has occurred within the site.

10.2.4 Site-Specific Analysis

The following table discusses the likelihood that UXO could remain on site, following any post-WWII activity.

Mitigating factors during post-WWII period	The available evidence suggests that the site has been subject only to shallow ground works since the end of WWII. It is possible that clearance operations may have been undertaken within the northern section of the site, within the original bounds of Dunwich Training Area. However, the details and extents of these works are not known, and therefore the possibility that UXO could still remain in this area cannot be ruled out.
Further comments	Within the footprints of the post-war redevelopment / ground works, the risk of shallow buried UXO remaining will have been partially mitigated since any such items could have been encountered and removed during soil stripping and levelling. Only within the volume of any post-war basement level bulk excavations and at the precise locations of any post-war pile foundations / boreholes, will the risk from deeper buried German HE UXBs have been completely mitigated. At any location on site where no bulk excavations have been carried out, the risk from deep buried UXO remains unmitigated to the maximum bomb penetration depth.

10.3 The Likelihood that Ordnance may be Encountered during the Works

The following table discusses the likelihood that UXO could be encountered on site during the proposed works.

At-Risk Scenarios	The most likely scenarios under which a UXO could be encountered during construction works is during piling, drilling operations or bulk excavations for basement levels. The overall risk will depend on the extent of the works, such as the numbers of boreholes/piles (if required) and the volume of the excavations. Since an air-dropped bomb may come to rest at any depth between just below ground level and its approximate penetration depth there is also a chance that such an item could be encountered during shallow excavations (for services or site investigations) into the original WWII ground level. If the proposed works are due to be undertaken within post war fill material / made ground, the risk of encountering WWII UXBs is low. However, if works are to be undertaken below WWII ground level this risk is significantly higher.
Likelihood of UXO being encountered during the proposed works	The proposed works are expected to consist of site investigation works, comprising boreholes and trial pits. As such, it is considered possible that an item of UXO could be encountered during these works.

10.4 The Risk that Ordnance may be Initiated

Items of ordnance do not become inert or lose their effectiveness with age. Time can indeed cause items to become more sensitive and less stable. This applies equally to items submerged in water or embedded in silts, clays or similar materials. The greatest risk occurs when an item of ordnance is struck or interfered with. This is likely to occur when mechanical equipment is used or when unqualified personnel pick up munitions.

10.4.1 Initiation of Unexploded Bombs

In the case of unexploded German bombs discovered within the construction site environment, there are a number of potential initiation mechanisms:

Direct Impact onto the main body of the bomb	Unless the fuze or fuze pocket is struck, there needs to be a significant impact to initiate a buried iron bomb.
Re-starting the clock timer in the fuze	Only a small proportion of German WWII bombs employed clockwork fuzes. It is probable that significant corrosion has taken place within the fuze since the end of WWII that would prevent clockwork mechanisms from functioning, nevertheless it was reported that the fuze in a UXB dealt with by 33 EOD Regiment in Surrey in 2002 did recommence.
Induction of a static charge, causing a current in an electric fuze	The majority of German WWII bombs employed electric fuzes. It is probable that significant corrosion has taken place within the fuze mechanism since the end of WWII such that the fuze circuit could not be activated.
Friction impact initiating the (shock-sensitive) fuze explosive	This is the most likely scenario resulting in the bomb detonating.

10.4.2 Activities that may Result in the Initiation of Unexploded Ordnance

Unexploded bombs do not spontaneously explode. All high explosive requires significant energy to create the conditions for detonation to occur. The risk that UXO could be initiated if encountered will depend on its condition, how it is found and the energy with which it is struck. However certain activities pose a greater risk than others.

Percussive piling or deep mechanical excavations	The most violent activity on most construction sites is percussive piling or deep mechanical excavations. If an item is struck with a significant enough impact, be it direct or through friction/vibration, it risks detonation.
Shallow excavation	Soil levelling and shallow excavation such as trial pits can pose a similar risk to deeper excavations, since UXO can be found at any depth between ground level and the maximum bomb penetration depth. In addition to risk of initiation by violent impact or vibration, detonation can also occur if discovered items are mishandled by unqualified personnel. This is particularly common when onsite personnel are not trained in the recognition of ordnance.
Non-intrusive works	In the case of non-intrusive planned works, little risk is posed by items of UXO that are buried beneath the ground. However, risk can arise from unburied munitions, particularly items of ordnance discarded in periphery areas of military sites. These items are frequently discovered by onsite personnel and remain live and liable to activate if mishandled.

10.5 The Consequences of Encountering or Initiating Ordnance

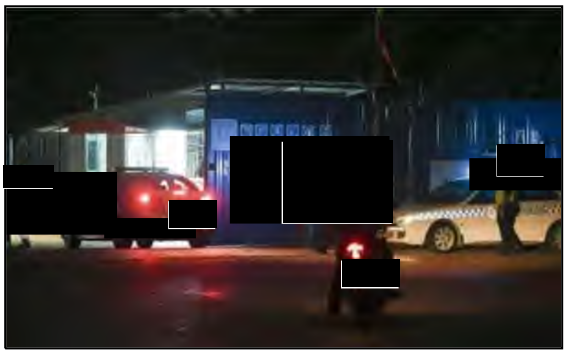
Clearly the consequences of an inadvertent detonation of UXO during construction operations would be catastrophic with a serious risk to life, damage to plant and a total site shutdown during follow-up investigations.

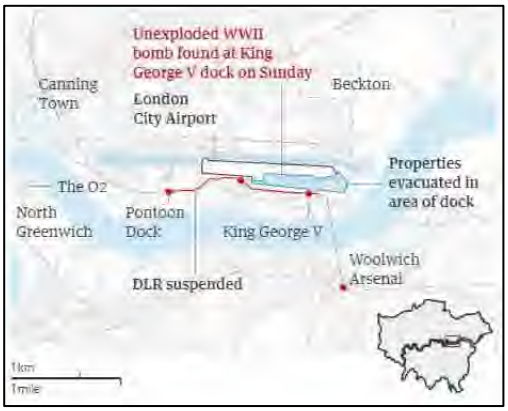
Since the risk of initiating ordnance is significantly reduced if appropriate mitigation measures are undertaken, the most important consequence of the discovery of ordnance will be economic. This would be particularly so in the case of high-profile locations and could involve the evacuation of the public.

The unexpected discovery of ordnance may require the closing of the site for any time between a few hours and a week with a potentially significant cost in lost time. Note also that the suspected find of ordnance, if handled solely through the authorities, may also involve loss of production since the first action of the Police in most cases will be to isolate the locale whilst awaiting military assistance, even if this turns out to have been unnecessary.

The following tables review a number of finds over recent years both in the UK and overseas that have seen large-scale disruptions, damage and injury/death:

UXB Incidents where intrusive works have caused detonation, resulting in death, injury and damage to plant	
 Blown up by history	A WWII bomb killed 3 and injured 8 in Berlin - 1944
	WWII bomb killed 3 in Goettingen, Germany – 2010.
	Excavator operator killed by WWII bomb in Euskirchen, Germany – 2014. A WWII bomb exploded at a construction site near a west German town, killing a man and injuring 8 others. The explosion occurred with a digger accidently struck the device during excavation works.

	A highway construction worker in Germany accidentally struck a WWII bomb, killing himself and wrecking several passing cars – 2006.
	Destroyed piling rig and dump truck after detonation of WWII UXB in Austria – 2006.
	WWII bomb injures 17 at construction site in Hattingen, Germany – 2008.
	A buried WWII-era bomb exploded during construction works in Bandar Malaysia, Kuala Lumpur – 2017.

UXB Incidents in the UK, resulting in delays, site shutdowns, evacuations, and disruptions	
	London City Airport shut: Flights cancelled after WWII bomb found in River Thames dock. London City Airport was closed after the discovery of a 250kg WWII German bomb, affecting tens of thousands of passengers. All flights into and out of the airport were stopped after the device was found by SafeLane Global in the nearby King George V dock. A 700ft exclusion zone was put in place and people living nearby were evacuated.
	Unexploded WWII bomb found in Birmingham, causing a construction site to be evacuated.
	A WWII UXB was found near to the Aston Expressway, leading to the evacuation of around 200 residents and a 500m cordon. Following the discovery, the weapon was safely detonated by the Army. However, although the M6 was reopened after the blast, the key Aston Expressway stayed shut until 6pm, extending traffic disruption. All nearby rail services and other roads were also disrupted.
	Up to 1000 homes were evacuated and a 300m exclusion zone was put in place following the discovery of a WWII UXB in Lansdown Road, Bath. The 500lb bomb was found just a meter beneath a playground at the former Royal High Junior School.

11 SafeLane Global's Risk Assessment

The Risk Assessment made by SafeLane Global for the site is based upon the likelihood that the site was contaminated, the risk of the contaminant item remaining, and the likelihood of, and potential consequences, should the item be struck during the proposed works. The following section discusses the risk that each ordnance type presents to the scope of works for the project site.

11.1 Conclusions

Taking into consideration the findings of this study, SafeLane Global considers the UXO risk at the site to be heterogeneous and can therefore be divided into areas of Medium and High risk. The Medium Risk Zones are also divided into Medium Risk Zones 1 and 2. A UXO Risk Map detailing these areas is presented in Annex F.

High Risk Zone 1:

- Areas within WWII-era training areas and military facilities.
- Previously encountered UXO items.
- High possibility of anti-aircraft fire over the area.
- Moderate German bombing density.
- Vegetated / rural open ground.
- Buffer area to account for the J-Curve Effect.

Type of Ordnance	Likelihood of Contamination	Likelihood of UXO remaining	Likelihood of encounter	Potential Consequence	Overall Risk level
German High Explosive Bombs	Medium	Medium	Medium	Severe	**Medium**
German 1kg Incendiary Bombs	Low	Low	Low	Severe	**Low**
Allied Anti-Aircraft Shells	High	Medium	Medium	Minor	**Medium**
British / Allied Small Arms	High	High	High	Not Significant	**Medium**
Land Service Ammunition	High	High	High	Severe	**High**

High Risk Zone 2:

- Areas within a fortified beach, including beach minefield.
- High possibility of anti-aircraft fire over the area.
- Moderate German bombing density.
- Buffer area to account for the J-Curve Effect.

Type of Ordnance	Likelihood of Contamination	Likelihood of UXO remaining	Likelihood of encounter	Potential Consequence	Overall Risk level
German High Explosive Bombs	Medium	Medium	Medium	Severe	**Medium**
German 1kg Incendiary Bombs	Low	Low	Low	Severe	**Low**
Allied Anti-Aircraft Shells	High	Medium	Medium	Minor	**Medium**
British / Allied Small Arms	High	High	High	Not Significant	**Medium**
Land Service Ammunition	High	High	High	Severe	**High**
Landmines	High	High	High	Severe	**High**

Medium Risk Zone 1:

- Moderate German bombing density.
- Vegetated / rural open ground.
- Buffer area to account for the J-Curve Effect.
- High possibility of anti-aircraft fire over the area.

Type of Ordnance	Likelihood of Contamination	Likelihood of UXO remaining	Likelihood of encounter	Potential Consequence	Overall Risk level
German High Explosive Bombs	Medium	Medium	Medium	Severe	**Medium**
German 1kg Incendiary Bombs	Low	Low	Low	Severe	**Low**
Allied Anti-Aircraft Shells	High	Medium	Medium	Minor	**Medium**
British / Allied Small Arms	Low	Low	Low	Not Significant	**Low**
Land Service Ammunition	Low	Low	Low	Severe	**Low**

Medium Risk Zone 2:

- Moderate German bombing density.
- Vegetated / rural open ground.
- Buffer area to account for the J-Curve Effect.
- High possibility of anti-aircraft fire over the area.
- WWII-era military activity (non-training area).

Type of Ordnance	Likelihood of Contamination	Likelihood of UXO remaining	Likelihood of encounter	Potential Consequence	Overall Risk level
German High Explosive Bombs	Medium	Medium	Medium	Severe	**Medium**
German 1kg Incendiary Bombs	Low	Low	Low	Severe	**Low**
Allied Anti-Aircraft Shells	High	Medium	Medium	Minor	**Medium**
British / Allied Small Arms	Medium	Medium	Medium	Not Significant	**Medium**
Land Service Ammunition	Medium	Medium	Medium	Severe	**Medium**

12 Proposed Risk Mitigation Strategy

SafeLane Global recommends the following minimum risk mitigation measures be deployed to support the proposed ground works at the site.

12.1 Summary

Based on the findings of the report, the following mitigation measures have been recommended for the proposed works on the site. Further detail on each method is presented in Section 12.2.

Risk Level	Planned Site Activity	Recommendations
Medium / High	Shallow Intrusive Works eg. excavations	• UXO Safety & Awareness Briefing (Toolbox Brief, TBB) • Site Specific Safety Instructions (SSSIs) Training Course • Non-Intrusive (NI) Magnetometer Survey (Greenfield areas only) • Target Investigation (Required as a follow-on from NI magnetometer survey) • Search & Clear • Explosive Ordnance Disposal (EOD) Engineer Watching Brief (for brownfield areas unsuitable for NI magnetometer survey) • Explosive Ordnance Disposal (EOD) Engineer to support Site Investigation Works
	Deep intrusive works (eg. piling)	• UXO Safety & Awareness Briefing (Toolbox Brief, TBB) • Site Specific Safety Instructions (SSSIs) Training Course • Intrusive Magnetometer Survey of pile/borehole positions
	Offshore works	Appropriate risk mitigation measures can be provided for any works taking place in marine (coastal or offshore) parts of the project site if necessary. These can usually include the following: • UXO Safety & Awareness Briefing (Toolbox Brief, TBB) • Client threat briefing • Authorities' engagement where required • Non-Intrusive (NI) High-Resolution Marine Survey – Area specific to each project module • Assessment and production of a Master Target List • Target Investigation (Required as a follow-on from NI Marine Survey) • ROV/Diver Investigation / Survey • Disposal if requested

12.2 Additional Notes

Risk Mitigation Measures – Further Detail	
Site Specific Explosive Ordnance Safety and Awareness Briefings (UXO Toolbox Briefing) to all personnel conducting intrusive works	These briefings are intended to make site operatives aware of the nature of explosive ordnance that may be encountered on their project site. • Delivered by a specialist Explosive Ordnance Disposal Engineer. • Provides information on the site-specific explosive ordnance risk • Basic ordnance identification. • What to do in the event of an encounter with a suspicious object. Provide UXO response procedures.
Site Specific Safety Instruction (SSSI)	For longer term projects that require Explosive Ordnance Safety and Awareness Briefings as part of the Explosive Ordnance Risk Mitigation measures for the project, SSSIs can be provided to allow nominated site representatives to deliver these briefings after initial training. • 2/3-hour presentation and training course. • Delivered by a fully qualified senior EOD Engineer. • Suitable for Project Site Manager HSE representative and supervisors. • Includes briefing pack. This provides a cost-effective solution to ensure that the Explosive Ordnance Safety and Awareness Briefings can be delivered effectively and efficiently to the required standard.
Explosive Ordnance Disposal (EOD) Engineer On-Site Support	In areas where the risk posed by the potential presence of explosive ordnance is low or where the conditions are not suitable for pro-active survey, EOD On-Site Support can provide a reactive response to any suspicious object that may be encountered during open excavation works. The presence of the EOD Engineer (sometimes referred to as 'high risk dig wardens') on-site in support of shallow intrusive work allows for a direct monitoring of works using visual recognition and instrumentation and provides an immediate response to reports of suspicious objects or suspected items of ordnance that have been recovered by ground workers. SafeLane Global EOD personnel on-site also have the additional benefit of providing Explosive Ordnance Safety and Awareness briefings (UXO TBB) to any staff that have not received them earlier and can advise staff of the need to modify working practices to take account of the ordnance threat. The EOD Engineer will also aid potential incident management which would involve liaison with the local authorities and police should ordnance that presents an explosive hazard be identified. • Specialist Explosive Ordnance Disposal Engineer. • Maintains a watching brief over all excavations. • Provides safety and awareness briefings to construction personnel as required.

	• Provides immediate identification of any suspicious item that is encountered. • Identifies whether any UXO item is live or inert. • Provides liaison assistance with the relevant authorities when dealing with any live UXO. Avoids on site delays which can be caused by the incorrect identification of a suspect item being potential UXO.
Explosive Ordnance Disposal (EOD) Engineer to support site investigation works	For cost effective Explosive Ordnance Risk Mitigation for site investigation work, the EOD Engineer can survey ahead of trial pits, monitor excavations when the ground conditions are not suitable for a pro-active survey and conduct intrusive surveys for borehole and window sample locations working in conjunction with the site investigation team. The On-Site Support will also provide a reactive response to any suspicious object that may be encountered during open excavation works. SafeLane Global EOD personnel on-site also have the additional benefit of providing Explosive Ordnance Safety and Awareness briefings to any staff that have not received them earlier and can advise staff of the need to modify working practices to take account of the ordnance threat. The EOD Engineer will also aid potential Incident Management which would involve liaison with the local authorities and police should ordnance be identified and present an explosive hazard. • Specialist Explosive Ordnance Disposal Engineer. • Maintains a watching brief over all trial pit excavations. • Provides safety and awareness briefings to construction personnel as required. • Works in conjunction with the drilling team to survey all borehole and window sample locations in real-time using a staged drilling and magnetometer survey procedure. • Provides immediate identification of any suspicious item that is encountered. • Identifies whether any UXO item is live or inert. • Provides liaison assistance with the relevant authorities when dealing with any live UXO. • Avoids on site delays which can be caused by the incorrect identification of a suspect item being potential UXO. *Technical Information* 1. In optimum ground conditions each survey using the borehole technique will have a 1 metre look ahead capability. 2. Any steel casing used for borehole surveys will need to be retracted by 3 metres to allow the magnetometer survey to be conducted. Non-ferrous pipe will be required to support the borehole during the survey minimum diameter 60mm (to be supplied by the client).
Search & Clear	Where a non-intrusive magnetometer survey is not possible (e.g. wooded areas) SafeLane Global can deploy a two-man Explosive Ordnance Disposal Engineer team using handheld magnetometer equipment who will proactively survey either in search lanes or boxes, investigating each reading with the support of

	an operated excavator. The survey is suited to detecting suspicious ferro-magnetic buried objects that may be munitions and/or explosive ordnance related. All SafeLane Global personnel involved with the Search and Clearance Works will be former military personnel who have gained formal NATO Military Explosive Ordnance Disposal Qualifications, having completed training at the Defence Explosive Ordnance Disposal School (DEODS) Chattenden, Kent or similar establishment throughout their military service. The client will be responsible for: • Demarcating the areas to be searched. • Providing services clearance and permit to dig. • Providing operated excavator to access deeper targets if required (SafeLane Global can provide this service at additional cost). • Providing coordinates of positions where debris have been identified (if information required in report). • Providing storage for recovered debris. Output will depend upon terrain and contamination (number of readings to be investigated).
Non-Intrusive Magnetometer Survey and Target Investigation (greenfield land only)	Non-Intrusive Survey This survey type is designed for use on magnetically 'clean' land commonly referred to as 'greenfield'. Brownfield land is often described as that which has had previous industrial or commercial use. In this context it specifically encompasses sites with are underlain by 'made ground' which may contain metallic contamination. Non-intrusive magnetometry or electromagnetic equipment which is used in the search for buried UXO relies upon the detection of small changes between clear ground and that containing UXO. The technique operates very successfully in environments where there is minimal ground contamination from other sources such as fired bricks, reinforced concrete, discarded scrap metal and buried services. There are also man-made ambient effects on magnetic and electromagnetic non-intrusive survey systems which include moving plant vehicles, power cables, electric trains etc. Non-Intrusive survey is carried out using either total-field or gradiometer magnetometry, dependent upon site conditions. Data is recorded and then interpreted using advanced AGSPRoc software in order to map magnetic fields and model discrete magnetic anomalies (variations in the Earth's magnetic field caused by ferro-magnetic objects electrical fields or geology). The location of such anomalies is determined, and mathematical modelling used to estimate their mass and depth. The survey will also locate any buried services with a magnetic signature and indicate any areas of gross magnetic "contamination" which may indicate the presence of unknown obstructions. Additionally, the survey can provide information on archaeological features. The system can detect the magnetic field from a 50kg WWII air-dropped bomb at a depth of 4m and smaller items such as Land Service Ammunition to depths of up to 1.5m in ground with a low ambient magnetic field. In the case of soft geology, it should be noted that a 50kg high explosive bomb may be buried greater than 4 metres below ground level and therefore may not be detected by the survey. In this instance intrusive surveys may be required.

	The non-intrusive survey system will be deployed utilising the pedestrian survey frame. The output for the pedestrian frame is estimated at up to 2Ha per day. *Technical information:* • Client to clearly demarcate area to be surveyed prior to start and highlight any known services/underground obstructions. • Ground must be level, free of obstacles / obstructions and clear of undergrowth. Height of any crops should be no more than 400mm and where crops are present SafeLane Global would require written approval from the landowner or client to walk over the site area. • When working adjacent to existing infrastructure the survey may be ineffective due to the ferro magnetic interference caused by passing vehicles and the presence of underground buried services. A site visit may be recommended prior to commencement. • Note: the survey will be ineffective on Brownfield sites due to the magnetic nature of building rubble, which typically masks the weaker magnetic signatures of buried objects. If parts of the site are contaminated, then alternative risk mitigation measures may need to be considered. Target Investigation If a buried anomaly is detected that cannot be discounted as a potential UXO / UXB then the object will need to be investigated to positively identify the item. The process will include; • Specialist two-man Explosive Ordnance Disposal Team. • Combination of manual and mechanical excavation techniques. • Excavator shafting, shoring and dewatering equipment can be provided by SafeLane Global if required. • Excavation techniques will be defined and agreed prior to the commence. A factual report with clearance certificate will be issued on completion of the investigation.
Intrusive Magnetometer Survey of all pile locations down to the maximum bomb penetration depth	SafeLane Global can deploy a range of intrusive magnetometry techniques to clear ahead of all the pile locations. The appropriate technique is governed by a number of factors, but most importantly the site's ground conditions. The appropriate survey methodology would be confirmed once the enabling works have been completed. A site meeting would be required between SafeLane Global and the client to determine the methodology suitable for this site. Target investigation or avoidance will be recommended as appropriate.

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The key sources consulted during this assessment are listed below;

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iv. Fegan, T., *The Baby Killers': German Air raids on Britain in the First World War*, (Leo Cooper Ltd. 2002).

v. Fleischer, W., *German Air-Dropped Weapons to 1945*, (Midland Publishing. 2004).

vi. Jappy, M. J., *Danger UXB: The Remarkable Story of the Disposal of Unexploded Bombs during the Second World War*, (Channel 4 Books, 2001).

vii. Price, A., *Blitz on Britain, The Bomber Attacks on the United Kingdom 1939 – 1945*, (Purnell Book Services Ltd. 1977).

viii. Ramsey, W., *The Blitz Then and Now, Volume 1*, (Battle of Britain Prints International Limited. 1987).

ix. Ramsey, W., *The Blitz Then and Now, Volume 2*, (Battle of Britain Prints International Limited. 1988).

x. Ramsey, W., *The Blitz Then and Now, Volume 3*, (Battle of Britain Prints International Limited. 1990).

xi. Whiting, C., *Britain Under Fire: The Bombing of Britain's* Cities 1940-1945, (Pen & Sword Books Ltd. 1999).





© OpenStreetMap contributors

Recent Aerial Photograph

N



Approximate site boundary

Extension site boundary

Google Earth™ Mapping Services

N



Approximate site boundary

N



Approximate site boundary Clearance

N



Approximate site boundary

N



Approximate site boundary Clearance

N



Approximate site boundary

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Approximate site boundary Clearance

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Coldfair Green
Knowsbill Common
Wood Hall
Manor Farm
Hollyfield Wood
Fox Farm Cottages
Fox Hall
Fox Lodge
Fox Arms Public House
Fox Arms Cottages
Fox Arms Cottage
Fox Arms Garage
Fox Arms Caravan Park
Fox Arms Caravan Park Cottages
Fox Arms Caravan Park Cottage
Fox Arms Caravan Park Cottage
Fox Arms Caravan Park Cottage

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Approximate site boundary Clearance

N



Approximate site boundary

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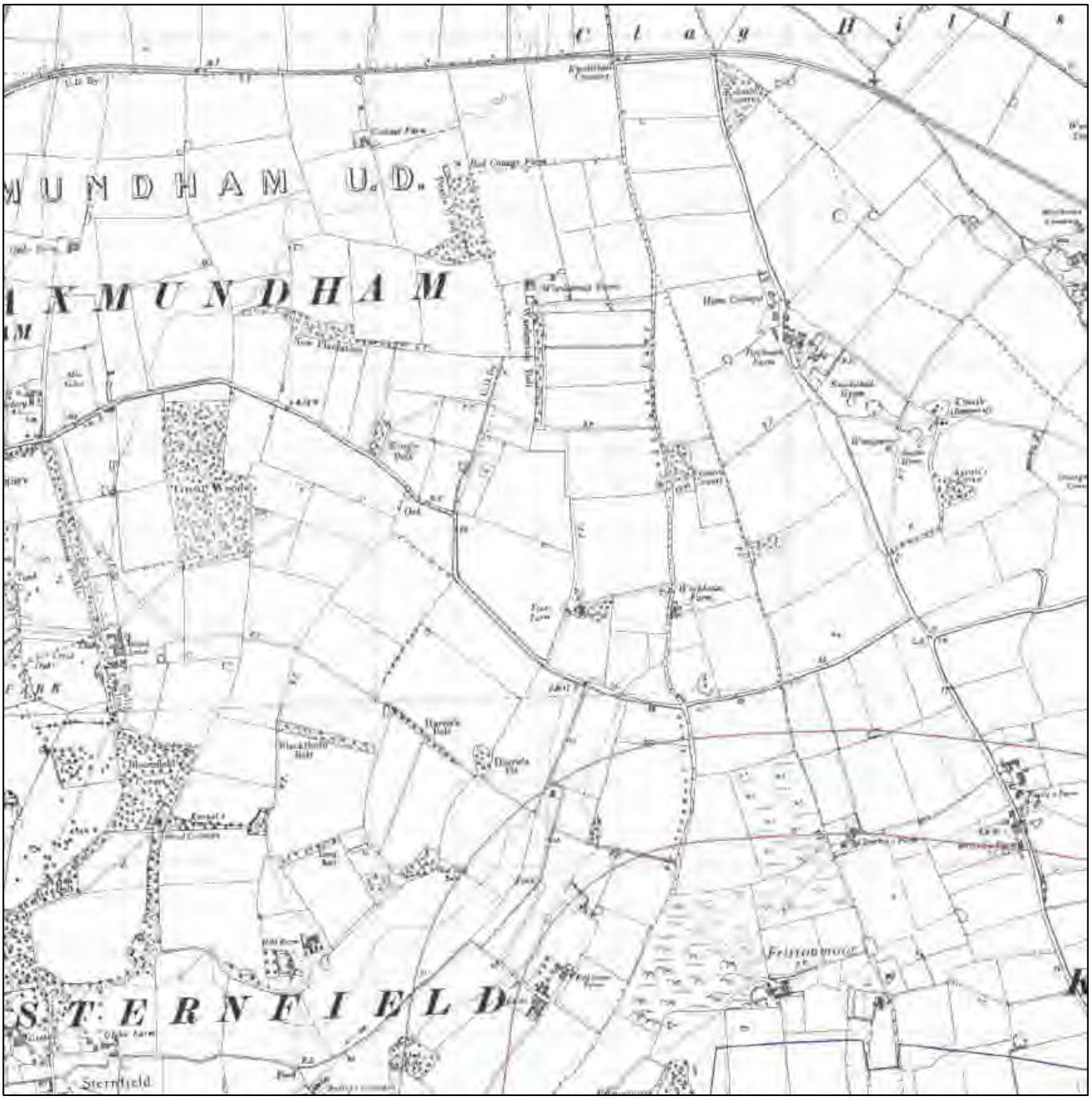
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Approximate site boundary Clearance

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Approximate site boundary Clearance

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Approximate site boundary

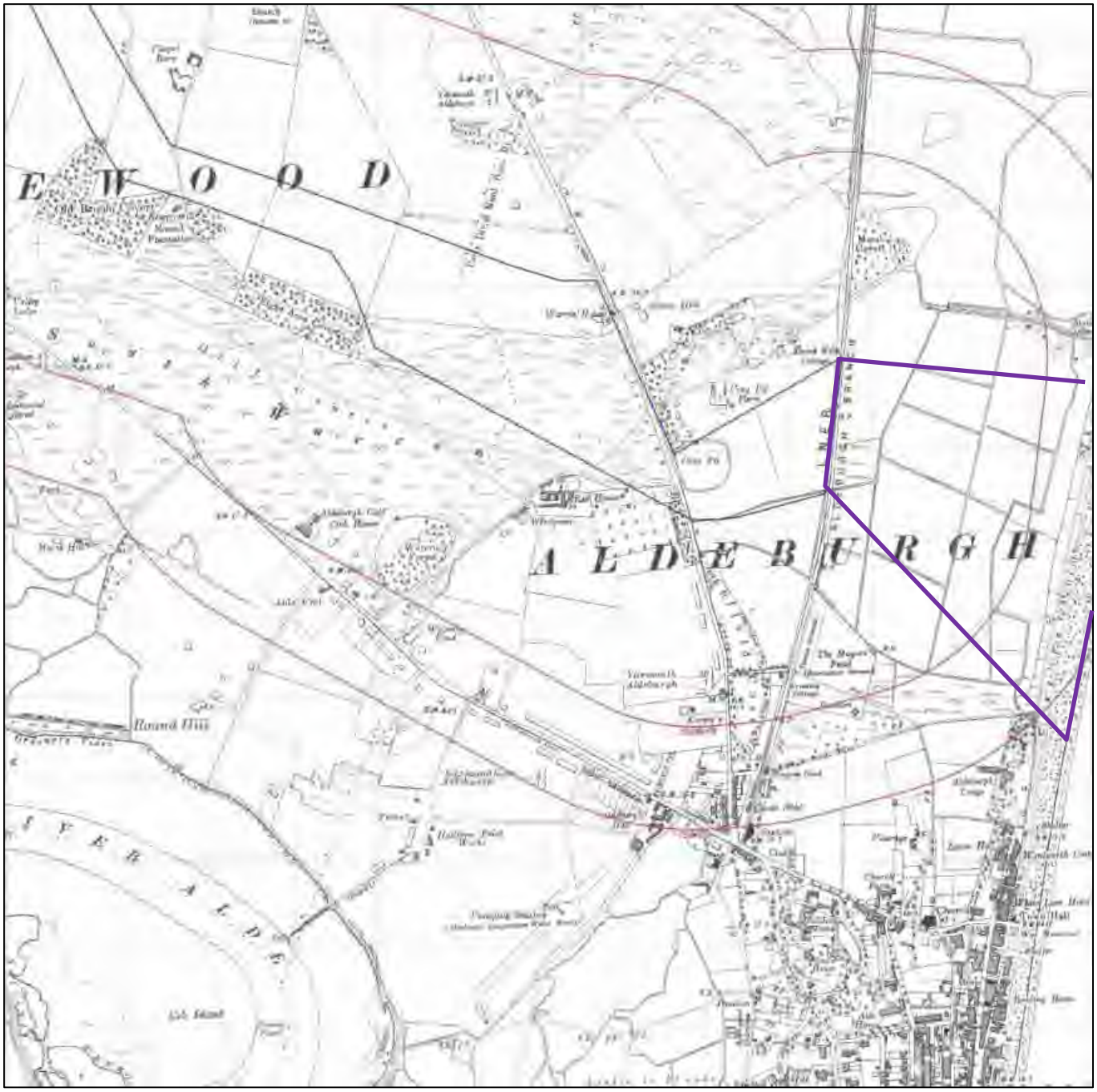
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Approximate site boundary

Clearance

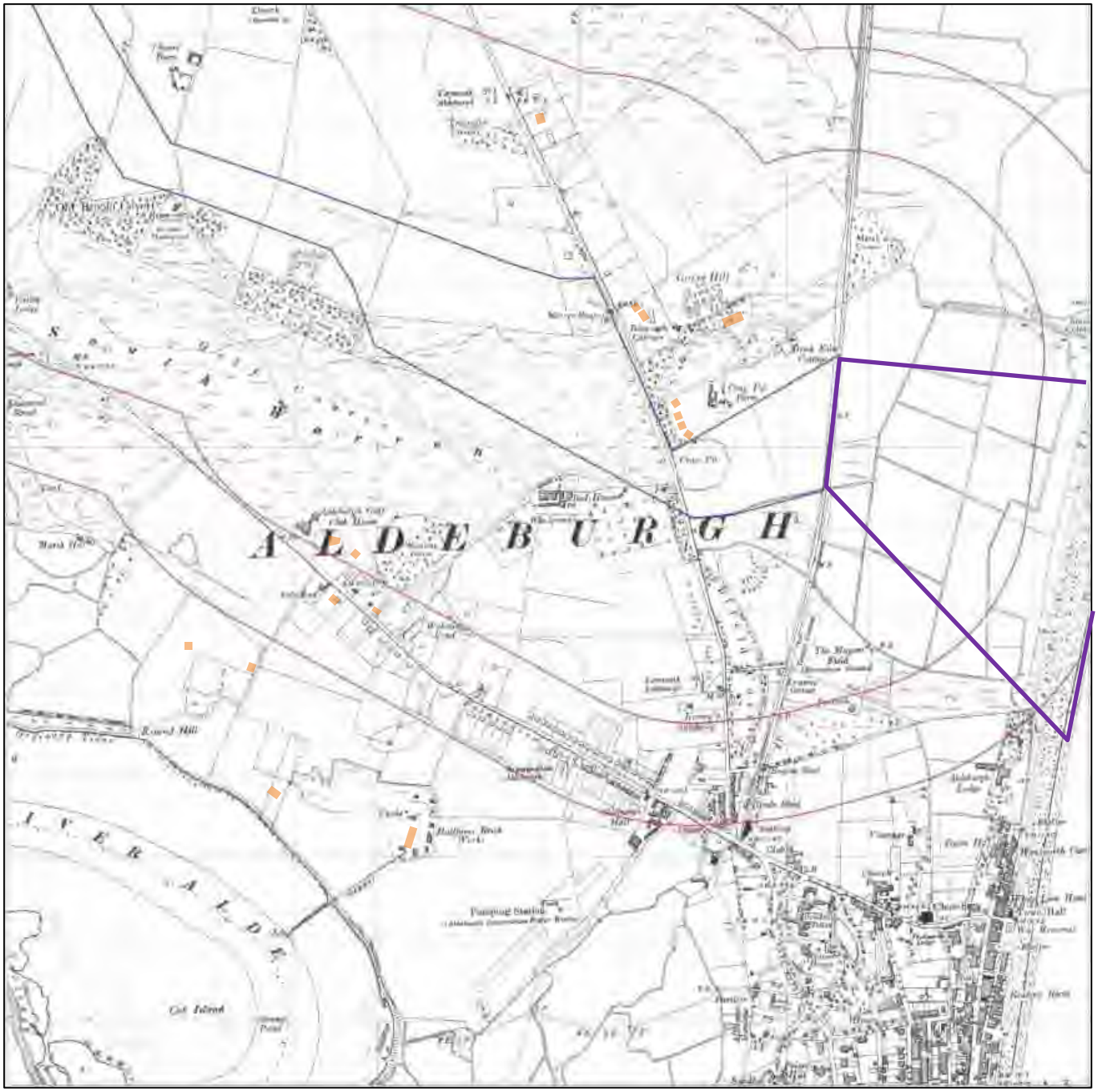
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Approximate site boundary

Approximate extension site boundary

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Approximate site boundary

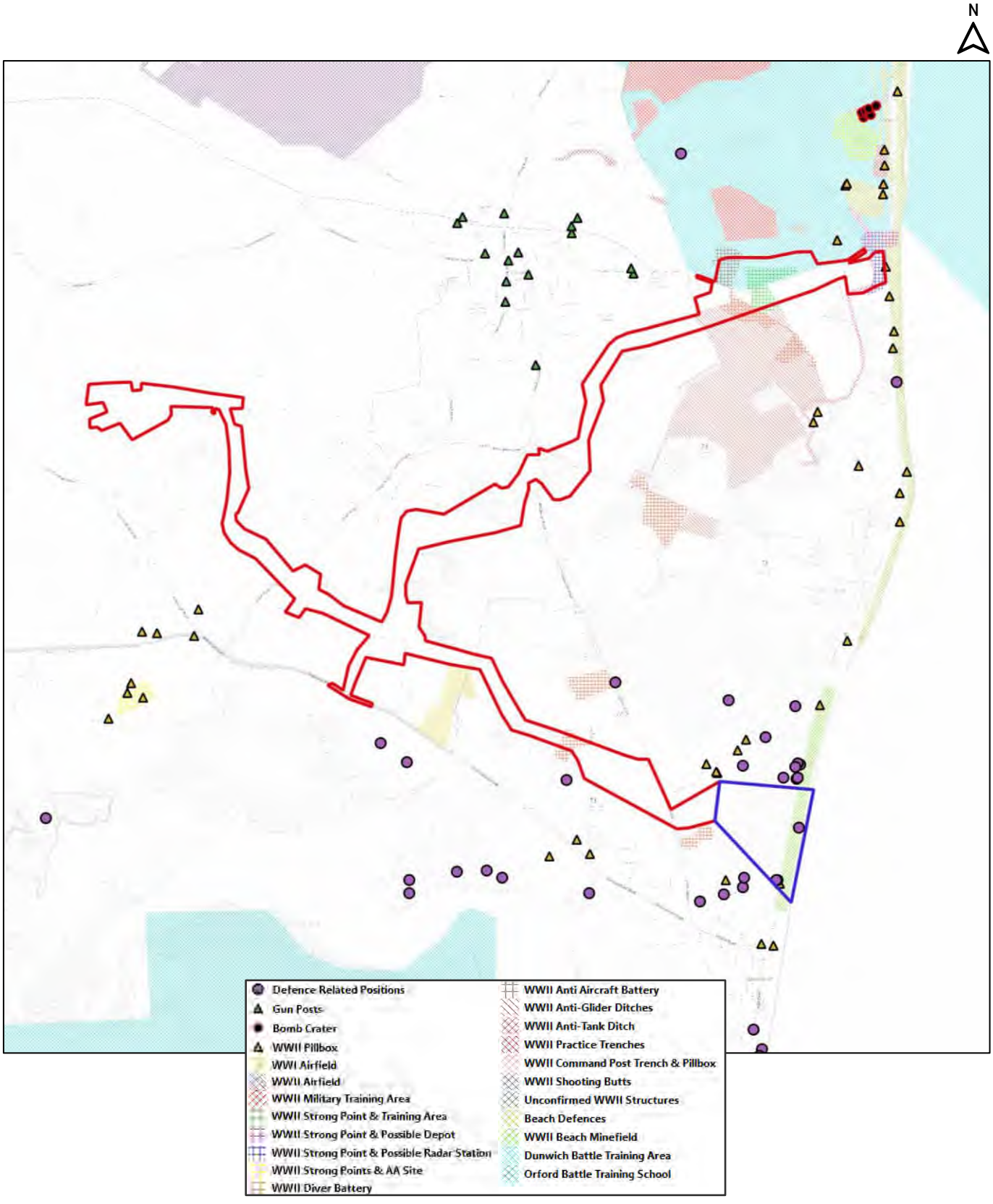
Approximate extension site boundary

Clearance

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Potential Risk Contributors - Overview

Annex
D-1
9758-1 RA



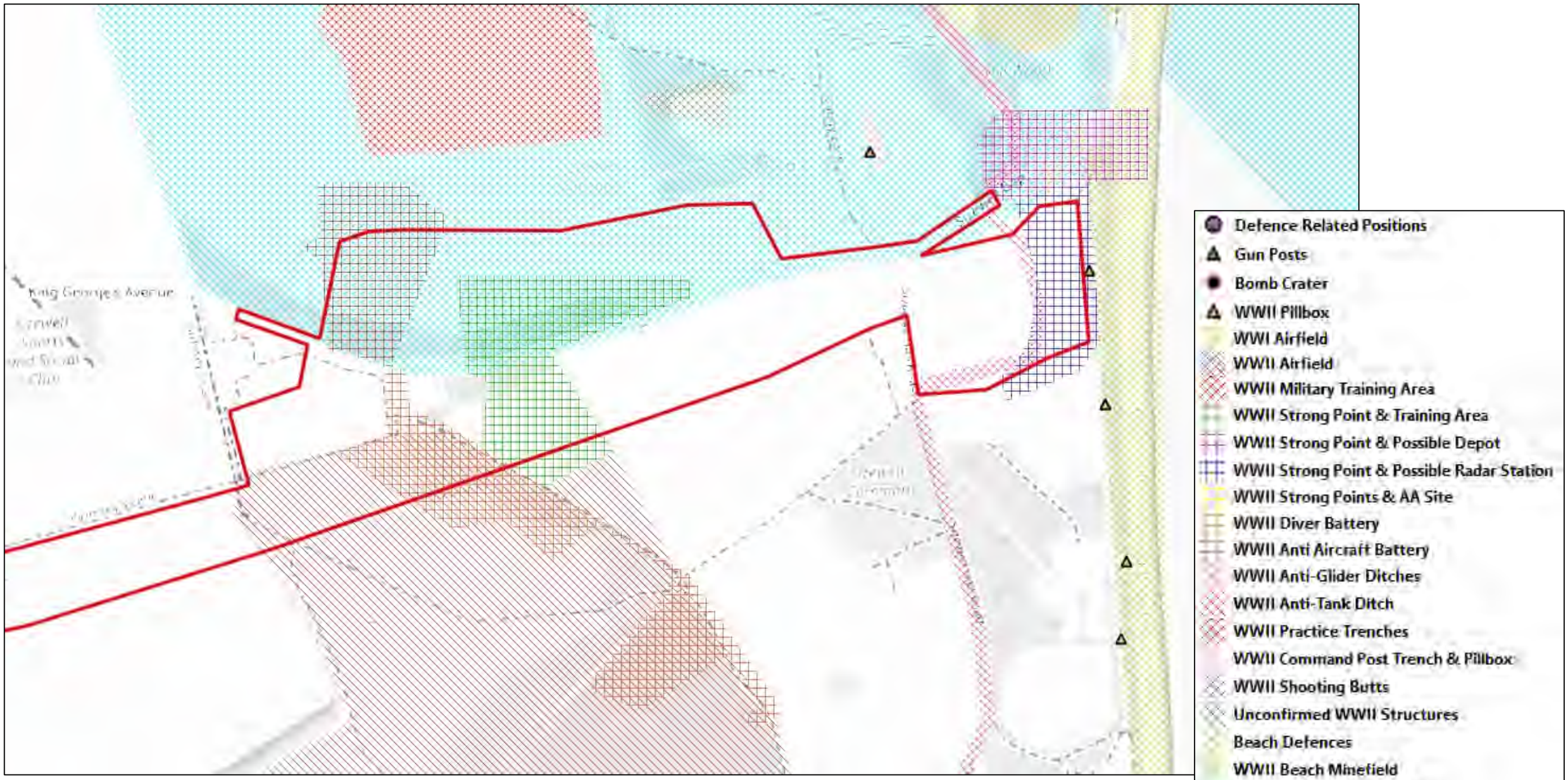
Approximate site boundary

Extension site boundary

SafeLane Global & Various Historical Sources

Potential Risk Contributors - Northern Section

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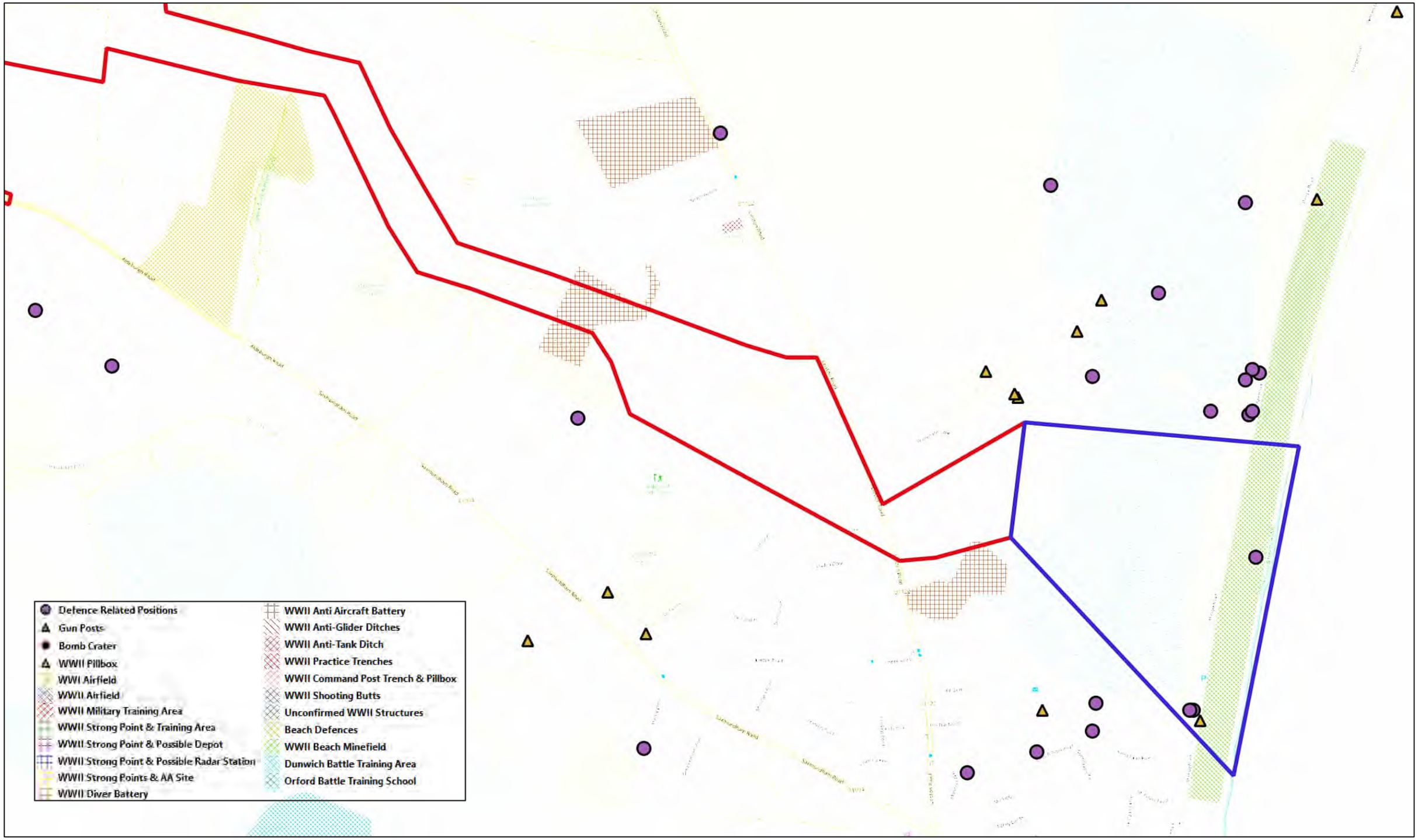


Approximate site boundary

SafeLane Global & Various Historical Sources

Potential Risk Contributors - Southern Section

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Approximate site boundary

Extension site boundary

SafeLane Global & Various Historical Sources

SAFELANE® GLOBAL

WWII-era RAF Aerial Photography – 26th August 1942

Annex
E-1
9758-1 RA



Approximate site boundary

NCAP

WWII-era RAF Aerial Photography – 26th August 1942

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Approximate site boundary

Extension site boundary

WWII-era RAF Aerial Photography – Circa. 1945

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Approximate site boundary

WWII-era RAF Aerial Photography – Circa. 1945

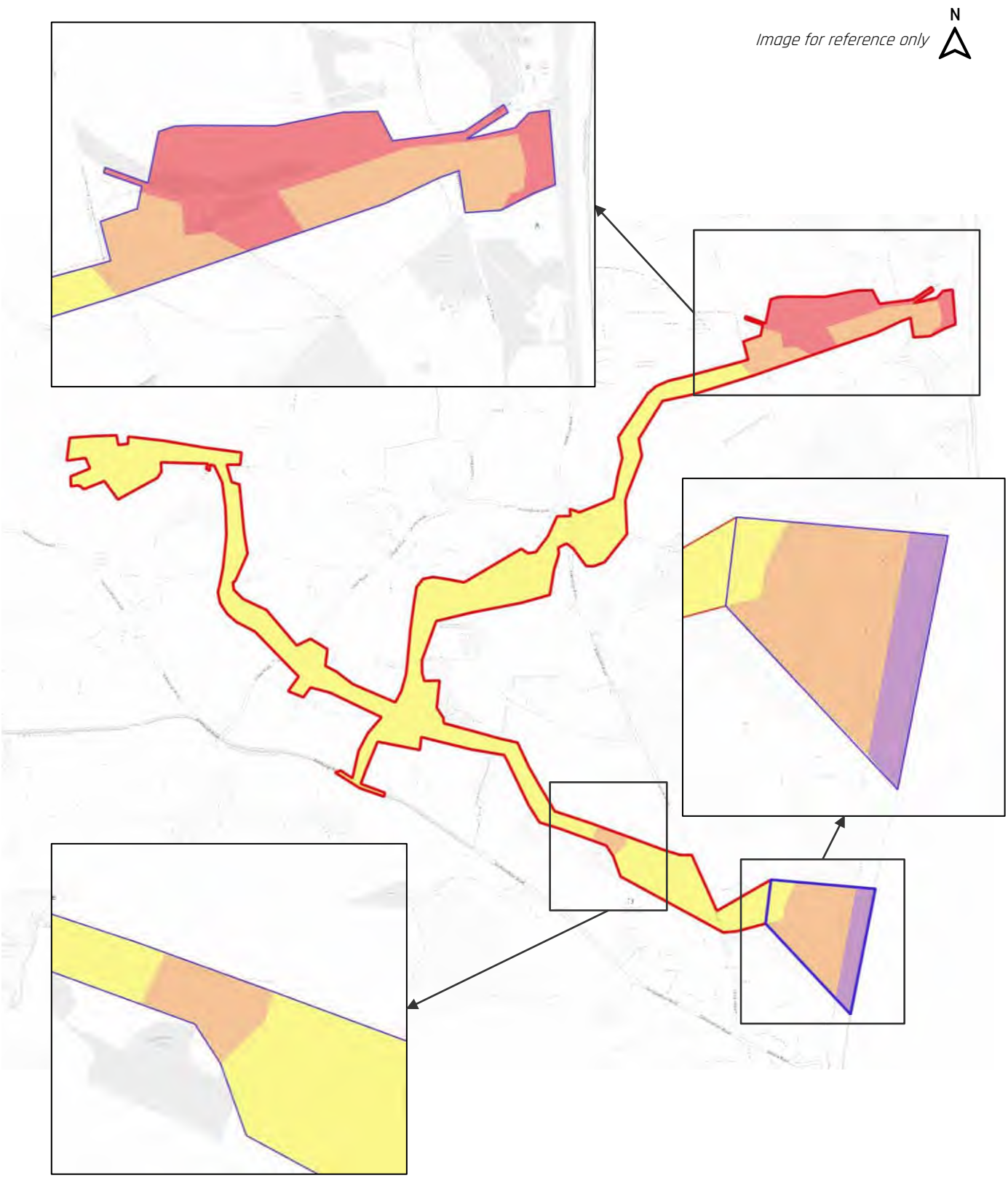
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Approximate site boundary

Image for reference only

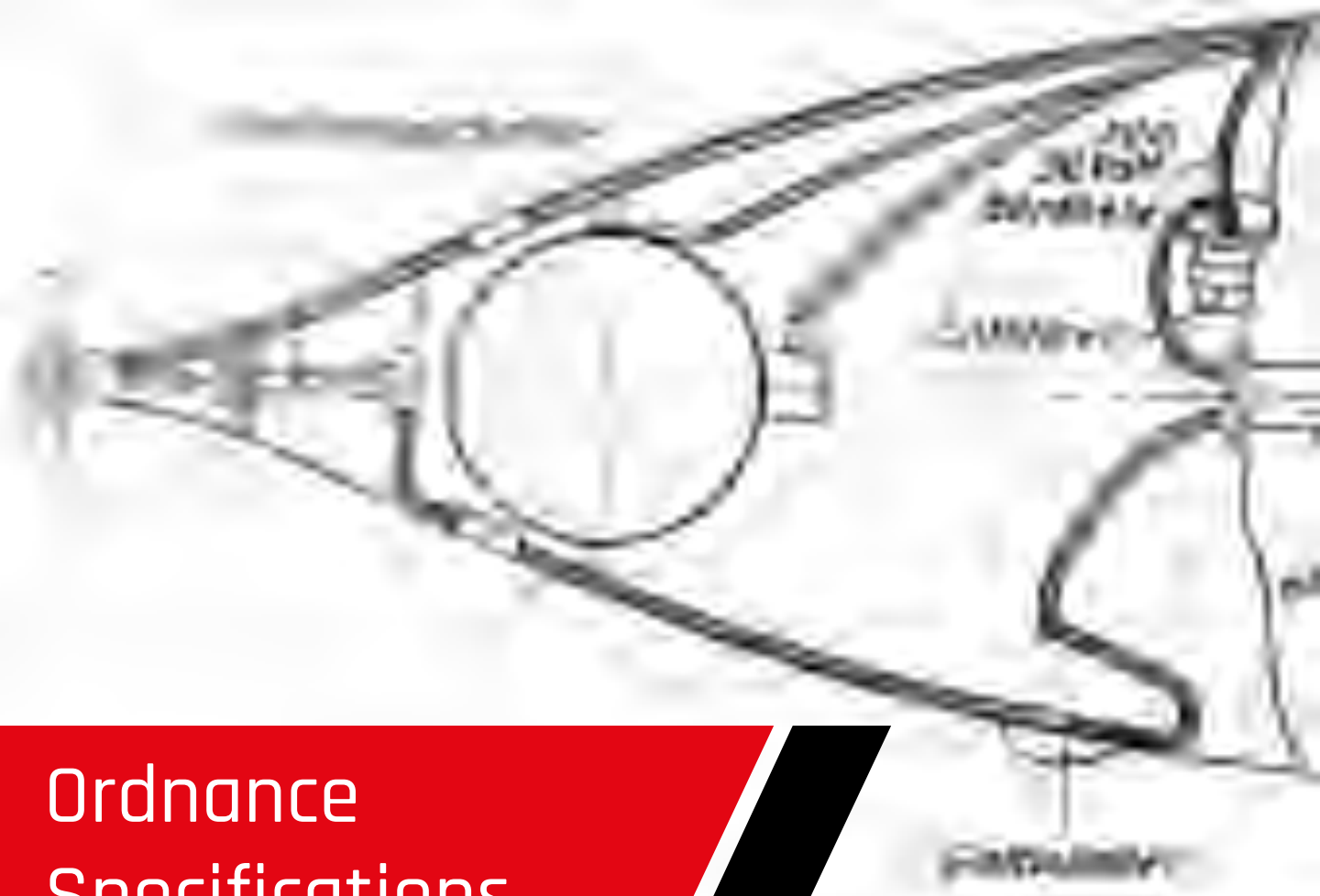
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Please see Executive Summary or Section 12 for recommended scope-specific UXO risk mitigation measures.

Medium Risk Zone 1 | Medium Risk Zone 2 | High Risk Zone 1 | High Risk Zone 2

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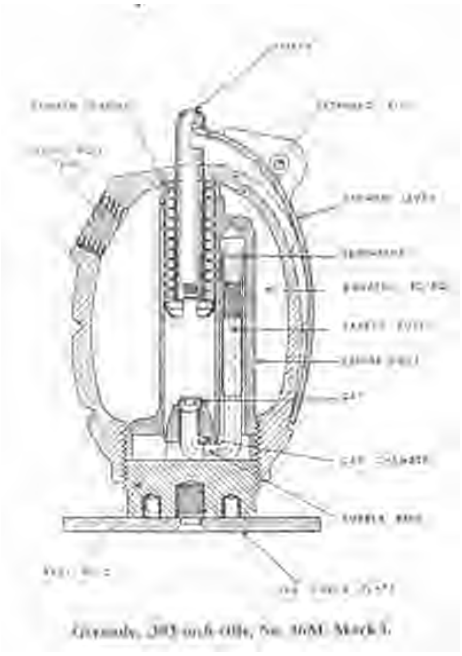
Ordnance Specifications and Information





British & Allied Ordnance

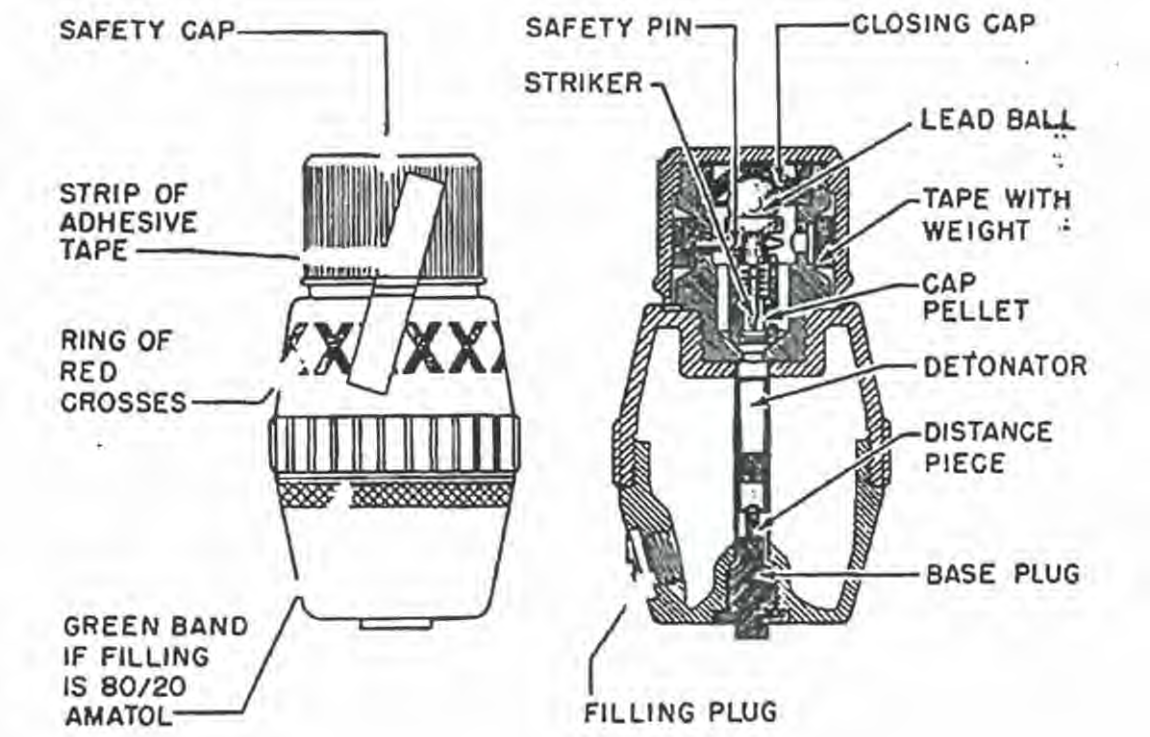




No. 36 “Mills” Grenade

Weight: 0.7kg filled
Type: Hand or discharger, fragmentation
Dimensions: 95 x 61mm
Filling: Alumatol, Amatol 2 or TNT
Remarks: 4 second hand-throwing fuze with approximate range of 30m. First introduced May 1918.



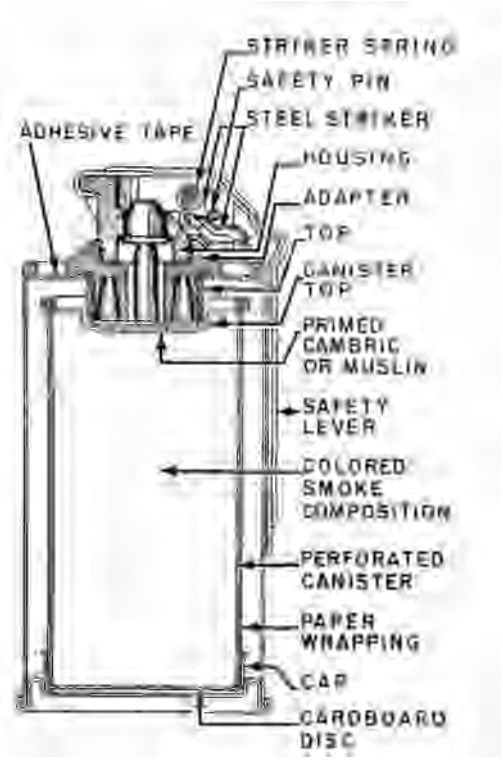


No. 69 Grenade

Weight: 038kg filled
Type: Percussion / Blast
Date Introduced: December 1940
Remarks: Black Bakelite body. Blast rather than fragmentation type. After unscrewing the safety cap, a tape is held when throwing the grenade releasing the safety bolt in the throwing motion. Detection is problematic due to its very low metal content.







Typical Smoke Grenade

Dimensions: Approx. 65 x 115mm
Type: Smoke
Date Introduced: Current MoD issue
Remarks: Smoke grenades are used as ground-to-ground or ground-to-air signalling devices, target or landing zone marking devices, and screening devices for unit movement.





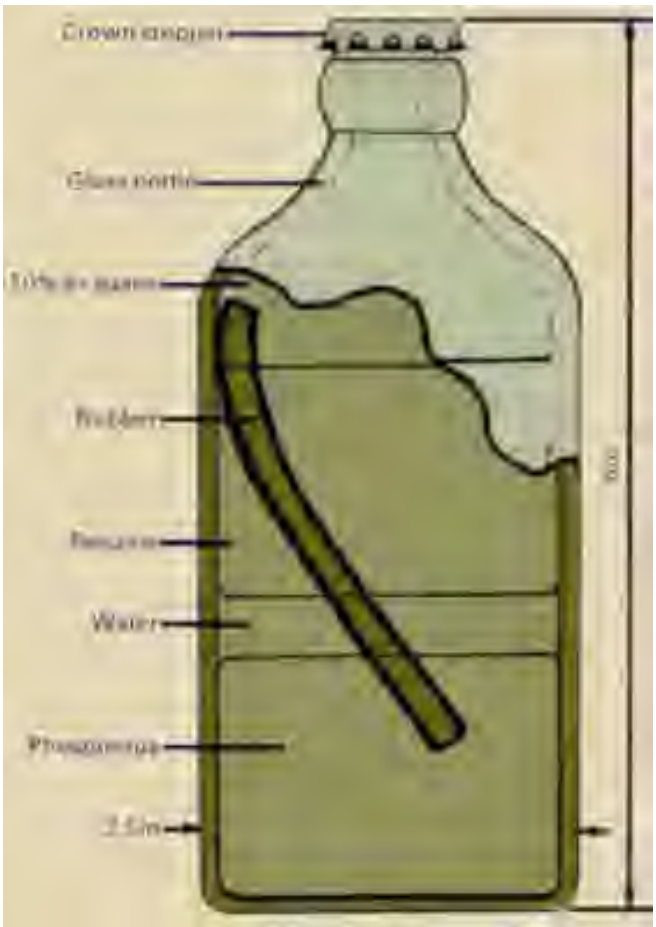


Self-Igniting Phosphorous (SIP) Grenade

Sometimes called the "A&W (Albright & Wilson)" grenade.

The grenade comprised a glass bottle with a total volume of approximately 1 pint. It was filled with white phosphorous, benzene, a piece of rubber and water. Over time, the rubber dissolved to create a sticky fluid which would self-ignite when the bottle broke.

Fired by hand or Northover Projector.

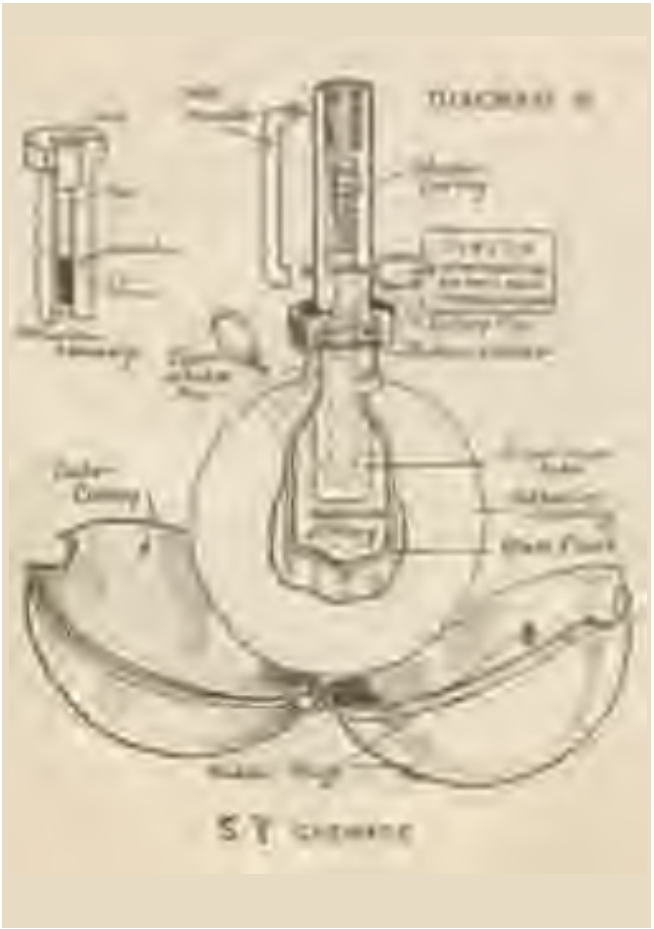






No. 74 Grenade (Sticky Bomb)

Designed as an anti-tank grenade and used by the Home Guard. The grenade consisted of a glass ball on the end of a Bakelite (plastic) handle. Inside the glass ball was an explosive filling whilst on the outside was a very sticky adhesive covering. Until used, this adhesive covering was encased in a metal outer casing.

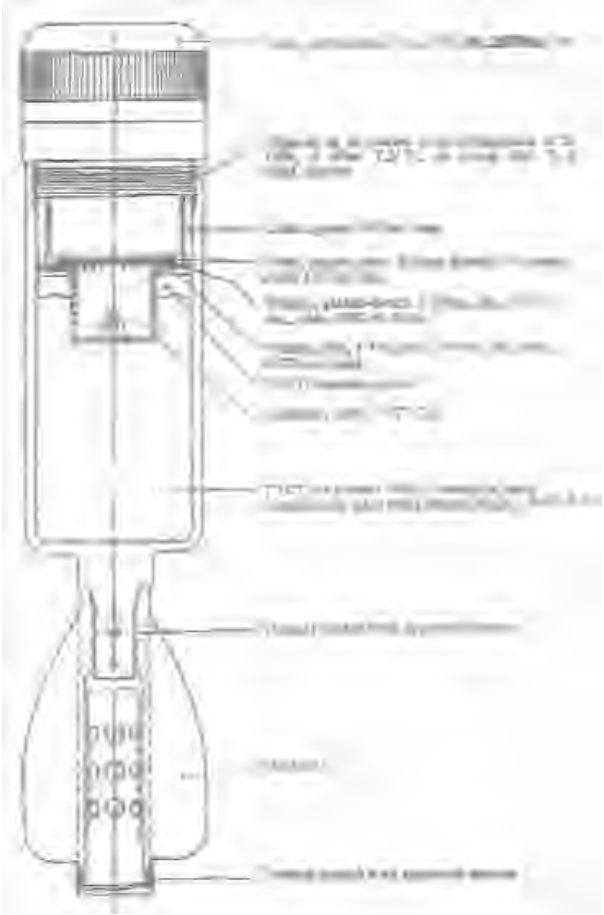






Typical 2" High Explosive Mortar

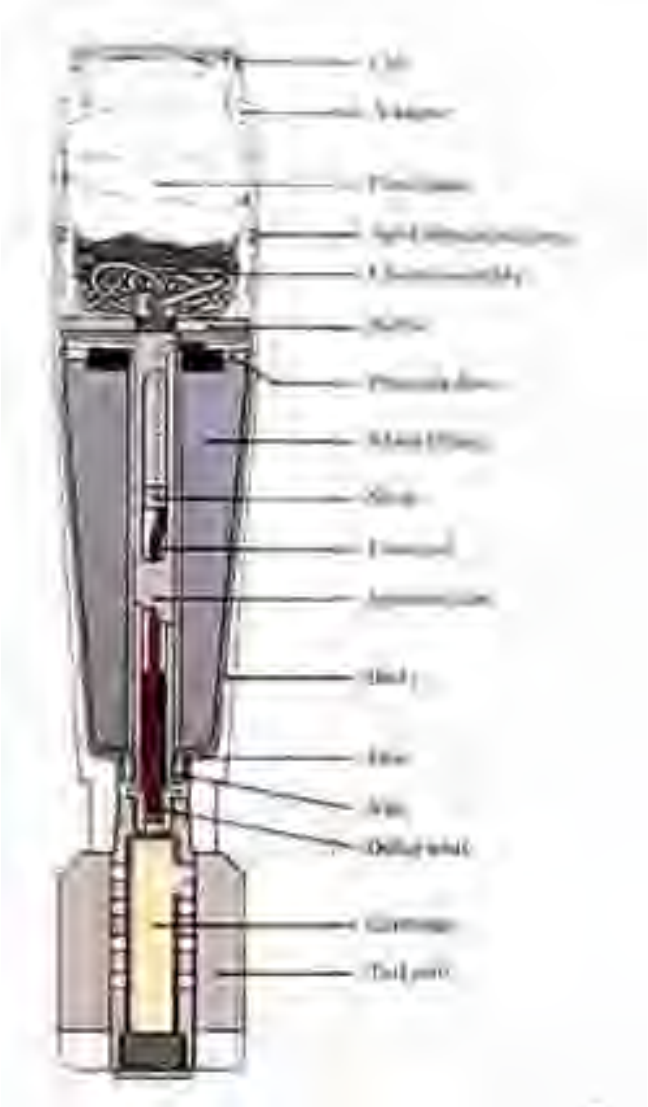
Bomb weight: 1.02kg
Fuze Type: High Explosive
Bomb Dimensions: 51 x 290mm
Filling: 200g RDX/TNT
Remarks: Fitted with an impact fuze which detonates the fuze booster charge (exploder) and, in turn, the high explosive charge. The main charge shatters the mortar bomb body, producing near optimum fragmentation and blast effect at the target.





Typical 2" Illuminating Mortar

Fuze Type: Illuminating
Bomb Dimensions: 51 x 290mm
Filling: Various
Remarks: The expulsion charge ignites and ejects the candle assembly. A spring ejects the parachute from the tail cone. The parachute opens, slowing the descent of the burning candle which illuminates the target.







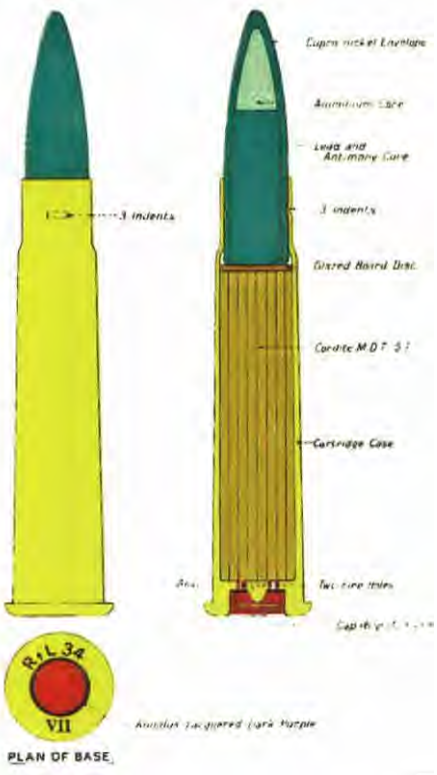


Typical 3" Smoke Mortar

Fuze Type: Smoke
Bomb Dimensions: c.490 x 76mm
Filling: Typically, white phosphorus
Remarks: On impact, the fuze functions and initiates the bursting charge. The bursting charge ruptures the mortar bomb body and disperses the white phosphorous filler. The white phosphorous produces smoke upon exposure to the air.



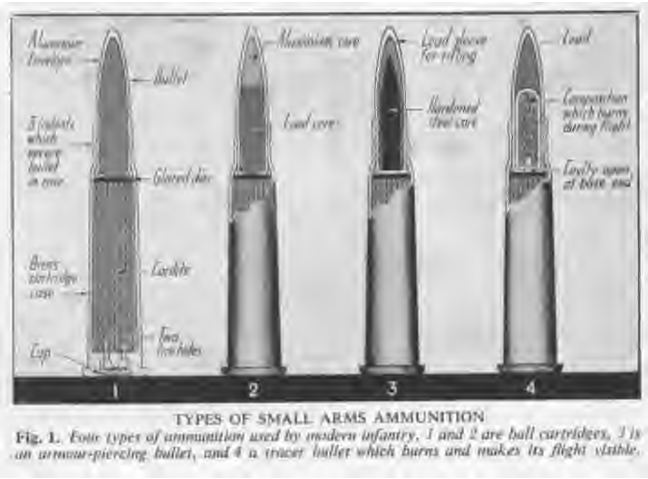




.303" Ammunition

Type: Rifle / machine gun round
Markings: Regular round – none. Tracer round – red primer
Bullet Weight: 150–180g
Dimensions: Total cartridge / projectile length – 182mm
Filling: Regular round – none. Tracer round – small incendiary fill
Threat: Explosive cordite within unspent cartridge
Deployment: Royal Navy, RAF and British Army Light Anti-Aircraft guns, machine guns and rifles. Standard British and Commonwealth military cartridge from 1889 until the end of the 1950s
Remarks: Cartridges are belted or supplied loose in cartons

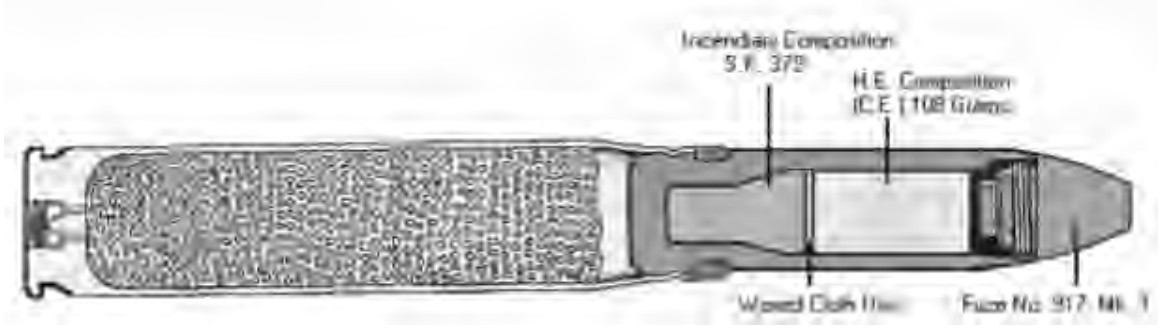




TYPES OF SMALL ARMS AMMUNITION
Fig. 1. Four types of ammunition used by modern infantry. 1 and 2 are ball cartridges, 3 is an armour-piercing bullet, and 4 a tracer bullet which burns and makes its flight visible.

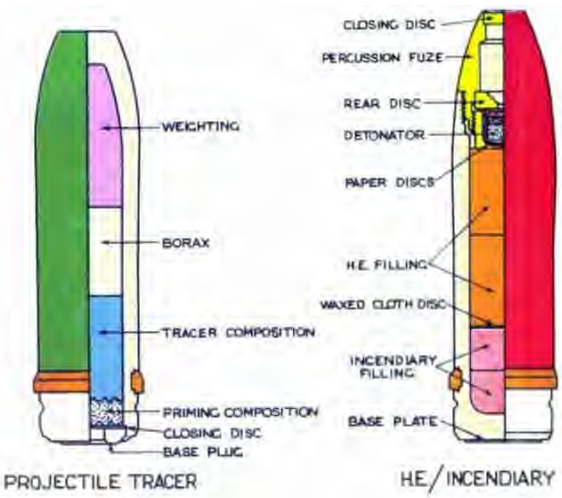






20mm Hispano HEI Ammunition

Type: Live cannon round
Markings: Upper half of projectile painted "buff" colour, lower half is red
Cartridge Weight: 256g
Dimensions: Total cartridge / projectile length – 182mm
Fuze: Contact fuze – No. 253, No. 254 or No. 917
Filling: 108g of contact explosive & 68g of SR. 379 incendiary composition
Threat: Explosives within unspent cartridge as well as the projectile
Deployment: Royal Navy, RAF and British Army Light Anti-Aircraft guns. Also RAF aircraft cannons.
Remarks: Cartridges are belted or supplied loose in cartons.



COLOUR IDENTIFICATION		
BRITISH		
NATURE OF SHELL	H.E. FILLING	COLOUR
H.E. TRACER	T.N.T.	
H.E.	T.N.T.	
PROJ. PRACTICE		
PROJ. TRACER		
H.E. INCENDIARY	T.N.T.	
H.E. INCENDIARY TRACER	T.N.T.	

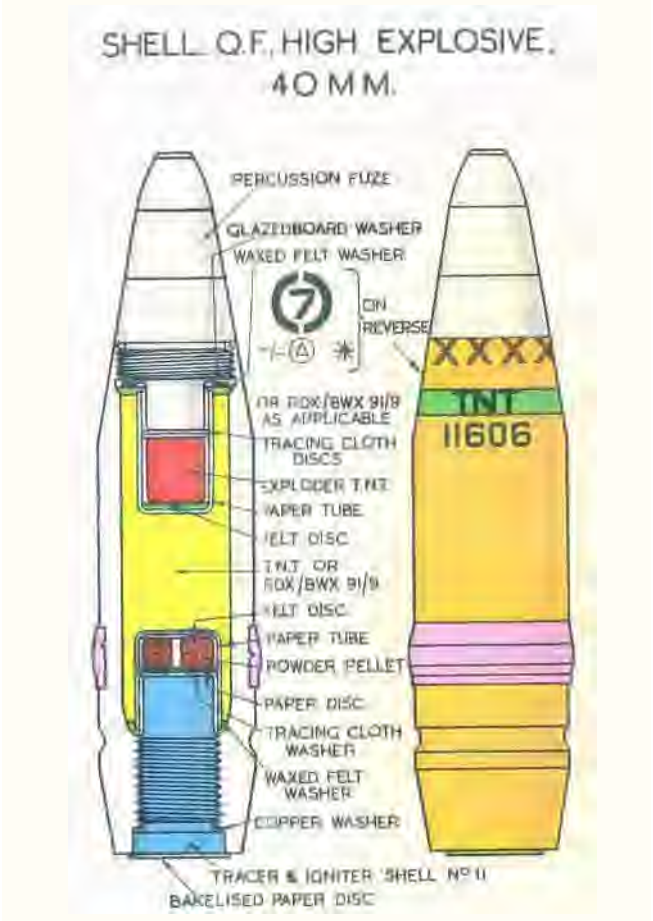






40mm Bofors Gun Projectile

Weight: 0.86kg
Bomb Dimensions: 40mm x 310mm
Rate of Fire: 120 rounds per minute
Ceiling: 7,000m
Muzzle Velocity: 881m/s
Remarks: Mobile batteries – normally few records of where these guns were located.

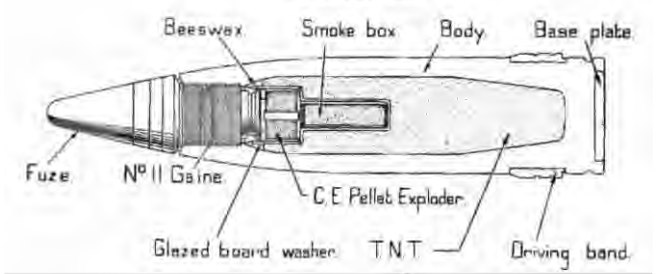




3.7" Anti-Aircraft Projectile

Weight: 12.7kg
Bomb Dimensions: 94 x 360mm
Rate of Fire: 10-20 rounds per minute
Carriage: Typically, white phosphorus
Ceiling: 9,000-18,000m
Muzzle Velocity: 72m/s
Remarks: 4.5" projectiles were also commonly utilized.







Miscellaneous Military Contamination: Detonators, Flares, Fuzes

When working on land currently or historically used by the military, all manner of explosive ordnance-related items dating back over 100 years could be encountered. These may include practice (dummy) items, experimental weapons and other miscellanea such as detonators, flares and fuzes. It should be noted that, although small, detonators contain enough primary explosive to cause serious injury.

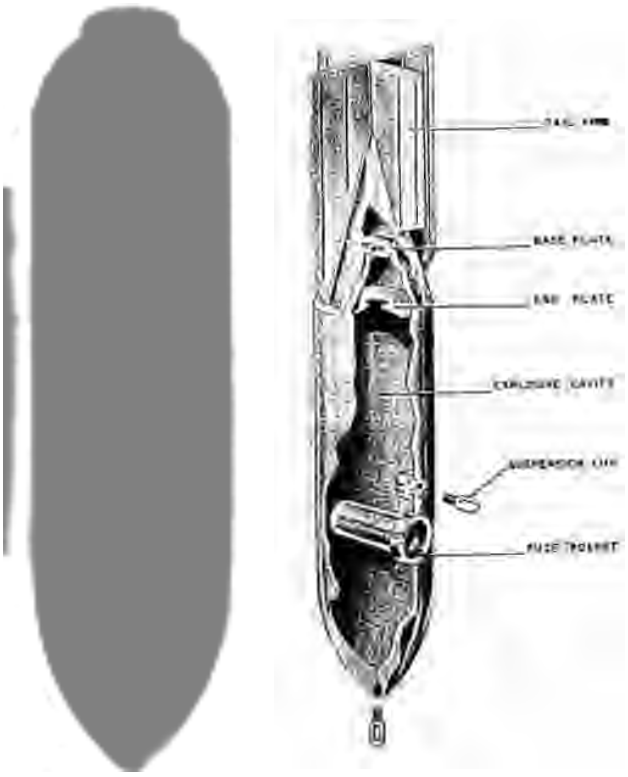








German Ordnance





Sprengbombe Cylindrisch 50

Bomb weight: 40-54kg
Fuze Type: Impact fuze / electro-mechanical time delay fuze
Bomb Dimensions: 1090 x 280mm
Body Diameter: 200mm
Use: Used against lightly damageable materials, hangars, railway rolling stock, ammunition depots, light bridges and buildings up to 3-storeys.
Remarks: The smallest and most common conventional German bomb. Nearly 70% of bombs dropped on the UK were 50kg.

SC50 found on site

In May 2015, an SC50 was found at a building site on Empire Way, Wembley, London. (*Image source: The Guardian*)

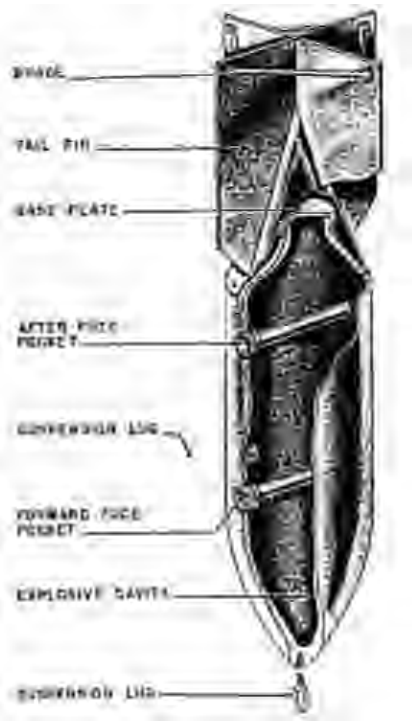


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Ordnance Specifications & Information

SC250





Sprengbombe Cylindrisch 250

Bomb weight: 245-256k

Explosive Weight: 125-130kg

Fuze Type: Electrical impact / mechanical time delay fuze

Bomb Dimensions: 1640x512mm

Body Diameter: 368mm

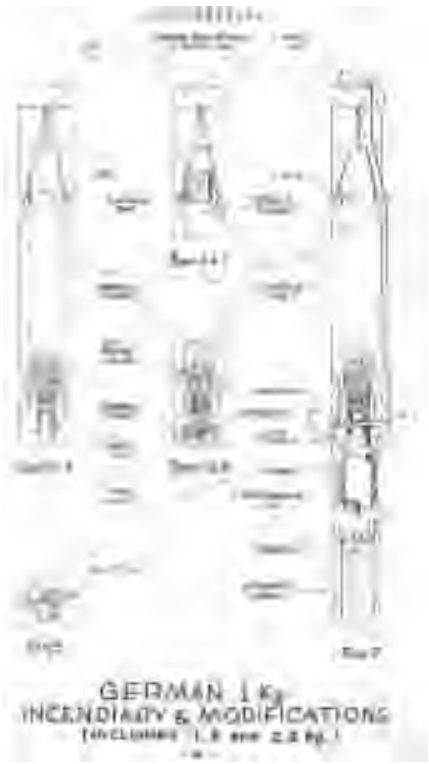
Use: Used against railway installations, embankments, flyovers, underpasses, large buildings and below-ground installations.

SC250 found on site

In the year 2000, SafeLane Global discovered an SC250 whilst supervising construction work at Hawkinge, Kent.









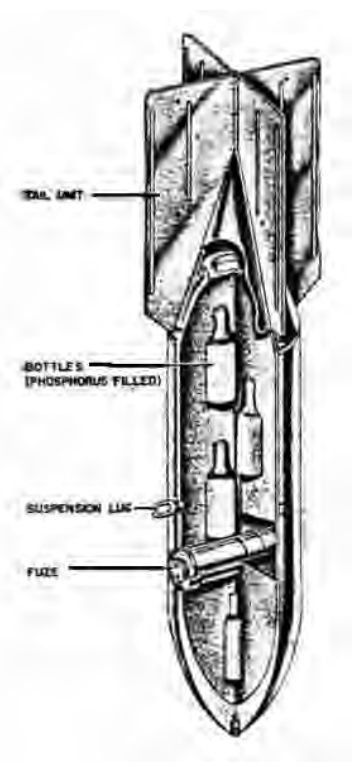
Above: Left – ordinary scaffold pipe, centre - 1kg incendiary bomb, right - incendiary bomb recently found on site in UK

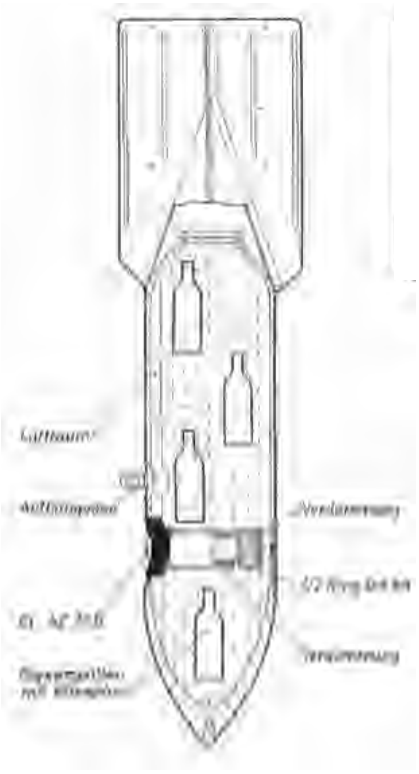
1kg Incendiary Bomb (IB)

Bomb weight: 1.0 & 1.3kg
Filling: 680g Thermite
Fuze Type: Impact fuze
Body Dimensions: 350x50mm
Body Diameter: 50mm
Use: As incendiary – dropped in clusters against towns and industrial complexes
Remarks: Jettisoned from air-dropped containers. Magnesium alloy case. Sometimes filled with high explosive charge.



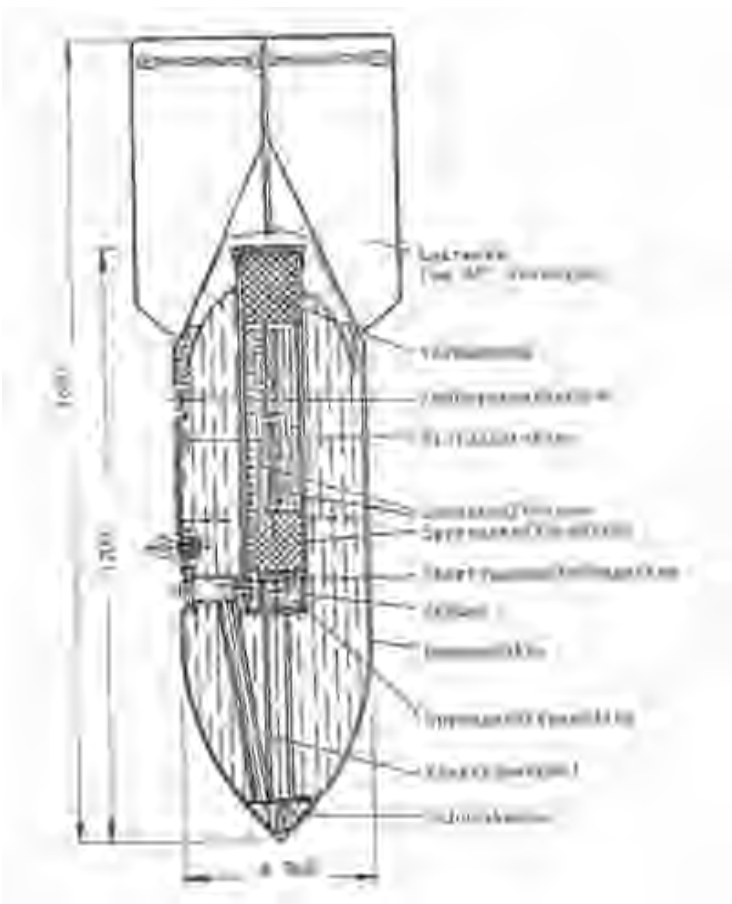






C-50 A Phosphorus Bomb

Bomb Weight: c.41kg
Explosive Weight: 0.03kg
Incendiary Filling: 12kg liquid filling with phosphor igniters in glass phials
Fuze Type: Electrical impact fuze
Bomb Dimensions: 1100x2800mm
Body Diameter: 200mm
Use: Against all targets where an incendiary effect is to be expected
Remarks: Early fill was a phosphorus / carbon disulphide incendiary mixture

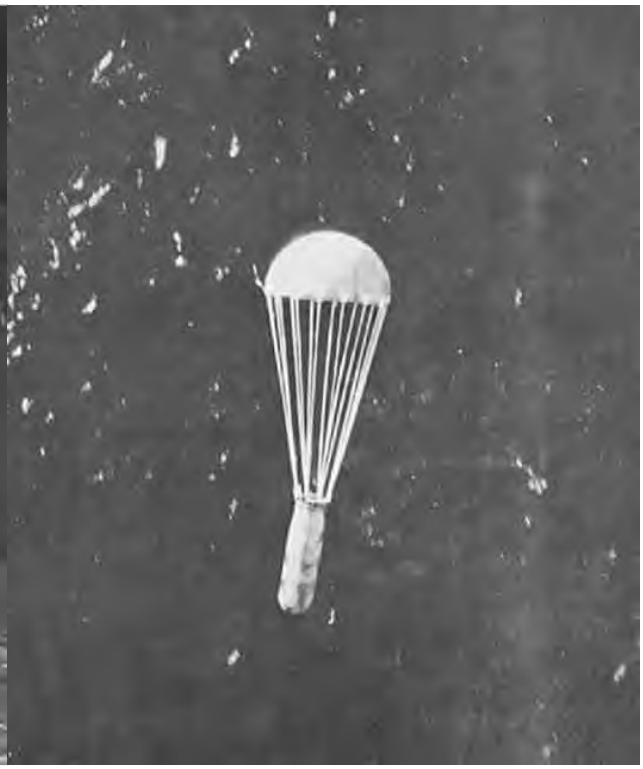




Flam C-250 'Oil Bomb'

Bomb Weight: 125kg
Explosive Weight: 1kg
Flammable Weight: 74kg
Filling: Mixture of 30% petrol and 70% crude oil
Fuze Type: Super-fast electrical impact fuze
Bomb Dimensions: 1650 x 512.2mm
Body Diameter: 368mm
Use: Often used for surprise attacks on living targets, against troop barracks and industrial installations
Remarks: Thin casing – not designed for ground penetration

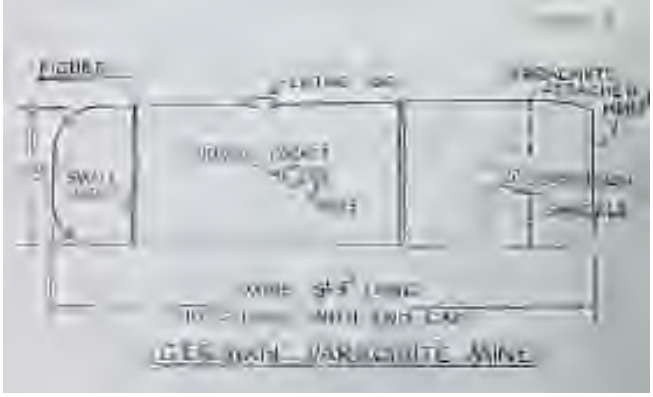


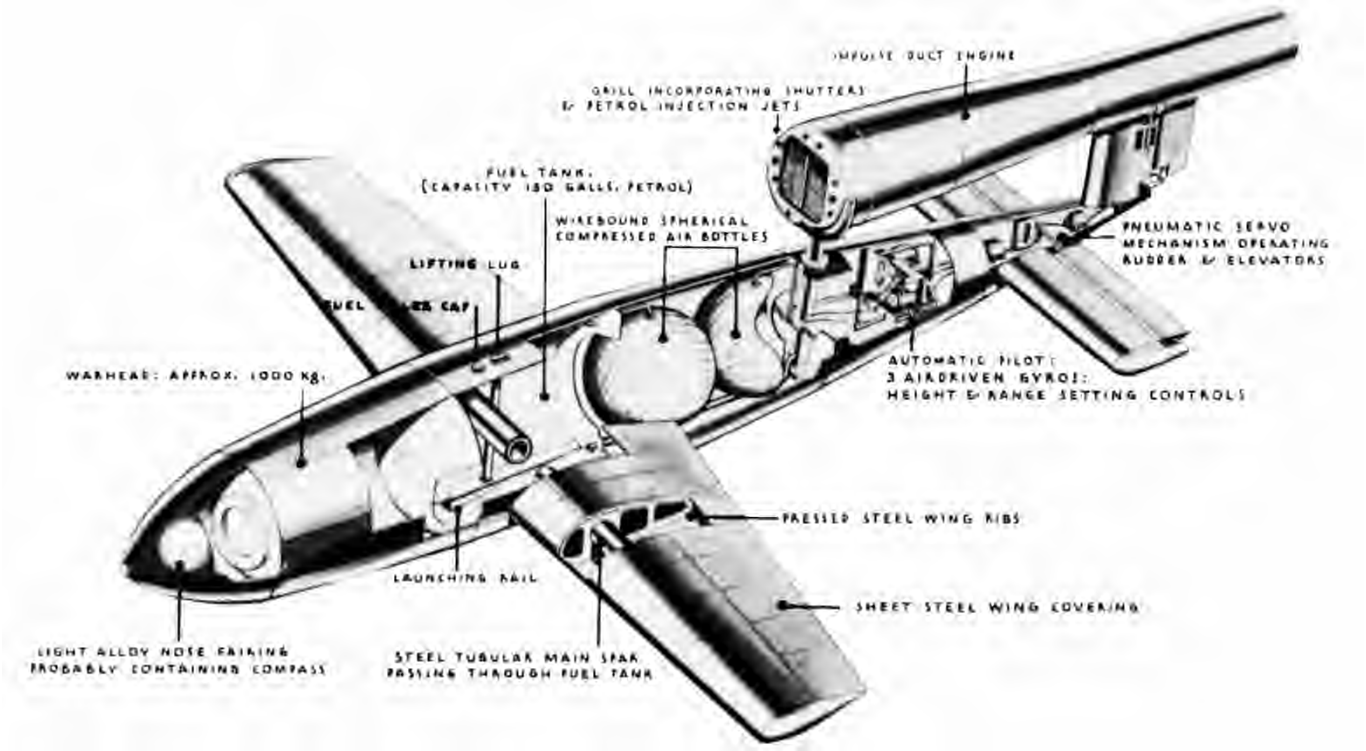


Luftmine A/B 'Parachute Mine'

Bomb Weight: A- 500kg, B – 1000kg
Fuze Type: Mechanical clockwork fuze
Bomb Dimensions: A – 1768mm, B – 2682mm
Use: Capable of creating severe blast damage in built-up areas.
Remarks: Parachute mines were standard German sea mines fitted with a suitable detonator. They were widely used against British cities.





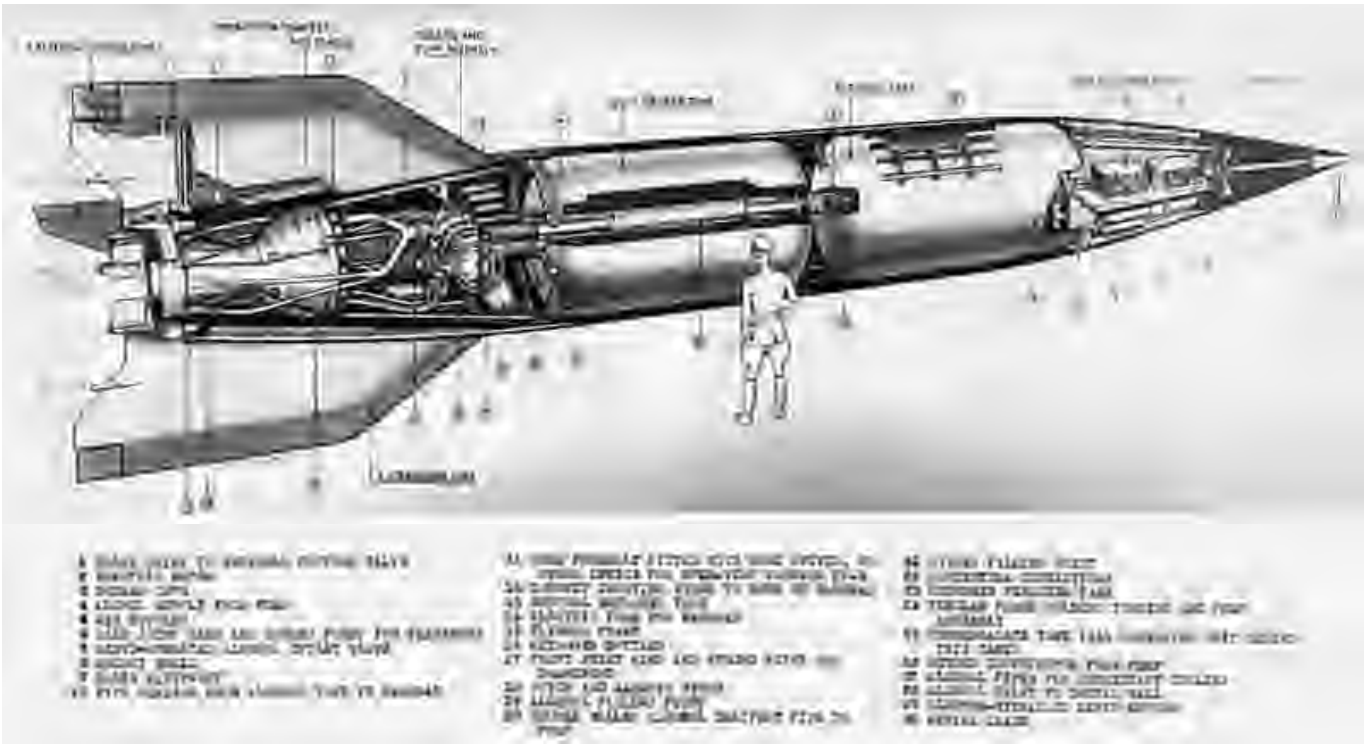


Vergeltungswaffe 1 (V-1) 'Fly' Bomb

Missile Weight: 2,150kg
Fuze Type: Electric Impact Fuze
Missile Length: 8.32m
Width: 5.37m
Range: 250km
Use: Pulsejet-powered guided cruise missile, designed to attack Allied cities.
Remarks: Armed with an 850kg warhead, around 10,000 V-1 flying bombs were fired at England, causing significant damage and killing approximately 6,000 people . There is a negligible risk from unexploded V-1s today, since the remains would have left incontrovertible evidence of the impact.



A V-1 'Fly' Bomb, captured over London seconds before impacting



Vergeltungswaffe 2 (V-2) Rocket

Rocket Weight: 12,500kg
Fuze Type: Electric Impact Fuze
Rocket Length: 14m
Body Diameter: 1.65m
Range: 320km
Use: Long-range ballistic missile, designed to attack Allied cities.
Remarks: Armed with a 975kg warhead and travelling at three times the speed of sound, the V-2 could cause widespread destruction. There is a negligible risk from unexploded V-2s today, since the remains would have left incontrovertible evidence of the impact.



SAFELANE
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Detailed Unexploded Ordnance Risk Assessment

In Respect Of:
Sea Link Outline, Suffolk - Revision

For:
Mott MacDonald Ltd

Report Reference:
9758-2 RA



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This Report has been produced in compliance with the Construction Industry Research and Information Association guidelines for the preparation of Detailed Unexploded Ordnance Risk Assessments in the management of UXO risks in the construction industry. This report has been compiled using all due diligence and expertise and having made all proper but reasonable enquiries within given time limitations. However, in accepting and implementing the recommendations contained in this report, the client does so strictly at his own risk.

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Executive Summary

The Site	
Address:	Leiston Road, Sternfield, Suffolk IP17 1TG
OS National Grid Reference:	TM 39343 62967
Site Description:	The site is irregular in shape, located between Friston and Saxmundham. The study area comprises agricultural, open fields. Access to the site is gained through Liston Road which runs adjacent to the site's northern boundary. An additional section of land (highlighted in blue) is present to the north of the site. This section largely comprises open ground, overlapping onto Priors Grange in the west.
Proposed Works	
Ground investigation will comprise boreholes to a depth of between 15 and 35m bgl and trial pits to max. 4m depth.	
Risk Assessment	
Risk Assessment Methodology: In accordance with CIRIA guidelines this assessment has carried out research, analysed the evidence and considered the likelihood that the site has been contaminated with unexploded ordnance; that such items remained on site; the risk that they could be encountered during any intrusive works and the consequences that could result. Appropriate risk mitigation measures have been proposed.	
UXO Risk Rating	**MEDIUM from the following UXO types:** • German Air-Delivered HE bombs • Anti-Aircraft Projectiles
The full UXO Risk Assessment and a breakdown of the UXO Risk Level can be found in Section 11.	
Maximum Bomb Penetration Depth	It has been assessed that a 500kg bomb would have had an approximate maximum bomb penetration depth of between **8-10m** below WWII ground level. Penetration depth could potentially have been greater if the UXB was larger (though only 4% of German bombs used in WWII over Britain were of that size). Note that UXBs may be found at any depth between just below the WWII ground level and the maximum penetration depth.

Recommended Risk Mitigation		
Risk Level	**Planned Site Activity**	**Recommendations**
Medium	**Shallow Intrusive Works eg excavations**	• UXO Safety & Awareness Briefing (Toolbox Brief, TBB) • Site Specific Safety Instructions (SSSIs) Training Course • Non-Intrusive (NI) Magnetometer Survey (Greenfield areas only)

		• Target Investigation (Required as a follow-on from NI magnetometer survey)
	Deep intrusive works (eg piling)	• UXO Safety & Awareness Briefing (Toolbox Brief, TBB) • Site Specific Safety Instructions (SSSIs) Training Course • Intrusive Magnetometer Survey of pile/borehole positions
In making this assessment and recommending these risk mitigation measures, the proposed works outlined in the 'Scope of the Proposed Works' section were considered. Should the planned works be modified, or additional intrusive engineering works be considered, SafeLane Global should be consulted to see if re-assessment of the risk or mitigation recommendations is necessary.		

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Ordnance Specifications and Information

Glossary of Terms

AAA	Anti-Aircraft Artillery
ARP	Air-raid Precautions
BDO	Bomb Disposal Officer
EOD	Explosive Ordnance Disposal (current term for "bomb" disposal)
HE	High Explosive
HG	Home Guard
IB	Incendiary Bomb
Kg	Kilogram
LM	Land Mine
LSA	Land Service Ammunition (includes grenades, mortars, etc.)
Luftwaffe	German Air Force
m bgl	Metres Below Ground Level
MoD	Ministry of Defence
OB	Oil Bomb
PM	Parachute Mine
RAF	Royal Air Force
SI	Site Investigation
SAA	Small Arms Ammunition (small calibre cartridges used in rifles & machine guns)
UXB	Unexploded Bomb
UXO	Unexploded Ordnance
V-1	"Doodlebug" the first cruise type missile, used against London from June 1944. Also known as 'Flying Bomb'
V-2	The first ballistic missile, used against London from September 1944
WWI	First World War (1914 -1918)
WWII	Second World War (1939 – 1945)

Detailed Unexploded Ordnance Risk Assessment

In Respect of

Sea Link Outline, Suffolk - Revision

1 Introduction

Groundsure Ltd, on behalf of Mott MacDonald Ltd, has commissioned SafeLane Global to conduct a Detailed Unexploded Ordnance Risk Assessment of the Sea Link Outline revised project site, Suffolk.

Unexploded Ordnance (UXO) presents a significant risk to construction projects in parts of the UK as a result of enemy actions during the two 20th Century World Wars and historic British and Allied military activity.

One of the legacies of this conflict is buried unexploded air-dropped bombs or anti-aircraft projectiles resulting from the failure of a proportion of the weapons to function as designed. It is commonly accepted that the failure rate of these munitions was approximately 10% and, depending on their shape, weight, velocity and ground conditions, many penetrated the ground and came to rest at depth.

In addition, it is estimated that over 20% of the UK landmass has been used by the military at some point and between 2006 and 2009, over 15,000 items of British / Allied ordnance (excluding small arms ammunition) were found on UK construction sites (CIRIA).

Intensive efforts were made during and after the war to locate and render safe all UXO but, unsurprisingly, not all were found and dealt with. This is evidenced by the regular, on-going discoveries of UXO during construction-related intrusive ground works.

As a result of a generally increased risk awareness amongst professionals involved in ground engineering works and proactive health and safety measures, the risk to life and limb from UXO has been minimised. However even the simple discovery of a suspected device during on-going works can cause considerable disruption to production and cause unwanted delays and expense.

Such risks can be more fully addressed by a better understanding of the site-specific risk and the implementation of appropriate risk mitigation measures.

2 Construction Industry Duties and Responsibilities

2.1 The UK Regulatory Environment

There is no legal requirement for the control and mitigation of UXO risk in the construction industry, but guidelines for good practice, information, and solutions with regards to UXO risk are detailed within CIRIA (C681): Unexploded Ordnance (UXO) A Guide for the Construction Industry.

These guidelines provide the construction industry with a set process for the management of risk associated with UXO, from preliminary risk assessment to implementation of site-specific risk mitigation strategies.

Specific legislation does however exist for health and safety, and is addressed under a number of regulatory instruments, as outlined below.

In practice, the regulations impose a responsibility on the construction industry to ensure that they discharge their obligations to protect those engaged in ground-intrusive operations (such as archaeology, site investigation, drilling, piling or excavations) from any reasonably foreseeable UXO risk.

2.2 The Health and Safety at Work Act, 1974

The Act places a duty of care on an employer to put in place safe systems of work to address, as far as is reasonably practicable, all risks (to employees and the general public) that are reasonably foreseeable.

2.3 Construction (Design and Management) Regulations 2015

CDM 2015 ensures that health and safety within the construction industry is continually improved:

- Works are sensibly planned and managed.
- Competent staff are engaged in the works.
- Risks are identified and managed.
- All parties cooperate and coordinate activities.
- Communication flows to those who require it.
- Workers are consulted and engaged about risks and how they are being managed.

In line with CDM 2015 legislation, SafeLane Global are able to assist parties in their discharge of CDM duties as follows:

- Assist Principal Designers with pre-construction information and risk assessments.
- Assist the Designer with the Designer's Risk Assessment.
- Issue UXO risks as have been identified and manage risks accordingly.
- Assist the Principal Contractor with the construction phase information, in particular risk assessments and mitigation strategies.
- Plan, manage and monitor survey and clearance works under SafeLane Global's control.

2.4 Other Legislation

Other relevant legislation includes the "Management of Health and Safety at Work Regulations 1999" and "The Corporate Manslaughter and Corporate Homicide Act 2007".

3 The Role of the Authorities and Commercial Contractors

3.1 The Authorities

The Police have the responsibilities for co-ordinating the emergency services in the case of an ordnance-related incident on a construction site. They will make an initial assessment (i.e. is there a risk that the find is ordnance or not?) and if they judge necessary impose a safety cordon and/or evacuation and call the military authorities (JSEODOC - Joint Services Explosive Ordnance Disposal Operations Centre) to arrange for investigation and/or disposal. In the absence of an EOD specialist on site many Police Officers will use the precautionary principle, impose cordon(s)/evacuation and await advice from the JSEODOC.

The priority given to the request by JSEODOC will depend on their judgement of the nature of the risk (ordnance, location, people and assets at risk) and the availability of resources. They will respond immediately or as resources are freed up. Depending on the on-site risk assessment the item of ordnance may be removed or demolished (by controlled explosion) in situ. In the latter case additional cordons and/or evacuations may be necessary.

Note, that the military authorities will only carry out further investigations or clearances in very high profile or high-risk situations. If there are regular ordnance finds on a site, the JSEODOC may not treat each occurrence as an emergency and will encourage the construction company to put in place alternative procedures (i.e. the appointment of a commercial contractor) to manage the situation and relieve pressure from the JSEOD disposal teams.

3.2 Commercial Contractors

In addition to pre-construction site surveys and follow-on clearance work, a commercial contractor is able to provide a reactive service on construction sites. The presence of a qualified EOD Engineer with ordnance recognition skills will avoid unnecessary call-outs to the authorities and the contractor will be able to arrange for the removal and disposal of low risk ordnance. If high risk ordnance is discovered actions will be co-ordinated with the authorities with the objective of causing the minimum possible disruption to site operations whilst putting immediate, safe and appropriate measures in place.

4 This Report

4.1 Aims and Objectives

The aim of this report is to examine the possibility of encountering any explosive ordnance during any intrusive works at the site. Risk mitigation measures will be recommended in line with the CIRIA C681 guidelines, to reduce the risk of initiating UXO, and the subsequent risk of harm / damage during the envisaged works to as low as reasonably practicable (ALARP).

4.2 Risk Assessment Methodology

The following issues will be addressed in the report:

- The likelihood that the site was contaminated with unexploded ordnance.

- The likelihood that unexploded ordnance remains on site.
- The likelihood that ordnance may be encountered during any intrusive works.
- The risk that ordnance may be initiated.
- The consequences of initiating or encountering ordnance.

Risk mitigation measures, appropriate to the assessed level of risk and site conditions, will be recommended.

4.3 Approach

In preparing this Unexploded Ordnance Risk assessment, SafeLane Global has considered general and, as far as possible, site specific factors including:

- Evidence of German bombing and delivery of UXBs.
- Site history, occupancy and conditions during WWII.
- The legacy of Allied military activity.
- Details of any known EOD clearance activity.
- The extent of any post war redevelopment.
- Scope of the current proposed works.

4.4 Sources of Information

SafeLane Global has carried out detailed historical research for this Unexploded Ordnance Risk Assessment including accessing military records and archived material held in the public domain and in the MoD.

Material from the following sources has been consulted:

- The National Archives.
- RAF Aerial Collection.
- Groundsure Limited.
- Landmark Maps.
- Relevant information supplied by the client.
- Available material from 33 Engineer Regiment (EOD) Archive.
- SafeLane Global's extensive archives built up over many years of research and hands-on Explosive Ordnance Disposal activities in the UK.
- Open sources such as published books, local historical records and the internet.

4.5 Reliability of Historical Records

4.5.1 General Considerations

This report is based upon research of historical evidence. Whilst every effort has been made to locate all relevant material SafeLane Global cannot be held responsible for any changes to the assessed level of risk or risk mitigation measures based on documentation or other information that may come to light at a later date.

The accuracy and comprehensiveness of wartime records is frequently difficult or impossible to verify. As a result, conclusions as to the exact location, quantity and nature of the ordnance risk can never be definitive but must be based on the accumulation and careful analysis of all accessible evidence. SafeLane Global cannot be held responsible for inaccuracies or gaps in the available historical information.

4.5.2 Bombing Records

During WWII, considerable efforts were expended in recording enemy air raids. Air Raid Precautions (ARP) wardens were responsible for making records of bomb strikes either through direct observation or by post-raid surveys. However, their immediate priority was to deal with casualties and limit damage, so it is to be expected that records are often incomplete and sometimes contradictory. Record keeping in the early days of bombing was not comprehensive and details of bombing in the early part of the war were sometimes destroyed in subsequent attacks. Some reports may cover a single attack, others a period of months or the entire war.

Records of raids that took place on sparsely or uninhabited areas were often based upon third party or hearsay information and are not always reliable; records of attacks on military or strategic targets were often maintained separately from the general records and have not always survived.

5 The Site and Scope of Proposed Works

Site Address	Leiston Road, Sternfield, Suffolk IP17 1TG	
OS National Grid Reference	TM 39343 62967	
Site Description	The site is irregular in shape, located between Friston and Saxmundham. The study area comprises agricultural, open fields. Access to the site is gained through Liston Road which runs adjacent to the site's northern boundary. An additional section of land (highlighted in blue) is present to the north of the site. This section largely comprises open ground, overlapping onto Priors Grange in the west.	
Proposed Works	Ground investigation will comprise boreholes to a depth of between 15 and 35m bgl and trial pits to max. 4m depth.	
References	**Site Location Maps**	**Annex A**
	Recent Aerial Photograph	**Annex B**

6 Ground Conditions

Data Source		Description
British Geological Survey Borehole	Borehole Reference	TM46SW3
	Location	Highhouse Farm, approximately 110m north of the site.
	Date	Unknown.
	Recorded Shallow Geology	• 0.30m SOIL. • 27.13m blue CLAY. • 12.19m brown SAND.
British Geological Survey Mapping	Superficial Deposits	Superficial deposit types vary across the site. A map detailing these areas is presented in **Annex C**. • Lowestoft Formation – Diamiction. • Lowestoft Formation – Sand and Gravel. • Lowestoft Formation – Clay and Silt. • Alluvium – Clay, Silt, Sand, and Gravel.
	Bedrock	Crag Group – Sand.

7 Pre and Post-WWII OS Mapping

7.1 Area Observations

An area reference map can be found in **Annex D**.

	Date	Area 1: Observations	Reference	Source
Pre-WWII	1927	• Area 1 is occupied predominantly by open ground. • Two structures, listed on mapping as a *Miniature Rifle Range* are present approximately 80m west to the revised site area. • In addition, a railway line runs adjacent to the western extent of the site. • *Glebe Barn* is located within the revised section of the site. • A pond is present within one of the fields on site.	Annex E-1	Landmark Maps
Post-WWII	1971	• The rifle range buildings to the west of the site have been cleared. • In addition, *Glebe Barn* has been cleared by this time.		Landmark Maps

	Date	Area 2: Observations	Reference	Source
Pre-WWII	1927	• Area 2 is occupied predominantly by open ground. • An area of woodland is demarcated in Area 2's eastern extent. • A pond is present within one of the fields.	Annex E-2	Groundsure Ltd
Post-WWII	1970	• The woodland appears to have been cleared in this period, along with most field boundaries and the pond. • *Glebe Barn* has been cleared by this time.		Groundsure Ltd

	Date	Area 3: Observations	Reference	Source
Pre-WWII	1927	• Area 3 is occupied predominantly by open ground. • *Great Wood* is labelled in the western extent of the site.	Annex E-3	Groundsure Ltd
Post-WWII	1970	• The site appears consistent with the conditions highlighted in historical pre-war mapping. • The *Great Wood* has been cleared; however, some areas of vegetation can be identified in the south-western extent.		Groundsure Ltd

	Date	Area 4: Observations	Reference	Source
Pre-WWII	1927	• Area 4 is largely comprised of agricultural fields. • *Wood Farm* can be identified within close proximity to the site. • Dense vegetation runs adjacent to the site's western boundary.	Annex E-4	Groundsure Ltd
Post-WWII	1970	• The site appears consistent with the conditions highlighted in historical pre-war mapping. • A small area of clearance can be identified in the southern extent of the site. • Redevelopment is evident to the *Wood Farm* buildings, as well as to ancillary buildings to *Hurls Hall*.		Groundsure Ltd

	Date	Area 5: Observations	Reference	Source
Pre-WWII	1927	• Area 5 of the site is largely comprised of a woodland area, demarcated *Harris' Belt*.	Annex E-5	Groundsure Ltd
Post-WWII	1970	No data.		Groundsure Ltd

	Date	Area 6: Observations	Reference	Source
Pre-WWII	1927	• Area 6 of the site is largely comprised of open ground. • A section towards the south of this area comprises various features, identified on the mapping as embankments or ditches, rough pasture and a possible drain.	Annex E-6	Groundsure Ltd
Post-WWII	1970	No data.		Groundsure Ltd

	Date	Area 7: Observations	Reference	Source
Pre-WWII	1927	• Area 7 of the site comprises open ground with some mature trees. • A river / stream runs across the site in a south to north orientation. A *Footbridge* is identified to the north of the site boundary. • A drain runs parallel to this, also crossing the site. • Towards the south, *Bigsby's Corner* is demarcated.	Annex E-7	Groundsure Ltd
Post-WWII	1970	• No changes can be identified within the site boundary, aside from the potential removal of the formerly identified trees. • Clearance of some structures can be identified in *Bigsby's Corner*.		Groundsure Ltd

	Date	Area 8: Observations	Reference	Source
Pre-WWII	1927	• Area 8 is occupied by open ground. • Dense vegetation occupies the northern extent of the site, likely associated with *Bloomsfield's Covert*. • A small feature is visible in the site boundary, comprising mature vegetation and rough pasture.	Annex E-8	Groundsure Ltd
Post-WWII	1970	• The majority of the site appears to remain consistent with the conditions present in historical pre-war OS mapping.		Groundsure Ltd

		• However, the aforementioned demarcated feature has seemingly been removed. • A small area of clearance can be identified within Bloomsfield's Covent, approximately 70m south of the site.		

	Date	Area 9: Observations	Reference	Source
Pre-WWII	1927	• Area 9 appears to be primarily occupied by agricultural ground. • The *Long Belt*, an area of woodland is demarcated within the centre of the site, running adjacent to the boundary. A second wooded area, the *Nut Tree Belt,* encroaches on the south-eastern part of this area. • A pond can be identified in the south-eastern extent of the site.	Annex E-9	Groundsure Ltd
Post-WWII	1970	• Majority of the site appears to remain consistent with the conditions present in historical pre-war OS mapping. • Within the surrounding area, redevelopment can be identified to the *Hill Farm*, located approximately 200m to the south of the site.		Groundsure Ltd

	Date	Area 10: Observations	Reference	Source
Pre-WWII	1927	• Area 10 is occupied by areas of open ground, mainly agricultural, with rough pasture demarcated to the south. • An area of woodland, demarcated *Harris' Pit* is located within the north-eastern extent. • The eastern extent is bisected by an embanked road running from north to south.	Annex E-10	Groundsure Ltd
Post-WWII	1970	• No data was available for the north of this area. • Some further changes are demarcated on site, including the installation of a drain and a *Track,* in addition to some possible augmentation to the surrounding ground.		Groundsure Ltd

	Date	Area 11: Observations	Reference	Source
Pre-WWII	1927	• Area 11 appears to be occupied by areas of open ground, similar to the conditions shown in Area 9, with rough pasture / heath and agricultural ground. • *Clouting's* Farm is demarcated to the north and the village of *Fristonmoor* is highlighted to the south.	Annex E-11	Groundsure Ltd
Post-WWII	1970	• The site appears to remain consistent with the conditions present in historical pre-war OS mapping, although ground types are no longer demarcated here. • A small area of clearance is present on an ancillary building to the south of the site on *Moor Farm*. • A building on *Clouting's Farm* has seen some redevelopment.		Groundsure Ltd

	Date	Area 12: Observations	Reference	Source
Pre-WWII	1927	• Area 12 appears to be occupied by agricultural open ground. • A road bisects the centre of the study area. • A *drain* occupies the northern extent of the site. • *Burrell's Farm* is located to the north of the site.	Annex E-12	Groundsure Ltd
Post-WWII	1970	• The site appears to remain consistent with the conditions present in historical pre-war OS mapping. • Multiple structures associated with *Burrell's Farm* have been cleared.		Groundsure Ltd

	Date	Area 13: Observations	Reference	Source
Pre-WWII	1927	• Area 13 appears to be occupied by agricultural open ground. • The study area is located approximately 200m west to the village of *Knodishall*.	Annex E-13	Groundsure Ltd
Post-WWII	1970	• The site appears to remain consistent with the conditions present in historical pre-war OS mapping. • Two areas of clearance are present within the village, likely on ancillary buildings.		Groundsure Ltd

	Date	Area 14: Observations	Reference	Source
Pre-WWII	1927	• Area 14 comprises a small parcel of agricultural land. • A pond is present along the southern boundary. • *Fristonmoor Covert* is demarcated approximately 60m to the south of the site.	Annex E-14	Groundsure Ltd
Post-WWII	1970	• The site appears to remain consistent with the conditions present in historical pre-war OS mapping.		Groundsure Ltd

	Date	Area 15: Observations	Reference	Source
Pre-WWII	1927	• Area 15 is occupied predominately by agricultural land. • A pond is labelled in the north-eastern extent of the site.	Annex E-15	Groundsure Ltd
Post-WWII	1970	• The site appears to remain consistent with the conditions present in historical pre-war OS mapping. • Pylons have been erected approximately 80m east of the site.		Groundsure Ltd

	Date	Area 16: Observations	Reference	Source
Pre-WWII	1927	• Area 16 comprises a small parcel of land, comprising a road, likely hard-standing. • A farm is highlighted immediately adjacent to the east of the site.	Annex E-16	Groundsure Ltd
Post-WWII	1970	• The site appears to remain consistent with the conditions present in historical pre-war OS mapping. • Within the farm immediately adjacent, several small structures have been cleared. • Moreover, to the west, multiple buildings have been erected.		Groundsure Ltd

	Date	Area 17: Observations	Reference	Source
Pre-WWII	1927	• Area 17 is occupied predominately by agricultural land. • A demarcated *Footpath (FP)* crosses the south of the site, from west to east. • Two roads (or similar) cross the northern extent and centre of the site. • A farm is indicated to the west of the site.	Annex E-17	Groundsure Ltd
Post-WWII	1970	• The majority of the site appears to remain consistent with the conditions present in historical pre-war OS mapping. The road in the centre is now labelled as a *Track*. • The footpath is no longer demarcated on the mapping. • Evidence of clearance is present on *Manor Farm* to the west of the site.		Groundsure Ltd

	Date	Area 18: Observations	Reference	Source
Pre-WWII	1927	• Area 18 is occupied predominately by open ground. • The *Watch Walk Whin,* an area of rough pasture and woodland, is demarcated to the east of the site.	Annex E-18	Groundsure Ltd
Post-WWII	1970	• The site and surrounding area appear to remain consistent with the conditions present in historical pre-war OS mapping.		Groundsure Ltd

7.2 Additional Notes

The available post-WWII mapping was dated at least 25 years after the end of WWII. As such, changes to the project site may have occurred after WWII, unrelated to any wartime action.

Furthermore, a large proportion of the site was rural throughout WWII, and therefore damage from aerial bombing, as well as any defence-related features constructed during WWII, are unlikely to be visible on these available maps.

8 The Threat from Aerial Bombing

8.1 General Bombing History of Suffolk

8.1.1 First World War

London and Eastern England suffered aerial bombardment during WWI, beginning with indiscriminate night raids by Zeppelin airships. However as British defensive measures became more effective and aircraft development progressed, the German military switched to daylight raids by fixed-wing aircraft in June 1917.

Available bomb plot mapping indicates that at least one Zeppelin raid occurred directly over the general site area on 24th August 1916. Additionally, several aircraft crossed the Suffolk coast on their way to / from raids on London in October 1915. However, no recorded WWI bombs are confirmed to have fallen within the project site.

Furthermore, WWI bombs were generally smaller than those used in WWII and were dropped from a lower altitude, resulting in limited UXB penetration depths. Aerial bombing was often such a novelty at the time that it attracted public interest and even spectators to watch the raids in progress. For these reasons, there is a limited risk that UXBs passed undiscovered. When combined with the relative infrequency of attacks and an overall low bombing density the risk from WWI UXBs is considered low and will not be further addressed in this report.

8.1.2 Second World War

At the start of WWII, the Luftwaffe planned to destroy key military installations, including RAF airfields and Royal Navy bases, during a series of daylight bombing raids. After the Battle of Britain these tactics were modified to include both economic and industrial sites. Targets included dock facilities, railway infrastructure, power stations, weapon manufacturing plants and gas works. As a result of aircraft losses, daylight raids were reduced in favour of attacking targets under the cover of darkness.

Later in the war a number of Air stations, both British and American, became operational in East Anglia, including RAF Leiston (approximately 2.0km north-east of the site) and RAF Framlingham.

Airfields and radar stations such as RAF Leiston and RAF High Street would have been potential targets for the Luftwaffe and defensive measures were installed, including Light Anti-Aircraft guns, pill boxes, road blocks and air raid shelters. A Luftwaffe target identification photograph (not annexed) identifies RAF Leiston, to the north of the site, then under construction.

From mid-1944 the "V-weapon" (for Vengeance) campaign, using unmanned cruise missiles and rockets, represented Hitler's final attempt to reverse Germany's imminent defeat. The V1 (Flying Bomb or Doodlebug) and the V2 (Long Range Rocket) were launched from bases in Germany and occupied Europe. Totals of 2,419 V1s and 517 V2s were recorded in the London Civil Defence region.

Although these weapons caused considerable destruction, their relatively low numbers allowed accurate records of strikes to be maintained and these records have mostly survived. There is a negligible risk from unexploded V-weapons on land today since, even if an unexploded 1,000kg warhead had survived impact, the remains of the munition's body would have left incontrovertible evidence of the strike and would have been dealt with at the time.

8.2 Generic Types of WWII German Air-delivered Ordnance

The nature and characteristics of the ordnance used by the Luftwaffe allows an informed assessment of the hazards posed by any unexploded items that may remain today.

- HE Bombs: In terms of weight of ordnance dropped, HE bombs were the most frequent weapon deployed. Most bombs were 50kg, 250kg or 500kg (overall weight, about half of which was the high explosive) though large bombs of up to 2,000kg were also used. HE bombs had the weight, velocity and shape to easily penetrate the ground intact if they failed to explode. Post-raid surveys would not always have spotted the entry hole or other indications that a bomb penetrated the ground and failed to explode, and contemporary ARP documents describe the danger of assuming that damage, actually caused by a large UXB, was due to an exploded 50kg bomb. Unexploded HE bombs therefore present the greatest risk to present–day intrusive works.
- Blast Bombs/Parachute Mines: Blast bombs generally had a slow rate of descent and were extremely unlikely to have penetrated the ground. Non-retarded mines would have shattered on most ground types, if they had failed to explode. There have been extreme cases when these items have been found unexploded, but this was where the ground was either very soft or where standing water had reduced the impact. SafeLane Global does not consider there to be a significant risk from this type of munition on land.
- Large incendiary bombs: This type of bomb ranged in size from 36kg to 255kg and had a number of inflammable fill materials (including oil and white phosphorus), and a small explosive charge. They were designed to explode and burn close to the surface, but their shape and weight meant that they did have penetration capability. If they penetrated the ground, complete combustion did not always occur, and, in such cases, they remain a risk to intrusive works.
- 1kg Incendiary Bombs (IB): These bombs, which were jettisoned from air-dropped containers, were just over 30cm in size and therefore highly likely to go unnoticed. They had the potential to penetrate soft ground and left a very small entry hole. Furthermore, if bombs did not initiate and fell in water or dense vegetation or became mixed with rubble in bomb damaged areas, they could have remained hidden to this day. Some variants had explosive heads, and these present a risk of detonation during intrusive works, particularly due to their shape, which leads them to often be misidentified.

- Anti-personnel (AP) Bomblets: AP bombs had little ground penetration ability and should have been located by the post-raid survey unless they fell into water, dense vegetation or bomb rubble.
- Specialist Bombs (smoke, flare, etc): These types do not contain high explosive and therefore a detonation consequence is unlikely. They were not designed to penetrate the ground.

Examples of the most commonly deployed German bombs are presented in the *Ordnance Specifications and Information* appendices at the end of this document.

8.3 Second World War Bombing Statistics

The following table summarises the quantity of German bombs (excluding 1kg incendiaries and anti-personnel bombs) falling on the following administration areas covering the site between 1940 and 1945.

Record of German Ordnance Dropped	Rural District of Blyth	Urban District of Saxmundham
Area Acreage	98,184	1107
High Explosive Bombs (all types)	555	8
Parachute Mines	7	-
Oil Bombs	3	-
Phosphorus Bombs	12	-
Fire Pots	16	-
Pilotless Missile (V1)	14	-
Long Range Rocket (V2)	1	-
Total	608	8
Items Per 1,000 Acres	**6.2**	**7.2**

Source: Home Office Statistics

Detailed records of the quantity and locations of the 1kg incendiary and anti-personnel bombs were not routinely maintained by the authorities as they were frequently too numerous to record.

Although the incendiaries are not particularly significant in the risk they pose, they nevertheless are items of ordnance that were designed to cause damage and inflict injury and should not be overlooked in assessing the general risk to personnel and equipment. The anti-personnel bombs were used in much smaller quantities and are rarely found today but are potentially more dangerous. This table does not include UXO found during or after WWII.

8.4 Site Specific WWII Bombing Records

8.4.1 Original ARP Bombing Incident Records

Throughout WWII, records of bombing incidents were kept by the ARP and Civil Defence Office. These records were kept in the form of typed or hand-written notes and/or presented on bomb plot maps. Some other organisations, such as port authorities and railways, maintained separate records. ARP records covering the region the site is located in were sought out, none could be found in the timeframe of this report.

8.4.2 Home Office Intelligence Reports

The Home Office Intelligence reports document enemy action on British domestic soil and were prepared twice a day for the Home Security War Room. The summaries were prepared by intelligence staff, who compiled reports received from the twelve civil defence regions.

However, available records only document time and general location of attack and numbers of casualties. The intelligence officials generally only recorded locations on municipal level (town, village, or city), rarely providing specific addresses.

Date	Location	Details
8th/9th July 1940	Saxmundham	0 casualties.
19th/20th August 1940	Benhill, Saxmundham	0 casualties.
7th/8th September 1940	Saxmundham	0 casualties.
5th January 1941	Saxmundham	0 casualties.
13th/14th April 1941	Saxmundham	0 casualties
14th/15th May 1941	Saxmundham	0 casualties.
2nd August 1942	Saxmundham	0 casualties.
26th/27th August 1942	Saxmundham	0 casualties.
14th/15th March 1944	Saxmundham	0 casualties.

8.4.3 Secondary Source / Anecdotal Evidence

Anecdotal evidence of local bombing incidents was sought from publications and web resources. The following references to incidents on site or in the surrounding area were found.

Date	Weapon	Details
31/08/1940	Unspecified	Benhill, plotted approximately 750m south-west of the site.[1]
08/09/1940	Incendiary bombs	Blyth Rural District.[2] No exact location was specified.
20/09/1940	Parachute Mine	Blyth Rural District.[3] No exact location was specified.
22/09/1940	Parachute Mine	Blyth Rural District.[4] No exact location was specified.
05/11/1940	16 x HE bombs	Blyth Rural District.[5] No exact location was specified.
11/11/1940	10 x HE bombs	Blyth Rural District.[6] No exact location was specified.
24/11/1940	Unspecified	Friston, plotted approximately 1.1km south of the site.[7]
05/01/1941	Unspecified	Saxmundham, plotted approximately 800m west of the site.[8]
09/01/1941	4 x HE bombs	Blyth Rural District.[9]

[1] https://www.cambridge-news.co.uk/news/local-news/second-world-war-bombing-cambridge-20248474
[2] Bowyer, 1986
[3] Bowyer, 1986
[4] Bowyer, 1986
[5] Bowyer, 1986
[6] Bowyer, 1986
[7] https://www.cambridge-news.co.uk/news/local-news/second-world-war-bombing-cambridge-20248474
[8] https://www.cambridge-news.co.uk/news/local-news/second-world-war-bombing-cambridge-20248474
[9] Bowyer, 1986

8.4.4 WWII-era RAF Aerial Photography

The following WWII-era aerial photography was reviewed for the site:

Date	28th July 1946
Source	RAF Aerial Collection
Image Type	Aerial
Image quality	Low resolution and large scale. Partial coverage (parts of Areas 12, 13, 16 and 17).
Observations	• The site appears to remain consistent with the conditions shown in historical OS mapping. • The photography highlights the eastern extent of the site, it is predominately occupied by agricultural fields. • There does not appear to be any sign of ground disturbance or features indicative of bomb damage.
Reference	**Annex F**

8.4.5 Bombing Decoy Sites

A national decoy authority headed by Colonel John Fisher Turner was set up in July 1940, and following earlier experiments in Glasgow and Sheffield, a system of urban lighting decoys was set up. These were known as "Civil" sites; Civil 'QL' for urban lighting simulation, and Civil 'QF' for dummy fires. "Q" – sites were equipped with assorted electrical and pyrotechnical apparatus to simulate the flare given from furnace doors, steel-making, railway marshalling yards, and light given off by inefficient blackout precautions.

Other sites simulated small fires started by incendiary bombs, with oil-storage area fire simulation being developed near large oil installations. A further variation on fire decoy sites was the "SF", or "Special Fires" sites. A larger, longer-burning type of fire was provided at these sites - known as "Starfish" sites - to draw incendiary bombs, and hopefully as a consequence the full enemy payload, from falling on the larger conurbations and defence installations during heavy air raids. Decoy sites had a good level of success – airfield decoy sites across Britain for example had received 359 attacks by the end of 1941. The real airfields were bombed 358 times.

A bombing decoy site was established in close proximity to the site	✘

8.4.6 Abandoned Bombs

A post-air raid survey of buildings, facilities and installations would have included a search for evidence of bomb entry holes. If evidence was encountered, Bomb Disposal Officer teams would normally have been requested to attempt to locate, render safe and dispose of the bomb. Occasionally evidence of UXBs was discovered but due to a relatively benign position, access problems or a shortage of resources the UXB could not be exposed and rendered safe. Such an incident may have been recorded and noted as an Abandoned Bomb.

Given the inaccuracy of WWII records and the fact that these bombs were 'abandoned', their locations cannot be considered definitive, nor the lists exhaustive. The MoD states that 'action to make the devices safe would be taken only if it was thought they were unstable'. It should be noted that other than the 'officially' abandoned bombs, there will inevitably be UXBs that were never recorded.

SafeLane Global holds records of officially registered abandoned bombs at or near the site	✗

8.5 UXB Ground Penetration

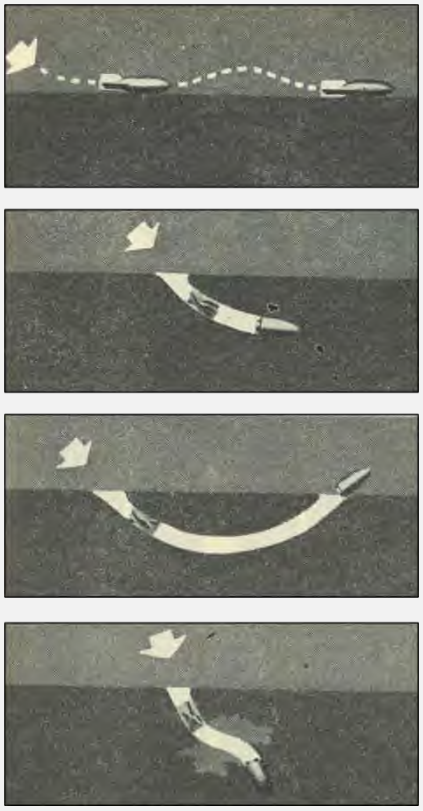
8.5.1 General Considerations

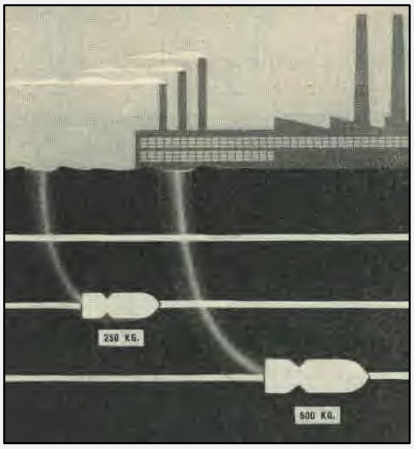
The actual penetration depth of aerial delivered bombs into the ground will have been determined by the mass and shape of the bomb, the velocity and angle of the bomb on impact (dependent on the height of release) and the nature of the ground and ground cover; the softer the ground, the greater the potential penetration. Peat, alluvium and soft clays are easier to penetrate than gravel and sand. Bombs are brought to rest or are commonly deflected by bedrock or large boulders.

8.5.2 The "j" Curve Effect

An air-dropped bomb released from normal bombing altitude (approx. 5,000m) on its curved trajectory can reach a terminal velocity of between 350-400 ms-1. In this case of high-level bombing, the angle of which the bomb enters the earth is approx. 15° from the perpendicular and its exact path is difficult to trace. The bomb is being driven by its kinetic energy can unless deflected, will continue its line of flight and can turn in an upwards curve towards the ground surface as it comes to rest. The upwards curve is caused by the transfer of energy as the bomb travels through the ground. The nose of the bomb travels slower than the rear of the bomb due to the drag/friction of it passing through the ground. The rear of the bomb, having more energy due to less drag/friction is travelling much quicker.

The location of the bomb is thus ''offset'' from the hole of entry. This ''offset'' from vertical is generally understood to be about one third of the penetration depth but can reach up to (and have been found at) 15m/50 ft from point of entry, dependent on ground conditions and the bomb's angle of impact. The figure below depicts the various paths of UXB through homogenous ground, showing how the J-curve effect can lead to a UXB coming to rest beneath undamaged buildings.





A UXB can come to rest beneath undamaged buildings due to the J-Curve effect if it lands in nearby soft ground.

Image source: Field Manual for Unexploded Bombs: Organisation and Operation For Disposal, United States War Department 1943

Left: Path of UXB in soft ground:

1. Ricochet resulting from low level attack: UXB stays perpendicular to ground and rests at surface.
2. Buried UXB with J-Curve: Bomb curves horizontally and rests perpendicular to surface.
3. UXB returning to surface due to J-Curve: Bomb points towards surface but may remain partially or completely below ground level.
4. UXB deflected by buried objects: Results in unpredictable path and unusual shift.

8.5.3 Second World War Bomb Penetration Studies

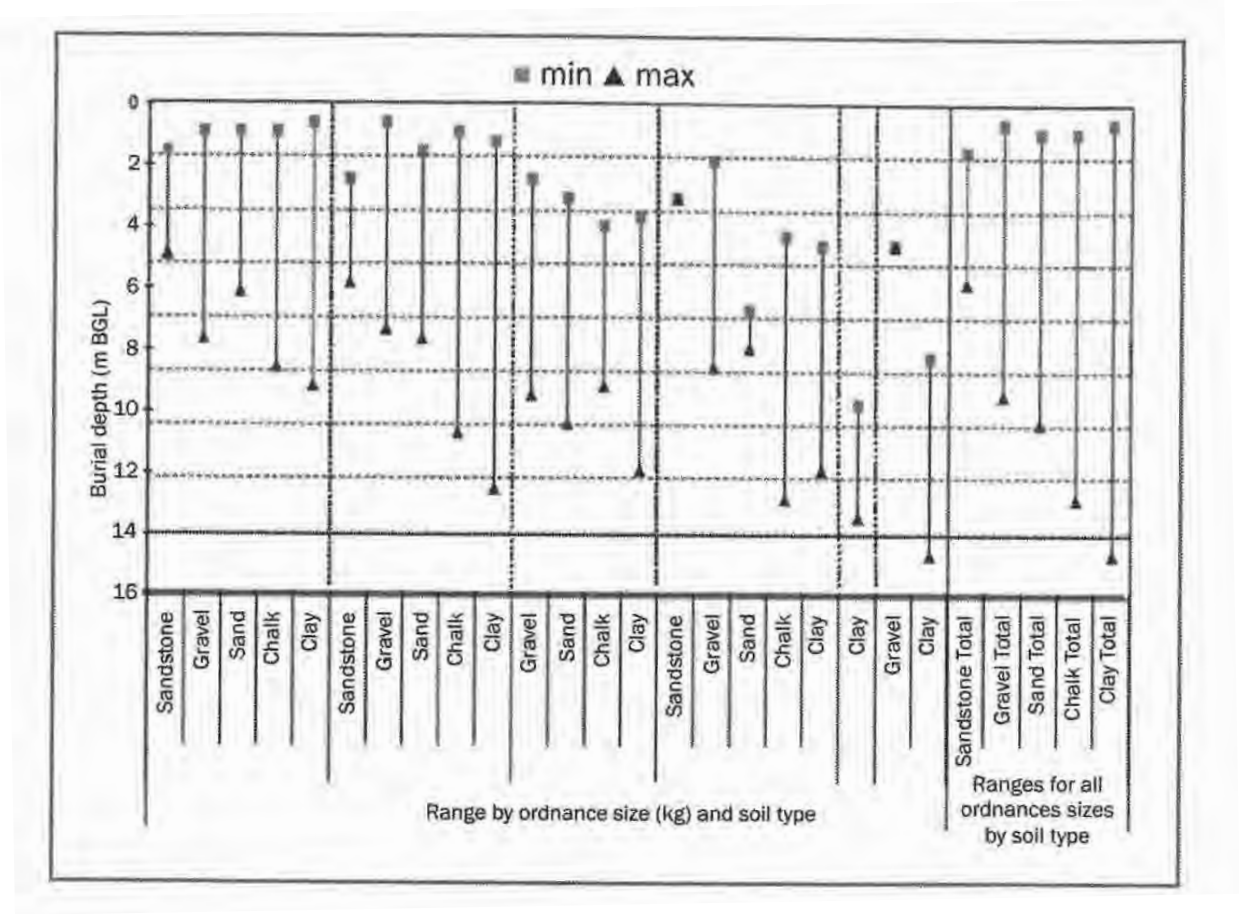
During WWII, the Ministry of Home Security undertook a major study on actual bomb penetration depths, carrying out statistical analysis on the measured depths of 1,328 bombs as reported by Bomb Disposal, mostly in the London area. They then came to conclusions as to the likely average and maximum depths of penetration of different sized bombs in different geological strata.

The median penetration of 430 x 50kg German bombs in London Clay was 4.6m and the maximum penetration observed for the SC50 bomb was 9m.

They concluded that the largest common German bomb, 500kg, had a likely penetration depth of 6m in sand or gravel but 8.7m in clay. The maximum observed depth for a 500kg bomb was 10.2m and for a 1,000kg bomb 12.7m. Theoretical calculations suggested that significantly greater penetration depths were probable.

8.5.4 CIRIA Bomb Penetration Depth Specifications

As stated within C681, the ground conditions at any individual site are likely to be highly variable and this results in a large range of burial depths for each different size bomb. The below chart shows the observed variation in burial depths of various sizes of air-delivered UXO for different ground conditions.



8.5.5 Site Specific Bomb Penetration Considerations

When considering an assessment of the bomb penetration at the site, the following parameters would be used:

- Geology – 0.30m of SOIL, >27.13m of CLAY, > 12.19m SAND.
- Impact Angle and Velocity – 80-90° from horizontal and 267 metres per second.
- Bomb Mass and Configuration – The 500kg SC (General Purpose) HE bomb, without retarder units or armour piercing nose. This was the largest of the common bombs used against Britain.

Taking into account the above-mentioned factors it has been assessed that a 500kg bomb would have had an approximate maximum bomb penetration depth of between 10-12m below WWII ground level. Penetration depth could potentially have been greater if the UXB was larger (though only 4% of German bombs used in WWII over Britain were of that size). Note that UXBs may be found at any depth between just below the WWII ground level and the maximum penetration depth.

8.6 Likelihood of Post-raid UXO Detection

Utilising the available historical bombing records as reviewed in Section 8.4, it is possible to make an assessment of the likelihood that evidence of UXO would have been noted on a site during the war and the incident dealt with or recorded at the time. Factors such as bombing density, frequency of access, ground cover, damage and failure rate have been taken into consideration.

8.6.1 Density of Bombing

Bombing density is an important consideration for assessing the possibility that UXBs remain in an area. A very high density of bombs will have increased the likelihood of errors in record keeping at the time, as civil defence personnel and emergency services may have been overwhelmed. A higher density of bombing also increases the number of UXBs actually occurring in a given area.

The type and specific location of recorded bomb strikes is also an important consideration. If a stick of bombs (one individual aircraft's bomb load) is plotted in line with a site or is shown to straddle a site, then this raises the possibility that an unrecorded UXB from the same stick struck that site.

8.6.2 Bomb Damage

In Blitzed cities / towns throughout Britain, bomb sites were often not cleared of rubble until after the war and mid-war repairs to buildings were only carried out on the most vital facilities (power stations, gas works, weapons factories etc.). However, if a building only sustained bomb damage to its upper floors, any subsequent UXB strike to the structure will still have caused obvious damage, at ground floor level, which would have been reported and dealt with at the time.

HE bomb strikes to open ground will have resulted in a large crater and local soil disturbance. Any subsequent UXB strike will not have resulted in an easily identifiable entry hole and as such is likely to have gone unnoticed amongst the disturbed ground.

In London and south-east England, the German V1 Flying Bomb and V2 Long Range Rocket campaigns caused widespread devastation. However, as these weapons began to be utilised after the final significant Luftwaffe air raids had occurred, any serious damage caused by such weapons does not necessarily indicate an increased risk of Luftwaffe freefall UXB contamination. However, it is quite possible that serious damage inflicted during the 1940-1944 campaigns by Luftwaffe freefall bombs could have been erased by a subsequent V Weapon strike.

8.6.3 Frequency of Access

A UXB strike at a site where human access was infrequent would have had a lower chance of being observed, reported and recorded compared to a site which was developed and subject to regular access. UXB strikes during night time raids (when German planes could more easily evade anti-aircraft defences) are also more likely to have fallen unobserved than ones dropped during a daylight attack.

In frequently bombed cities / towns, ARP Wardens were tasked with carrying out searches for UXBs within recently bombed residential areas and schools. Similarly, many important home front facilities (factories, gas works, power stations, docks etc.) had their own dedicated ARP teams or Fire Watchers tasked with observing local air raids. Fire Watchers were mainly responsible for extinguishing 1kg incendiary bombs as well as reporting any UXB strikes. Anecdotal evidence however indicates that Fire Watchers did not always turn up for their shifts and therefore such UXB mitigating activities should not be assumed in the absence of site-specific evidence. Less important buildings sustaining bomb damage would have been abandoned until after the German bombing campaign in that area had ceased and repairs could be made, greatly decreasing the level of access to that site.

Schools closed due to the evacuation of children were often requisitioned by the Civil Defence authorities to be utilised as night time First Aid posts and reception centres (providing emergency accommodation for bombed out civilians). Therefore, an increased level of access is likely at these locations.

8.6.4 Ground Cover

The entry hole of a 50kg UXB (the most commonly deployed German HE bomb) could have been as little as 20cm in diameter. Wartime records also confirm that small German Incendiary Bombs, weighing just 1kg, were capable of significant penetration into soil, resulting in very small entry holes (5cm) or complete burial.

The quantity and type of ground cover present on a site during WWII would have had a significant effect, at ground level, on the visual evidence of buried UXO.

Evidence of UXO could be obscured in dense vegetation, soft ground, rubble, railway ballast or amongst stockpiled material (such as aggregate, coal or refuse heaps). A UXB strike to waterlogged ground or open water would have been immediately obscured from view beneath the waterline. Had such an incident occurred within a tidal mudflat or river bank, the resulting entry hole will have remained only temporarily, before becoming in-filled by water and sediment. Any HE UXB strike to elevated risk ground cover could potentially have come to rest beneath neighbouring undamaged buildings or hard-standing due to the 'J-Curve' Effect.

UXB strikes to undamaged/superficially damaged buildings and hard-surfaced ground will still have caused substantial damage or an easily identifiable and persistent entry hole. Similarly, it is unlikely that an HE UXB entry hole on well-maintained / manicured lawns (tennis courts, bowling greens, golf course fairways / greens, gardens in affluent areas etc), would have been overlooked. Such incidents would have been reported and the UXB subsequently removed.

8.6.5 German Air-Delivered Ordnance Failure Rate

Based on empirical evidence, it is generally accepted that 10% of the German HE bombs dropped during WWII failed to explode as designed. This estimate is probably based on the statistics of wartime recovered UXBs and therefore will not have taken account of the unknown numbers of UXBs that were not recorded at the time and is probably an underestimate.

The reasons for failures include:

- Fuze or gaine malfunction due to manufacturing fault, sabotage (by forced labour) or faulty installation.
- Clockwork mechanism failure in delayed action bombs.
- Failure of the bomber aircraft to arm the bombs (charge the electrical condensers which supplied the energy to initiate the detonation sequence) due to human error or equipment defect.
- Jettison of the bomb before it was armed or from a very low altitude. Most likely if the bomber was under attack or crashing.

War Office Statistics document that a daily average of 84 bombs which failed to function were dropped on civilian targets in Great Britain between 21st September 1940 and 5th July 1941. 1 in 12 of these (probably mostly fitted with time delay fuzes) exploded sometime after they fell; the remainder were unintentional failures.

From 1940 to 1945 bomb disposal teams dealt with a total of 50,000 explosive items of 50kg and over (i.e. German bombs), 7,000 AAA shells and 300,000 beach mines. These operations resulted in the deaths of 394 officers and men. However, UXO is still regularly encountered across the UK.

Note, due to manufacturing fault or failure of the bomber crew to correctly arm their munitions, whole bomb loads often failed to detonate. Therefore, the presence of reported UXBs increases the likelihood of an additional unrecorded UXB in the vicinity.

8.7 Site Specific Threat from German Air-Delivered Ordnance

The following table will place the site in context with these factors, in order to assess the likelihood of post-raid UXO detection within the project site.

Likelihood of Post Raid UXO Detection on Site			
Site-Specific Factors			**Additional Comments**
Density of Bombing Assessment	Based on wartime records or secondary source information, what was the bombing density over the site?	Low	
	Was the site ever subjected to one or more large-scale (>100 tons of ordnance) night time Blitz raids?	✘	
	Were any HE bomb strikes recorded on site?	✘	Home Office statistics indicate that there were numerous raids over Saxmundham & the surrounding area. It is feasible that the site could have been affected during these raids.
	What is the distance between the site boundary and the closest recorded large bomb strike?	750m	
	How many HE, Parachute Mine, Oil Incendiary, Phosphorus Incendiary or Fire Pot bombs (large bombs) were recorded within a 300m radius of the site?	0	
	Were any nearby sticks of large bombs recorded in line with the site?	✘	
	Were any 1kg incendiary bomb showers recorded over the site?	✘	
Bomb Damage Assessment	A comparison of the historical records confirms that buildings within the site boundary sustained serious bomb damage.	✘	
	Direct or indirect evidence of HE bomb craters in open ground (within the site boundary) has been found.	✘	
	Buildings on site were seriously damaged by a V1 and / or V2 strike.	✘	

	Buildings on site could have been seriously damaged prior to the nearby V1 or V2 strike?	n/a	
Frequency of Access Assessment	The site was situated in a densely populated urban area during WWII and therefore would have been accessed at the outbreak of WWII.	✘	
	The site was exclusively or partially developed during WWII.	✓	The site was almost entirely undeveloped, aside from occasional farmland dwellings / structures. However, these features occupied a very small proportion of the whole project site.
	Buildings on site survived WWII intact and therefore likely remained inhabited or in use, suggesting these localities and their immediate environs were accessed throughout the war.	✓	
	The site was crossed by roads / pavements or footpaths which would have been regularly used / subject to daily footfall.	✓	
	The site was occupied by small residential back yards / gardens, likely to have been put to use for cultivation as a result of the government's Dig for Victory Campaign.	✘	
	The site was occupied by a school during WWII.	✘	
	Part of the site is likely to have been subject to post-raid searches for UXO.	✘	
	Buildings on site sustained serious bomb damage and as a result were likely abandoned (along with any associated gardens / open ground) for the remainder of the war.	✘	
	The site was occupied by peripheral open ground / wasteland, with no apparent use, which may have been neglected.	✓	Due to nature of the ground conditions present on site, it is feasible that a UXB could have remained undetected.
	The site may have been occupied by recreational land / sports fields which may have only experienced seasonal access.	✘	
	The site was occupied by a graveyard which would have experienced limited access.	✘	
	The site was occupied by agricultural land, rural countryside or woodland which would not have been accessed in full, either regularly or frequently.	✓	

	The site was occupied by railway sidings which may not have been as regularly checked for buckling as mainline railway tracks.	✖	
	The site was occupied by soft railway embankments which are likely to have been neglected during the war.	✖	
Ground Cover Assessment	The site was partially or entirely abandoned, due to bomb damage, resulting in associated open ground likely becoming overgrown.	✖	
	The site was occupied by dense, inaccessible vegetation during WWII.	✓	Some areas were occupied by woodland and other dense vegetation.
	The site may have been susceptible to waterlogged conditions during WWII.	✓	.
	The site was occupied by (possibly) unmaintained grass field during WWII.	✓	
	The site was part occupied by a canal, river, dock basin, lake or reservoir during WWII.	✖	Note, that drains and ponds were present within the site.
	The site was occupied by tidal mud or marshland during WWII.	✖	
	The site was occupied by railway tracks crossing soft ground during WWII.	✖	
	The site was occupied by stockpiled material during WWII.	✖	
	The site was occupied by buildings, hard-standing or other manmade structures that did not sustain any degree of bomb damage.	✓	These features occupied a very small proportion of the whole project site.
	A comparison of the historical records confirms that buildings on site sustained inconsequential minor / moderate damage.	✖	
	The site was occupied by well-maintained, manicured lawn during WWII.	✖	
	Undamaged, developed parts of the site would have been vulnerable to the J-Curve Effect.	✓	

Bomb Failure Rate Assessment	Evidence has been found which suggests that the bomb failure rate in the vicinity of the site would have been different from the "approximately 10%" figure normally used.	✗	

9 The Threat from Allied Military Ordnance

The following potential historical and modern sources of UXO contamination on site or in the surrounding area have been considered:

Potential Source of Contamination on Site	
Army, Navy and RAF Bases / Installations	✓
Military Training Areas / Weapons Ranges	✗
Ordnance / Explosives Factories and Storage Depots	✗
Sites Requisitioned for Military Use	✓
Sites Used or Occupied by the Home Guard	✓
Military Fortifications and Coastal Defences	✗
Locations of Army Explosive Ordnance Clearance Tasks	✗
WWII Anti-Aircraft Batteries	✓
WWII Pipe Mined Locations and Beach Minefields	✗

The risk of contamination from Allied UXO on site is discussed below.

9.1 Dunwich Heath Training Area

During WWII, Dunwich Heath (approximately 3.5km north-east of the site) was one of the most heavily defended parts of the Suffolk coastline with a radar station, coastal artillery battery and anti-invasion defences.

In May 1941, a coastal artillery battery was built on the cliffs at Dunwich comprising 2 x 6" guns and was operational for around 2 years. In order to protect this site, along with the radar station, Dunwich Heath was covered with infantry positions and defences. One spigot mortar emplacement still survives today, which was constructed along with other defences.

By 1944, the final defences to be constructed at Dunwich were "Diver" anti-aircraft batteries, which were tasked with defending from the threat of V1s.

In the early stages of the war, an important training ground was established, within which the north of the project site was located. The training area was used throughout the conflict, whereby hundreds of troops and tanks used the heath for live firing practice. It was particularly important in the lead up to D-Day. In 1943, it was used for the exercise 'Kruschen' which was one of the first exercises to trial the specialised equipment that would be needed to break the concrete defences for the German Atlantic Wall.

9.2 RAF Leiston

RAF Leiston (approximately 2km north-east of the site) was built as a fighter station for RAF Fighter Command, its location approximately 5km from the North Sea coast meant it was ideal as a base for fighters.[10] In 1942, the airfield was designated to the Eighth Air Force of the USAAF, where it was operational until October 1945. During Leiston's occupation history, it was occupied by the 357th Fighter Group, 50th Service Group, 358th Fighter Group, 362nd Fighter Squadron, 363rd Fighter Squadron, 364th Fighter Squadron, and the 469th Service Squadron.[11]

9.3 Home Guard Activity

The Home Guard (HG) was a defence organisation of the British Army, operational between 1940 and 1944. It comprised 1.5 million local volunteers, otherwise ineligible for military service and acted as a secondary defence force in case of enemy invasion. The HG guarded the coastal areas of Britain and other important facilities such as airfields, factories and explosives stores. They were also active in county towns and cities.

Official records were rarely kept by the HG and therefore any present-day evidence is usually anecdotal. However, it is known that HG personnel often carried out training (including weapons training) in open countryside on the outskirts of cities / towns. Today, items of ordnance related to the HG are occasionally encountered by members of the public and the construction industry in the British countryside. This suggests a culture of ill-discipline regarding live ammunition within HG units.

HG personnel are known to have purposefully buried caches of ammunition and weapons in tactical positions, to be exhumed and used in case of invasion. Records of such caches were not rigorously kept, and some were therefore forgotten about. This is substantiated by several HG UXO finds over recent years. The below table shows just a handful of examples:[12]

[10] https://www.americanairmuseum.com/place/212
[11] https://www.americanairmuseum.com/place/212
[12] Various News Sources

Home Guard UXO Finds:	
	Unexploded Spigot Mortar Round, used by the Home Guard in WWII, found and disposed of in Hayle, Cornwall – January 2021
	24 x WWII grenades found buried in a field in Sibton, Suffolk – May 2019
	A cache of 80 phosphorous grenades buried by the Home Guard found in Eastbourne – September 2015
	Home Guard Phosphorous Grenades found buried beneath a bridge in Herne Bay – July 2015

9.4 Anti-Aircraft Gun Batteries

At the start of the war two types of AAA guns were deployed: Heavy Anti-Aircraft Artillery (HAA) and Light Anti-Aircraft Artillery (LAA). The LAA batteries were intended to engage fast low flying aircraft and were typically deployed around airfields or strategic installations. These batteries were mobile and could be moved to new positions with relative ease when required. With four guns per battery firing several rounds per minute, AA batteries could expel numerous shells in even the shortest engagements. Numerous unexploded AAA shells were recovered during and following WWII and are still occasionally encountered on sites today.

The maximum ceiling height of fire at that time was around 11,000m however, as the war progressed, improved variants of the 3.7" gun were introduced and, from 1942, large 5.25-inch weapons were brought into service. These had significantly improved ceiling heights of fire reaching over 18,000m.

When the supply of clockwork fuses from Switzerland was cut off, Britain was forced to make its own. After four years of war, the country still lacked the engineering skills to produce a reliable fuse. This resulted in a considerable number of AA projectiles exploding prematurely, killing the gunners or failing to explode at all and falling to the ground as UXBs. In January 1944, more people in London were killed by HAA shells than by German bombs.

9.5 Generic Types of WWII British / Allied Unexploded Ordnance

9.5.1 Land Service Ammunition (LSA)

9.5.1.1 General

The term Land Service Ammunition covers all items of ordnance that are propelled, placed or thrown during land warfare. They may be filled or charged with explosives, smoke, incendiary or pyrotechnics. They can be broken into five main groups:

a. Mortars

b. Grenades

c. Projectiles

d. Rockets

e. Landmines

Unexploded or partially unexploded Mortars and Grenades are among the most common items of UXO encountered in the UK. They are commonly encountered in areas used by the military for training and are often found discarded on or near historic military bases.

Examples of the most commonly used British / Allied Land Service Ammunition types are presented in the *Ordnance Specifications and Information* appendices, at the end of this document.

9.5.1.2 Mortars

A mortar bomb is a fin-stabilised munition, normally nose-fuzed and fitted with its own propelling charge (primary cartridge). Range is increased by adding extra propellant (augmenting charges). They are either HE or Carrier and generally identified by their tear-dropped shape (older variants however are parallel sided) and a finned 'spigot tube' screwed or welded to the rear end of the body housing the propellant charge.

A mortar relies on a striker hitting a detonator for explosion to occur. It is possible that the striker may already be in contact with the detonator and that only a slight increase in pressure would be required for initiation. Discarded augmenting charges are often encountered around mortar firing areas/bases.

9.5.1.3 Grenades

A grenade is a short-range weapon which may be thrown by hand, fired from the end of a rifle or projected/propelled from a special purpose grenade launcher. They are divided into two categories; HE and Carrier (generally smoke). As with mortars, a grenade striker may either be in contact with the detonator or still be retained by a spring under tension, and therefore shock may cause it to function. A grenade can have an explosive range of 15-20m. Common older variants have a classic 'pineapple' shape; modern grenades tend to be smooth-sided.

9.5.2 Small Arms Ammunition (SAA)

The most likely type of ordnance to be encountered on site are items of SAA (bullets), especially .303" ammunition which was the standard British and Commonwealth military cartridge from 1889 until the 1950s.

However even if an item such as this functioned, the explosion would not be contained within a barrel and detonation would only result in local overpressure and very minor fragmentation from the cartridge case.

Some LAA guns and RAF fighter cannons in use with British forces during WWII utilised the 20mm round. These bullets had a small fuse and a ~4gram HE or incendiary charge. Although small, this fill quantity still has the potential to cause serious injury.

Examples of the most commonly used British / Allied Small Arms Ammunition types are presented in the *Ordnance Specifications and Information* appendices, at the end of this document.

9.5.3 Anti-Aircraft Shells

At the start of the war two types of AAA guns were deployed: Heavy Anti-Aircraft Artillery (HAA) using large calibre weapons such as the 3.7" QF (Quick Firing) gun and Light Anti-Aircraft Artillery (LAA) using smaller calibre weapons such as 40mm Bofors gun which could fire up to 120 x 40mm HE shells per minute to over 1,800m. During the early war period there was a severe shortage of AAA so older WWI 3" and modified naval 4.5" guns were also deployed.

These shells are frequently mistakenly identified as small German air-delivered bombs but are differentiated by the copper driving band found in front of the base. Although the larger unexploded projectiles could enter the ground, they did not have great penetration ability and are therefore likely to be found close to WWII ground level. With a HE fill and fragmentation hazard these items of UXO also present a significant risk if encountered.

The smaller 40mm projectiles are similar in appearance and effect to small arms ammunition and, although still dangerous, present a lower risk. Details of the most commonly deployed WWII AAA projectiles are shown below:

Gun type	Calibre	Shell Dimensions	Shell Weight	HE Fill Weight
3.7 Inch	94mm	94mm x 438mm	12.7kg	1.1kg
4.5 Inch	114mm	114mm x 578mm	24.7kg	1.7kg
40mm	40mm	40mm x 311mm	0.84kg	70g

Examples of the most commonly used British / Allied Anti-Aircraft Ammunition types are presented in the *Ordnance Specifications and Information* appendices, at the end of this document.

9.6 Site-Specific Threat from Allied Military Ordnance

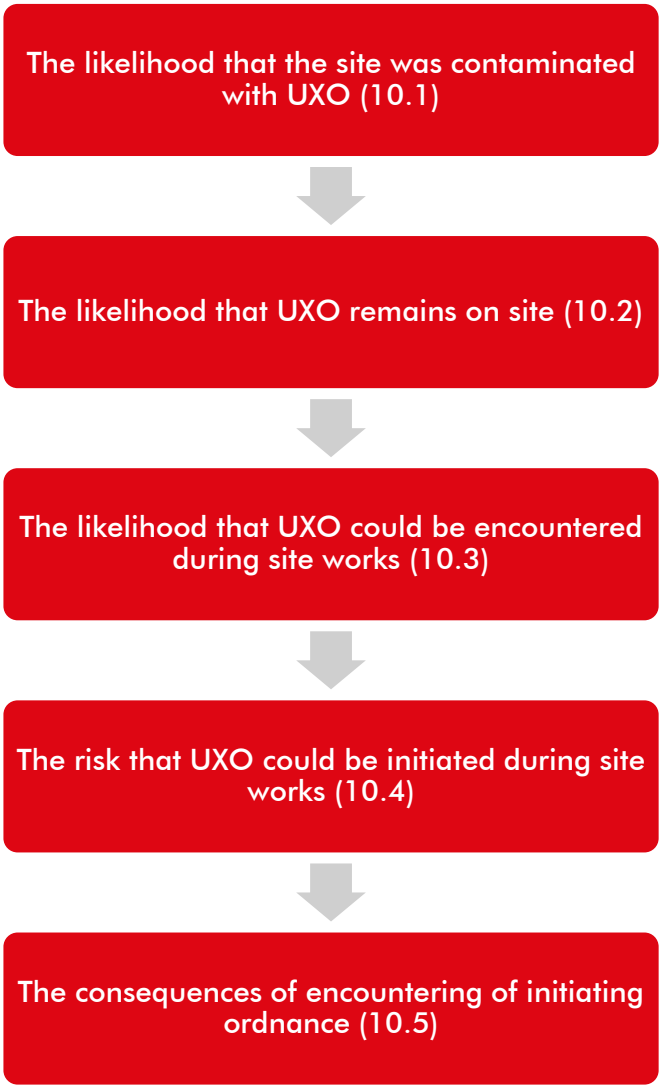
The following table identifies the potential threat to the site of contamination from British / Allied UXO.

Potential Source	Details
Military Activity on site	RAF Leiston: • Past experience has shown that contamination commonly occurred at WWII airfields, notably around munitions stores or areas such as dispersal pans where ordnance was loaded on and off aircraft. It also resulted from the deliberate disposal of damaged or unwanted ordnance which typically was burnt or buried in more remote areas. • Due to the distance from the site to the airfield, it is unlikely the site will have been contaminated from such activity. Dunwich Training Area: • A training range was located at Dunwich, with the firing arc facing east into the sea. As such, it is not likely that these particular ranges will have fired towards the site.
Home Guard Activity on site	• The closest Home Guard battalion to the site was the 8th Suffolk Battalion – Saxmundham. • An Auxiliary Operational Base was located approximately 2.7km north-west of the site, it is possible this was used as a headquarters for the Home Guard during WWII. • It is likely that the local training areas were utilised for Home Guard training exercises. • Typically, HG soldiers would take part in training exercises in areas occupied by open countryside, the conditions within the site would prove to be an opportunistic place for such activity. • An UX shell was discovered in Saxmundham 420m west of the site, this indicates that the Home Guard were active within the area. Home Guard are known to have purposefully buried ammunition in tactical locations. • An example of the Saxmundham Home Guard carrying out an exercise can be seen below, note, the exercise appears to have taken place in dense vegetation as well as with live ammunition. • The significant concentration of anti-invasion defences along the coastline and within the general project site area means Home Guard presence and activity is likely to have been significant.

	 *Source: https://ww2db.com/image.php?image_id=23262*
Defensive features within the vicinity	• 2 defensive features are located within close proximity to the site, a nodal point approximately 560m from the site, and a pillbox approximately 1.1km from the revised section of the site. The presence of a nodal point also implies the existence of various defensive features. • A cluster of pillboxes were located to the south of Friston, approximately 1.7km to the south of the site. • It is possible that additional defensive features could be found around the RAF base and the surrounding countryside, however this cannot be corroborated.
Threat to the site from unexploded AA shells	• At least 10 possible batteries have been identified towards the east of the site around Sizewell, including Heavy AA and Diver AA Batteries. One permanent battery is recorded 4.9km to the east. • However, it is likely that additional, temporary AA batteries will have been active in the area. For example, RAF airfields were often protected by anti-aircraft batteries, RAF Leiston was located 2km to the north-east and RAF Framlingham was located 4.7km west. • During WWII there was a lot of German air traffic over East Anglia, as such, the batteries would have been firing consistently throughout the war. • Had a UX AA landed on the open ground or dense / soft vegetation on site, it is possible that it would have remained undetected.

10 The Overall Unexploded Ordnance Risk Assessment Methodology

Taking into account the quality of the historical evidence, the assessment of the overall risk to any intrusive works from UXO must evaluate the following factors:



Each of these steps will be evaluated in the following sections in order to conclude the total risk from UXO to the proposed works to be undertaken within the project site.

10.1 The Likelihood that the Site was Contaminated with Unexploded Ordnance

10.1.1 General

The below is a generalised table of factors used to determine the likelihood that the site was contaminated with unexploded ordnance. Note that additional site-specific information can adjust UXO risk beyond these criteria:

Low Likelihood	Medium Likelihood	High Likelihood
German Air-Delivered Ordnance / Allied Anti-Aircraft Shells		
No evidence of bombing / bomb damage on site coupled with low local bombing density.	Moderate to High local bombing density or evidence of bombing / bomb damage on or close to the site.	High local bombing density or evidence of bombing /bomb damage on or adjacent to the site. Confirmed finds of WWII UXB.
Ground conditions that would prevent UXB penetration or lead to easily identifiable entry holes.	Ground conditions that allow for bomb penetration.	Ground conditions that would have immediately and completely obscured the existence of UXB.
Site was occupied and accessed fully throughout the bombing campaign.	Site located in an area that was infrequently observed or accessed, with a low likelihood that a UXB strike would have been noticed.	Site may be completely obscured from view or subject to very infrequent access.
British / Allied Ordnance		
No evidence of Allied military activity on or near the site. Or Military sites which have been cleared / redeveloped since their use Or Military-owned sites which have not been used for training with live munitions.	Clear evidence of military training activity on site involving live ammunition / munitions. Military sites which have not undergone clearance operations or redevelopment since use. Evidence of weapons storage on site.	Evidence of weapons testing or disposal on or adjacent to the site.
Developed areas that are unlikely to have been used for military exercises.	Open or unmaintained ground that may have been used for disposal or caching of munitions.	Evidence of UXO finds on or in the vicinity of the site.

The following sections assess the likelihood of contamination from German UXO and British / Allied UXO, based on the evidence discussed in the previous sections.

10.1.2 Likelihood of Contamination from German UXO

The following table discusses the overall likelihood of contamination from German UXO, based on the evidence discussed in Section 8.

Overview of the Potential Sources of German Air-Delivered UXO	
Bombing density	• Low bombing density. • The closest recorded strike was 750m west of the site. • However, Home Office Statistics indicate that there were multiple raids over Saxmundham and other villages in the local area during WWII. • Comprehensive bombing records and clear locations of bomb strikes are less likely to have been recorded in rural / agricultural areas. It is unlikely that the site was subject to stringent and detailed bombing records at the time.
Bomb Damage	• No direct evidence of bomb damage can be found on the site. • Cleared structures within the revised site area unlikely to be attributed to bomb damage. • However, the available historical sources and aerial photography only covered a small proportion of the site. • Damage is not likely to have been recorded within rural or agricultural areas to the same degree as an urban or developed area.
Ground Conditions	• Agricultural land occupied majority of the site. • There are areas of denser, wooded vegetation. • Small ponds and drains are also featured throughout the site. • The ground conditions within the majority of the site mean a UXB landing on site is unlikely to have been identified.
Frequency of Access	• Seasonal access to agricultural land. • Areas of woodland and more dense vegetation unlikely to be frequently accessed. • Taking into consideration the level of access to the site, had a UXB landed within much of the site, it is likely to have remained undetected.
J-Curve Effect	• Had any UXB landed within the soft ground on site, it could have come to rest up to 15m away from its original entry point, potentially even beneath adjacent undamaged buildings.
Other considerations	n/a
Overall Likelihood of Contamination	**Medium**

10.1.3 Likelihood of Contamination from British / Allied UXO

The following table discusses the overall likelihood of contamination from British / Allied UXO, based on the evidence discussed in Section 9.

Overview of the Potential Sources of British / Allied UXO	
Land Service Ammunition / Small Arms Ammunition	• RAF Leiston and the Dunwich Training Area indicate an increased military presence within the general site location. • A concentration of defensive features is located within close proximity to the site, including a nodal point approximately 560m from the site, and a pillbox approximately 1.1km from the revised section of the site. • An UX shell was discovered approximately 420m west of the site. • Despite the increased Home Guard and military activity in the area, no evidence has been found to suggest that the site formerly had any British / Allied military occupation or usage that could have led to contamination with items of UXO. • Although the possibility is considered to be unlikely, it can never be entirely discounted.
Anti-Aircraft Projectiles	• At least 10 possible batteries have been identified towards the east of the site around Sizewell, including Heavy AA and Diver AA Batteries. One permanent battery is recorded 4.9km to the east. • However, it is likely that additional, temporary AA batteries will have been active in the area, especially due to the proximity of two RAF airfields. • Had a UX AA landed on the open ground or dense / soft vegetation on site, it is possible that it would have remained undetected. • There was likely to have been a lot of German air traffic over the site, as such, the batteries would have been firing consistently throughout the war.
Overall Likelihood of Contamination	**Medium**

10.2 The Likelihood that Unexploded Ordnance Remains on Site

10.2.1 General

The extent to which any ordnance clearance activities have taken place on site or extensive ground works have occurred is relevant since they may indicate previous ordnance contamination but also may have reduced the risk that ordnance remains undiscovered.

10.2.2 EOD Bomb Disposal and Clearance Tasks

SafeLane Global holds a number of official records of explosive ordnance disposal operations during and following WWII, obtained from the Explosive Ordnance Disposal (EOD) Archive Information Office at 33 Engineer Regiment (EOD), British Army.

Potential Source	Details
Records of Army EOD tasks having taken place on site or in the vicinity	7th August 1992 - EOC Task at Wayside Breakers Yard recovered 1,187 items of expended ordnance, approximately 3.5km west. 15th March 2002- EOC Task at Carlton Hall recovered several items of UXO, including reports of AA rounds uncovered by digger and multiple .303 rounds. Located approximately 890m north-west of the site's revised section.
Local ordnance finds	15th February 2011 – An unexploded shell was discovered on Church Street, approximately 500m west of the site.
Local tasks undertaken by SafeLane Global	None

10.2.3 Post War Redevelopment

The nature of post-WWII ground works, redevelopment and construction has been considered. Significant structural redevelopment on site can, in some cases, provide a level of mitigation, particularly from shallow buried items. However, if a site has not undergone any extent of redevelopment, the likelihood of UXO remaining within its boundaries can remain.

The site has been redeveloped post-WWII	✓
Further Details	Some farm structures within the site have likely been redeveloped, but, since majority of the site was undeveloped agricultural land, it is likely these sections will not have been redeveloped. The remainder of the site is likely to have been subject only to shallow ground works & agricultural works.

10.2.4 Site-Specific Analysis

The following table discusses the likelihood that UXO could remain on site, following any post-WWII activity.

Mitigating factors during post-WWII period	Aside from shallow agricultural or maintenance works on site, as well as likely redevelopment to existing farm buildings, the site is not known to have undergone any significant redevelopment.
Further comments	Within the footprints of the post-war redevelopment / ground works, the risk of shallow buried UXO (especially small arms or land service ammunition) remaining will have been partially mitigated since any such items could have been encountered and removed during soil stripping and levelling. Only within the volume of any post-war basement level bulk excavations and at the precise locations of any post-war pile foundations / boreholes, will the risk from deeper buried German HE UXBs have been completely mitigated. At any location on site where no bulk excavations have been carried out, the risk from deep buried UXO remains unmitigated to the maximum bomb penetration depth.

10.3 The Likelihood that Ordnance may be Encountered during the Works

The following table discusses the likelihood that UXO could be encountered on site during the proposed works.

At-Risk Scenarios	The most likely scenarios under which a UXO could be encountered during construction works is during piling, drilling operations or bulk excavations for basement levels. The overall risk will depend on the extent of the works, such as the numbers of boreholes/piles (if required) and the volume of the excavations. Since an air-dropped bomb may come to rest at any depth between just below ground level and its approximate penetration depth there is also a chance that such an item could be encountered during shallow excavations (for services or site investigations) into the original WWII ground level. If the proposed works are due to be undertaken within post war fill material / made ground, the risk of encountering WWII UXBs is low. However, if works are to be undertaken below WWII ground level this risk is significantly higher.
Likelihood of UXO being encountered during the proposed works	Proposed works are expected to include piling and excavation works. As such, it is possible that any remaining UXO could be encountered during these works.

10.4 The Risk that Ordnance may be Initiated

Items of ordnance do not become inert or lose their effectiveness with age. Time can indeed cause items to become more sensitive and less stable. This applies equally to items submerged in water or embedded in silts, clays or similar materials. The greatest risk occurs when an item of ordnance is struck or interfered with. This is likely to occur when mechanical equipment is used or when unqualified personnel pick up munitions.

10.4.1 Initiation of Unexploded Bombs

In the case of unexploded German bombs discovered within the construction site environment, there are a number of potential initiation mechanisms:

Direct Impact onto the main body of the bomb	Unless the fuze or fuze pocket is struck, there needs to be a significant impact to initiate a buried iron bomb.
Re-starting the clock timer in the fuze	Only a small proportion of German WWII bombs employed clockwork fuzes. It is probable that significant corrosion has taken place within the fuze since the end of WWII that would prevent clockwork mechanisms from functioning, nevertheless it was reported that the fuze in a UXB dealt with by 33 EOD Regiment in Surrey in 2002 did recommence.
Induction of a static charge, causing a current in an electric fuze	The majority of German WWII bombs employed electric fuzes. It is probable that significant corrosion has taken place within the fuze mechanism since the end of WWII such that the fuze circuit could not be activated.
Friction impact initiating the (shock-sensitive) fuze explosive	This is the most likely scenario resulting in the bomb detonating.

10.4.2 Activities that may Result in the Initiation of Unexploded Ordnance

Unexploded bombs do not spontaneously explode. All high explosive requires significant energy to create the conditions for detonation to occur. The risk that UXO could be initiated if encountered will depend on its condition, how it is found and the energy with which it is struck. However certain activities pose a greater risk than others.

Percussive piling or deep mechanical excavations	The most violent activity on most construction sites is percussive piling or deep mechanical excavations. If an item is struck with a significant enough impact, be it direct or through friction/vibration, it risks detonation.
Shallow excavation	Soil levelling and shallow excavation such as trial pits can pose a similar risk to deeper excavations, since UXO can be found at any depth between ground level and the maximum bomb penetration depth. In addition to risk of initiation by violent impact or vibration, detonation can also occur if discovered items are mishandled by unqualified personnel. This is particularly common when onsite personnel are not trained in the recognition of ordnance.
Non-intrusive works	In the case of non-intrusive planned works, little risk is posed by items of UXO that are buried beneath the ground. However, risk can arise from unburied munitions, particularly items of ordnance discarded in periphery areas of military sites. These items are frequently discovered by onsite personnel and remain live and liable to activate if mishandled.

10.5 The Consequences of Encountering or Initiating Ordnance

Clearly the consequences of an inadvertent detonation of UXO during construction operations would be catastrophic with a serious risk to life, damage to plant and a total site shutdown during follow-up investigations.

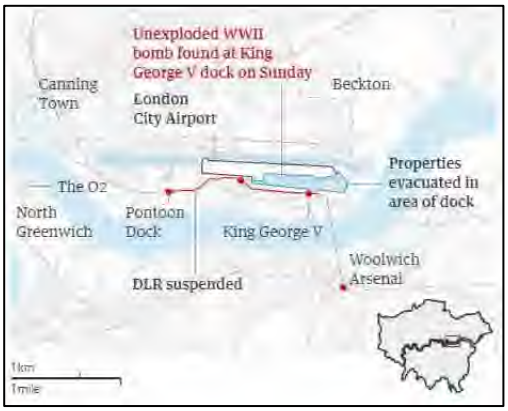
Since the risk of initiating ordnance is significantly reduced if appropriate mitigation measures are undertaken, the most important consequence of the discovery of ordnance will be economic. This would be particularly so in the case of high-profile locations and could involve the evacuation of the public.

The unexpected discovery of ordnance may require the closing of the site for any time between a few hours and a week with a potentially significant cost in lost time. Note also that the suspected find of ordnance, if handled solely through the authorities, may also involve loss of production since the first action of the Police in most cases will be to isolate the locale whilst awaiting military assistance, even if this turns out to have been unnecessary.

The following tables review a number of finds over recent years both in the UK and overseas that have seen large-scale disruptions, damage and injury/death:

UXB Incidents where intrusive works have caused detonation, resulting in death, injury and damage to plant	
 Blown up by history	A WWII bomb killed 3 and injured 8 in Berlin - 1994
	WWII bomb killed 3 in Goettingen, Germany – 2010.
	Excavator operator killed by WWII bomb in Euskirchen, Germany – 2014. A WWII bomb exploded at a construction site near a west German town, killing a man and injuring 8 others. The explosion occurred with a digger accidently struck the device during excavation works.

UXB Incidents where intrusive works have caused detonation, resulting in death, injury and damage to plant	
	A highway construction worker in Germany accidentally struck a WWII bomb, killing himself and wrecking several passing cars – 2006.
	Destroyed piling rig and dump truck after detonation of WWII UXB in Austria – 2006.
	WWII bomb injures 17 at construction site in Hattingen, Germany – 2008.
	A buried WWII-era bomb exploded during construction works in Bandar Malaysia, Kuala Lumpur – 2017.

UXB Incidents in the UK, resulting in delays, site shutdowns, evacuations, and disruptions	
	London City Airport shut: Flights cancelled after WWII bomb found in River Thames dock. London City Airport was closed after the discovery of a 250kg WWII German bomb, affecting tens of thousands of passengers. All flights into and out of the airport were stopped after the device was found by SafeLane Global in the nearby King George V dock. A 700ft exclusion zone was put in place and people living nearby were evacuated.
	Unexploded WWII 1000kg HE bomb found in Exeter, causing a construction site and the surrounding area to be evacuated. The subsequent detonation caused substantial damage to nearby buildings.
	A WWII UXB was found near to the Aston Expressway, leading to the evacuation of around 200 residents and a 500m cordon. Following the discovery, the weapon was safely detonated by the Army. However, although the M6 was reopened after the blast, the key Aston Expressway stayed shut until 6pm, extending traffic disruption. All nearby rail services and other roads were also disrupted.
	Up to 1000 homes were evacuated and a 300m exclusion zone was put in place following the discovery of a WWII UXB in Lansdown Road, Bath. The 500lb bomb was found just a meter beneath a playground at the former Royal High Junior School.

11 SafeLane Global's Risk Assessment

The Risk Assessment made by SafeLane Global for the site is based upon the likelihood that the site was contaminated, the risk of the contaminant item remaining, and the likelihood of, and potential consequences, should the item be struck during the proposed works. The following section discusses the risk that each ordnance type presents to the scope of works for the project site.

11.1 Conclusions

Taking into consideration the findings of this study, SafeLane Global considers the UXO risk at the site to be Medium.

Type of Ordnance	Likelihood of Contamination	Likelihood of UXO remaining	Likelihood of encounter	Potential Consequence	Overall Risk level
German High Explosive Bombs	Medium	Medium	Medium	Severe	**Medium**
German 1kg Incendiary Bombs	Low	Low	Low	Severe	**Low**
Allied Anti-Aircraft Shells	Medium	Medium	Medium	Minor	**Medium**
British / Allied Small Arms	Low	Low	Low	Not Significant	**Low**
Land Service Ammunition	Low	Low	Low	Moderate	**Low**

12 Proposed Risk Mitigation Strategy

SafeLane Global recommends the following minimum risk mitigation measures be deployed to support the proposed ground works at the site.

12.1 Summary

Based on the findings of the report, the following mitigation measures have been recommended for the proposed works on the site. Further detail on each method is presented in **Section 12.2**.

Risk Level	Planned Site Activity	Recommendations
Medium	Shallow Intrusive Works eg. excavations	• UXO Safety & Awareness Briefing (Toolbox Brief, TBB) • Site Specific Safety Instructions (SSSIs) Training Course • Non-Intrusive (NI) Magnetometer Survey (Greenfield areas only) • Target Investigation (Required as a follow-on from NI magnetometer survey)
	Deep intrusive works (eg. piling)	• UXO Safety & Awareness Briefing (Toolbox Brief, TBB) • Site Specific Safety Instructions (SSSIs) Training Course • Intrusive Magnetometer Survey of pile/borehole positions

12.2 Additional Notes

Risk Mitigation Measures – Further Detail	
Site Specific Explosive Ordnance Safety and Awareness Briefings (UXO Toolbox Briefing) to all personnel conducting intrusive works	These briefings are intended to make site operatives aware of the nature of explosive ordnance that may be encountered on their project site. • Delivered by a specialist Explosive Ordnance Disposal Engineer. • Provides information on the site-specific explosive ordnance risk • Basic ordnance identification. • What to do in the event of an encounter with a suspicious object. Provide UXO response procedures.
Site Specific Safety Instruction (SSSI)	For longer term projects that require Explosive Ordnance Safety and Awareness Briefings as part of the Explosive Ordnance Risk Mitigation measures for the project, SSSIs can be provided to allow nominated site representatives to deliver these briefings after initial training. • 2/3-hour presentation and training course. • Delivered by a fully qualified senior EOD Engineer. • Suitable for Project Site Manager HSE representative and supervisors. • Includes briefing pack. This provides a cost-effective solution to ensure that the Explosive Ordnance Safety and Awareness Briefings can be delivered effectively and efficiently to the required standard.
Explosive Ordnance Disposal (EOD) Engineer On-Site Support	In areas where the risk posed by the potential presence of explosive ordnance is low or where the conditions are not suitable for pro-active survey, EOD On-Site Support can provide a reactive response to any suspicious object that may be encountered during open excavation works. The presence of the EOD Engineer (sometimes referred to as 'high risk dig wardens') on-site in support of shallow intrusive work allows for a direct monitoring of works using visual recognition and instrumentation and provides an immediate response to reports of suspicious objects or suspected items of ordnance that have been recovered by ground workers. SafeLane Global EOD personnel on-site also have the additional benefit of providing Explosive Ordnance Safety and Awareness briefings (UXO TBB) to any staff that have not received them earlier and can advise staff of the need to modify working practices to take account of the ordnance threat. The EOD Engineer will also aid potential incident management which would involve liaison with the local authorities and police should ordnance that presents an explosive hazard be identified. • Specialist Explosive Ordnance Disposal Engineer. • Maintains a watching brief over all excavations. • Provides safety and awareness briefings to construction personnel as required.

	• Provides immediate identification of any suspicious item that is encountered. • Identifies whether any UXO item is live or inert. • Provides liaison assistance with the relevant authorities when dealing with any live UXO. Avoids on site delays which can be caused by the incorrect identification of a suspect item being potential UXO.
Explosive Ordnance Disposal (EOD) Engineer to support site investigation works	For cost effective Explosive Ordnance Risk Mitigation for site investigation work, the EOD Engineer can survey ahead of trial pits, monitor excavations when the ground conditions are not suitable for a pro-active survey and conduct intrusive surveys for borehole and window sample locations working in conjunction with the site investigation team. The On-Site Support will also provide a reactive response to any suspicious object that may be encountered during open excavation works. SafeLane Global EOD personnel on-site also have the additional benefit of providing Explosive Ordnance Safety and Awareness briefings to any staff that have not received them earlier and can advise staff of the need to modify working practices to take account of the ordnance threat. The EOD Engineer will also aid potential Incident Management which would involve liaison with the local authorities and police should ordnance be identified and present an explosive hazard. • Specialist Explosive Ordnance Disposal Engineer. • Maintains a watching brief over all trial pit excavations. • Provides safety and awareness briefings to construction personnel as required. • Works in conjunction with the drilling team to survey all borehole and window sample locations in real-time using a staged drilling and magnetometer survey procedure. • Provides immediate identification of any suspicious item that is encountered. • Identifies whether any UXO item is live or inert. • Provides liaison assistance with the relevant authorities when dealing with any live UXO. • Avoids on site delays which can be caused by the incorrect identification of a suspect item being potential UXO. *Technical Information* 1. In optimum ground conditions each survey using the borehole technique will have a 1 metre look ahead capability. 2. Any steel casing used for borehole surveys will need to be retracted by 3 metres to allow the magnetometer survey to be conducted. Non-ferrous pipe will be required to support the borehole during the survey minimum diameter 60mm (to be supplied by the client).
Search & Clear	Where a non-intrusive magnetometer survey is not possible (e.g. wooded areas) SafeLane Global can deploy a two-man Explosive Ordnance Disposal Engineer team using handheld magnetometer equipment who will proactively survey either in search lanes or boxes, investigating each reading with the support of

	an operated excavator. The survey is suited to detecting suspicious ferro-magnetic buried objects that may be munitions and/or explosive ordnance related. All SafeLane Global personnel involved with the Search and Clearance Works will be former military personnel who have gained formal NATO Military Explosive Ordnance Disposal Qualifications, having completed training at the Defence Explosive Ordnance Disposal School (DEODS) Chattenden, Kent or similar establishment throughout their military service. The client will be responsible for: • Demarcating the areas to be searched. • Providing services clearance and permit to dig. • Providing operated excavator to access deeper targets if required (SafeLane Global can provide this service at additional cost). • Providing coordinates of positions where debris have been identified (if information required in report). • Providing storage for recovered debris. Output will depend upon terrain and contamination (number of readings to be investigated).
Non-Intrusive Magnetometer Survey and Target Investigation (greenfield land only)	**Non-Intrusive Survey** This survey type is designed for use on magnetically 'clean' land commonly referred to as 'greenfield'. Brownfield land is often described as that which has had previous industrial or commercial use. In this context it specifically encompasses sites with are underlain by 'made ground' which may contain metallic contamination. Non-intrusive magnetometry or electromagnetic equipment which is used in the search for buried UXO relies upon the detection of small changes between clear ground and that containing UXO. The technique operates very successfully in environments where there is minimal ground contamination from other sources such as fired bricks, reinforced concrete, discarded scrap metal and buried services. There are also man-made ambient effects on magnetic and electromagnetic non-intrusive survey systems which include moving plant vehicles, power cables, electric trains etc. Non-Intrusive survey is carried out using either total-field or gradiometer magnetometry, dependent upon site conditions. Data is recorded and then interpreted using advanced AGSPRoc software in order to map magnetic fields and model discrete magnetic anomalies (variations in the Earth's magnetic field caused by ferro-magnetic objects electrical fields or geology). The location of such anomalies is determined, and mathematical modelling used to estimate their mass and depth. The survey will also locate any buried services with a magnetic signature and indicate any areas of gross magnetic "contamination" which may indicate the presence of unknown obstructions. Additionally, the survey can provide information on archaeological features. The system can detect the magnetic field from a 50kg WWII air-dropped bomb at a depth of 4m and smaller items such as Land Service Ammunition to depths of up to 1.5m in ground with a low ambient magnetic field. In the case of soft geology, it should be noted that a 50kg high explosive bomb may be buried greater than 4 metres below ground level and therefore may not be detected by the survey. In this instance intrusive surveys may be required.

	The non-intrusive survey system will be deployed utilising the pedestrian survey frame. The output for the pedestrian frame is estimated at up to 2Ha per day. *Technical information:* • Client to clearly demarcate area to be surveyed prior to start and highlight any known services/underground obstructions. • Ground must be level, free of obstacles / obstructions and clear of undergrowth. Height of any crops should be no more than 400mm and where crops are present SafeLane Global would require written approval from the landowner or client to walk over the site area. • When working adjacent to existing infrastructure the survey may be ineffective due to the ferro magnetic interference caused by passing vehicles and the presence of underground buried services. A site visit may be recommended prior to commencement. • Note: the survey will be ineffective on Brownfield sites due to the magnetic nature of building rubble, which typically masks the weaker magnetic signatures of buried objects. If parts of the site are contaminated, then alternative risk mitigation measures may need to be considered. **Target Investigation** If a buried anomaly is detected that cannot be discounted as a potential UXO / UXB then the object will need to be investigated to positively identify the item. The process will include; • Specialist two-man Explosive Ordnance Disposal Team. • Combination of manual and mechanical excavation techniques. • Excavator shafting, shoring and dewatering equipment can be provided by SafeLane Global if required. • Excavation techniques will be defined and agreed prior to the commence. A factual report with clearance certificate will be issued on completion of the investigation.
Intrusive Magnetometer Survey of all pile locations down to the maximum bomb penetration depth	SafeLane Global can deploy a range of intrusive magnetometry techniques to clear ahead of all the pile locations. The appropriate technique is governed by a number of factors, but most importantly the site's ground conditions. The appropriate survey methodology would be confirmed once the enabling works have been completed. A site meeting would be required between SafeLane Global and the client to determine the methodology suitable for this site. Target investigation or avoidance will be recommended as appropriate.

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The key sources consulted during this assessment are listed below;

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iii. Fegan, T., *The Baby Killers': German Air raids on Britain in the First World War*, (Leo Cooper Ltd. 2002).

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v. Jappy, M. J., *Danger UXB: The Remarkable Story of the Disposal of Unexploded Bombs during the Second World War*, (Channel 4 Books, 2001).

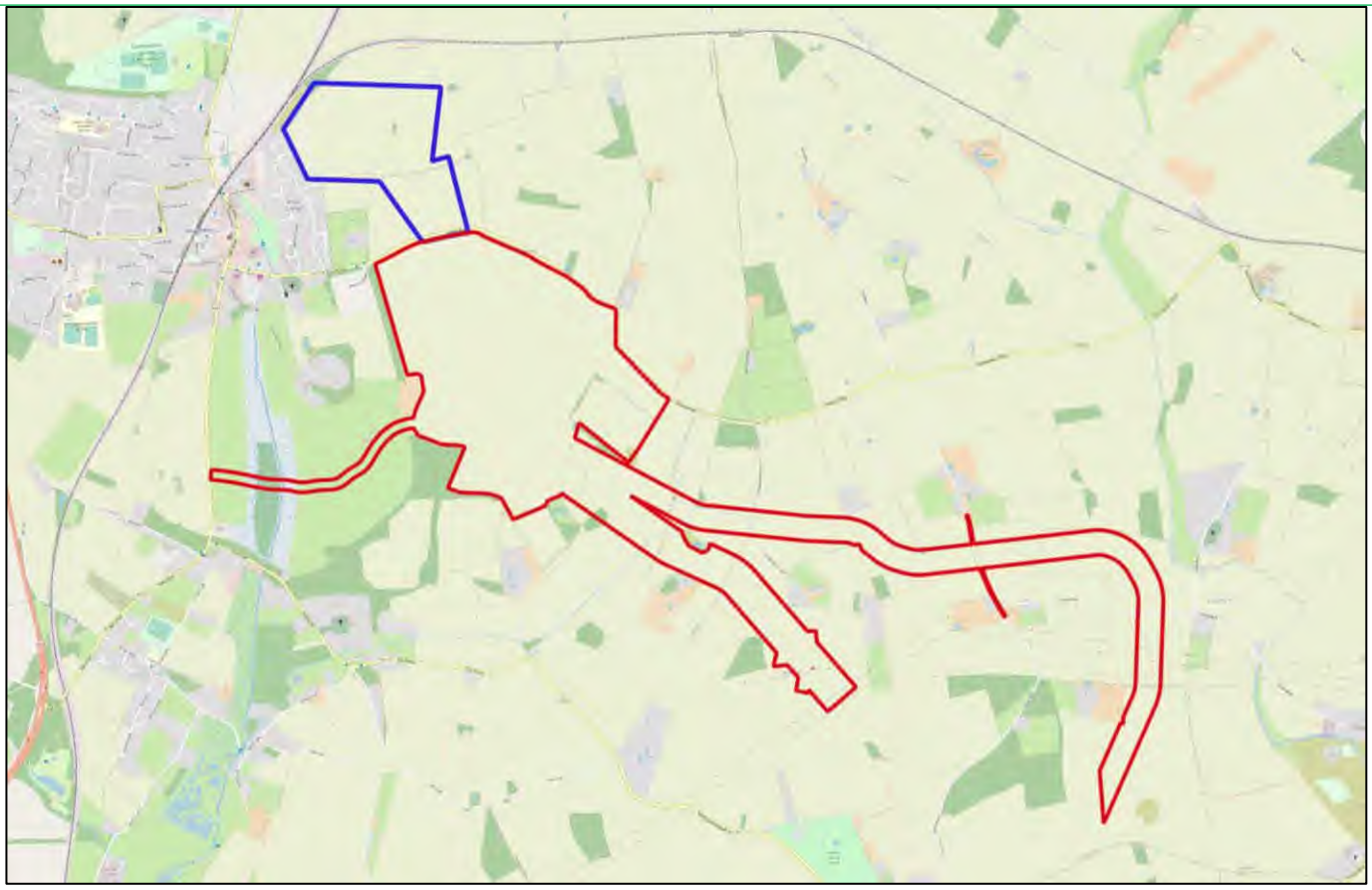
vi. Price, A., *Blitz on Britain, The Bomber Attacks on the United Kingdom 1939 – 1945*, (Purnell Book Services Ltd. 1977).

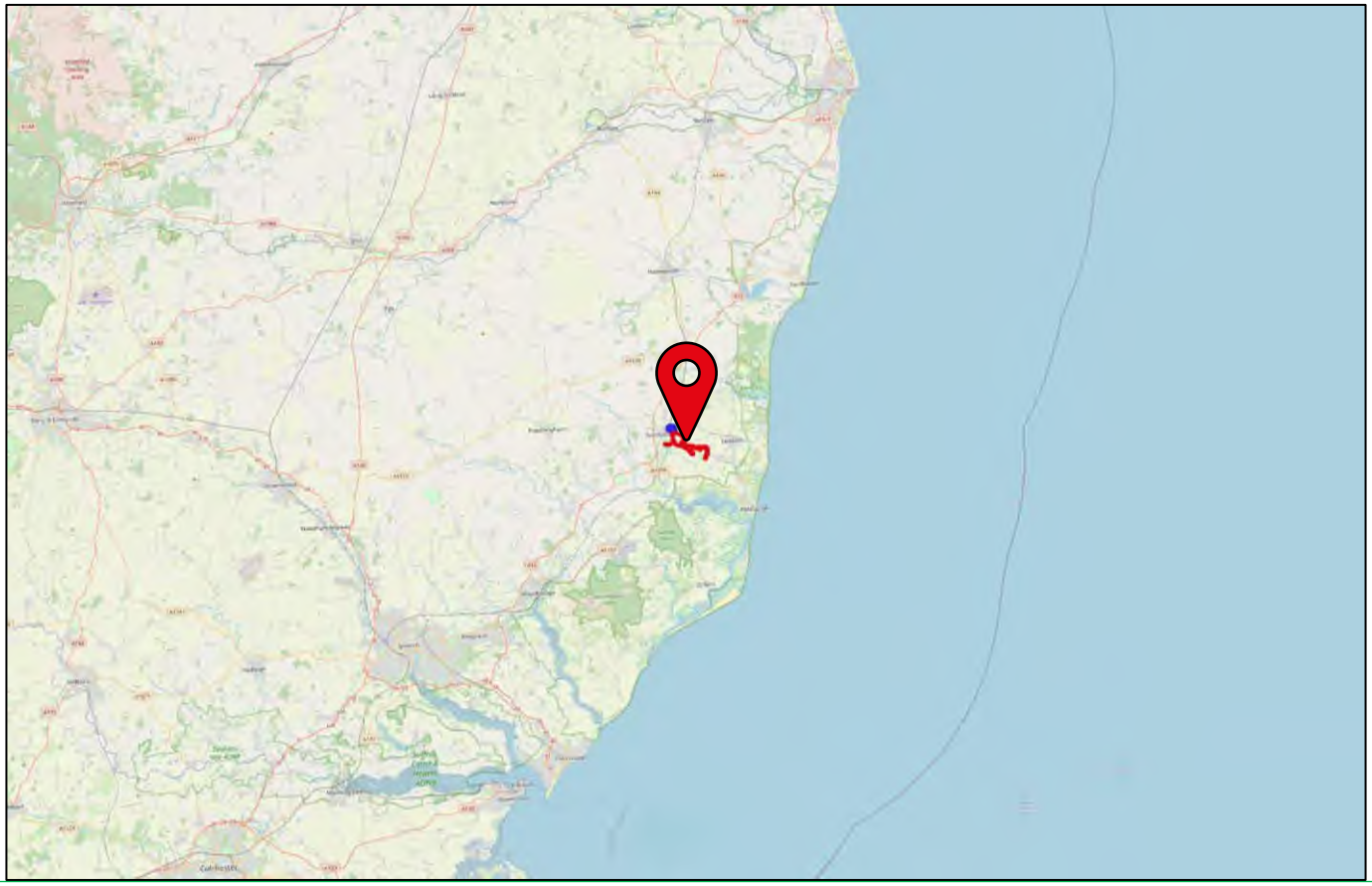
vii. Ramsey, W., *The Blitz Then and Now, Volume 1*, (Battle of Britain Prints International Limited. 1987).

viii. Ramsey, W., *The Blitz Then and Now, Volume 2*, (Battle of Britain Prints International Limited. 1988).

ix. Ramsey, W., *The Blitz Then and Now, Volume 3*, (Battle of Britain Prints International Limited. 1990).

x. Whiting, C., *Britain Under Fire: The Bombing of Britain's* Cities 1940-1945, (Pen & Sword Books Ltd. 1999).

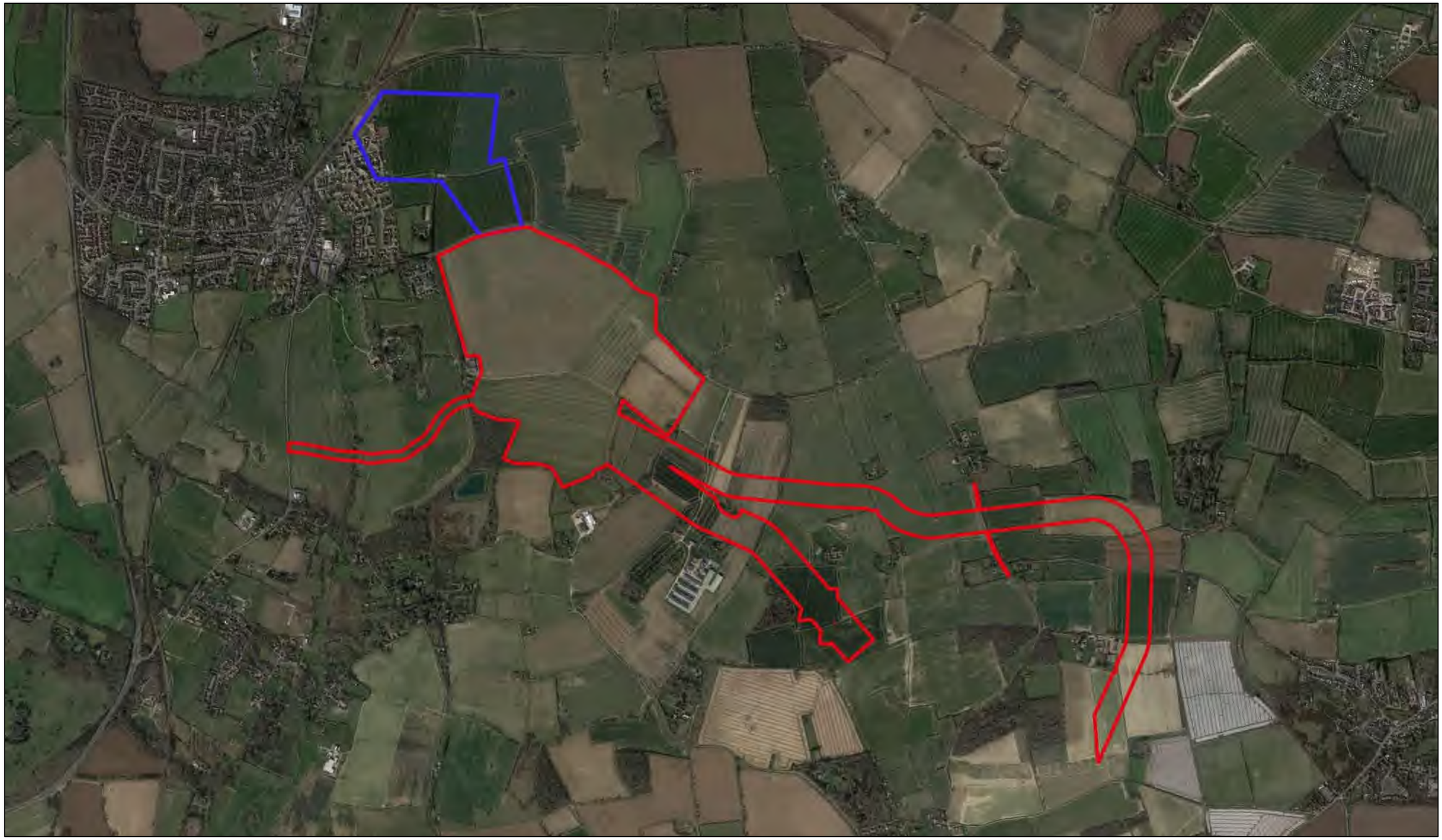




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Recent Aerial Photograph / Site Plan

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Google Earth™ Mapping Services

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Lowestoft Formation - Diamiction

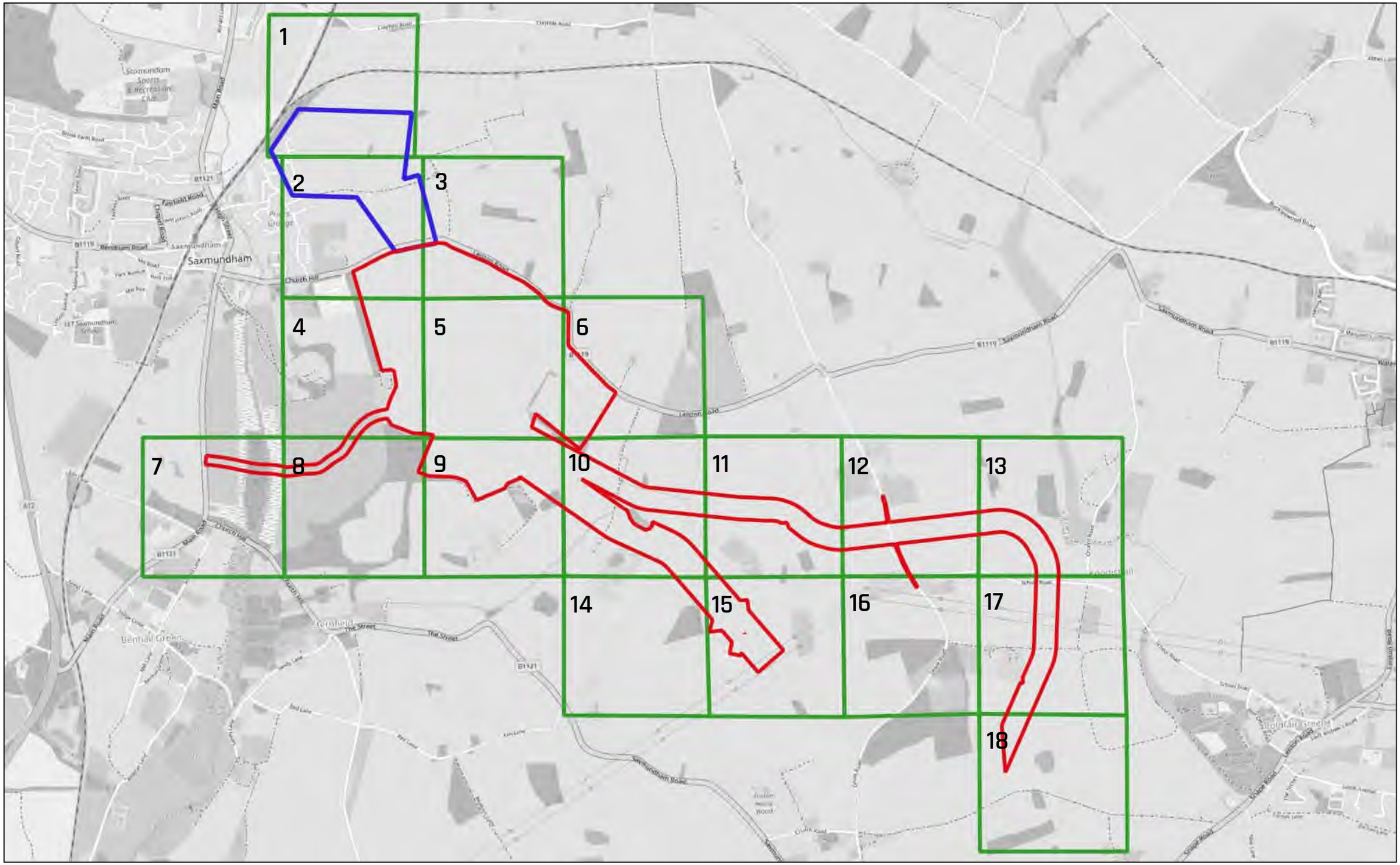
Lowestoft Formation – Clay and Silt

Lowestoft Formation – Sand and Gravel

Alluvium – Clay, Silt, Sand, and Gravel

OS Mapping - Area Reference Map

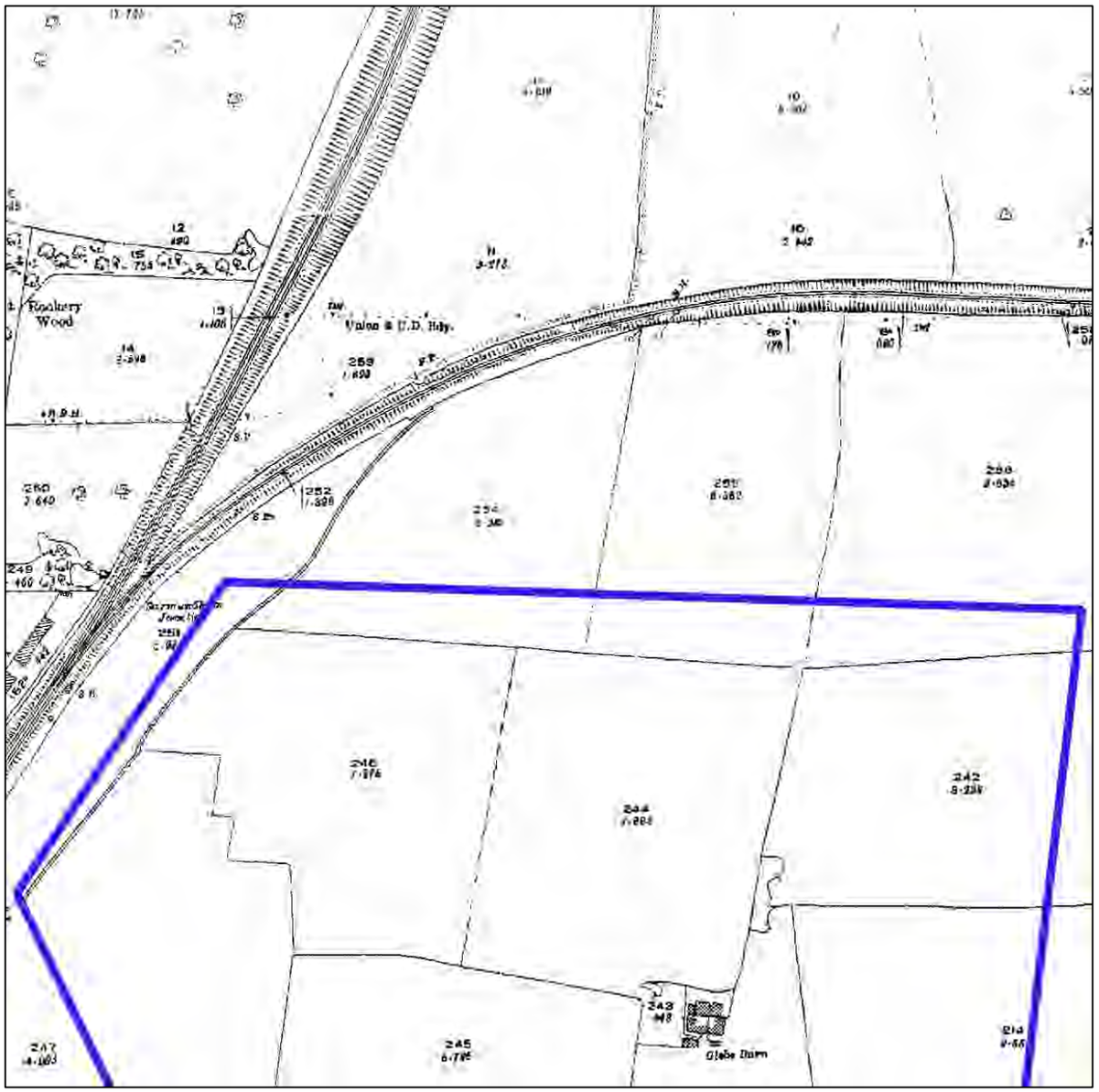
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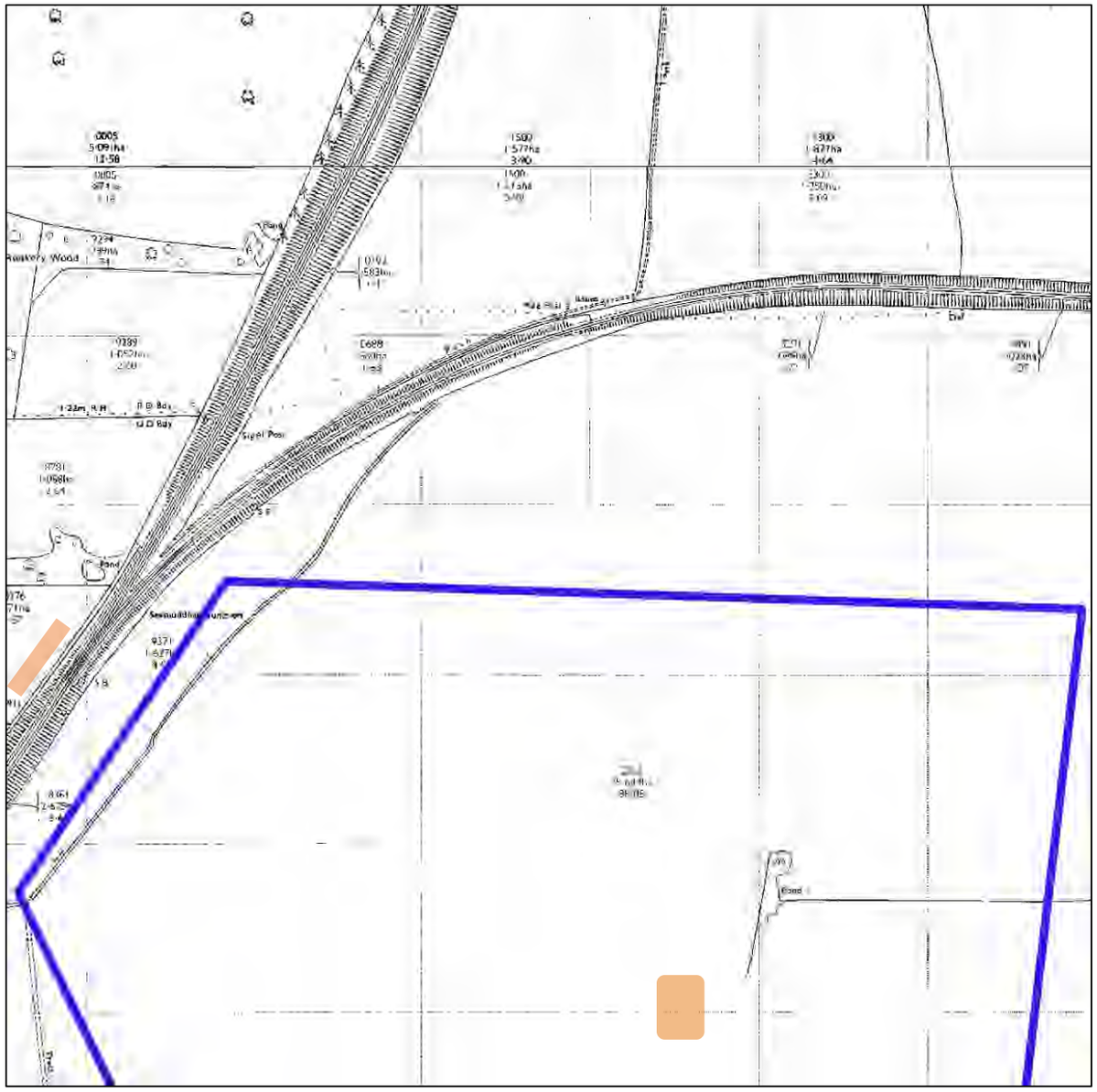
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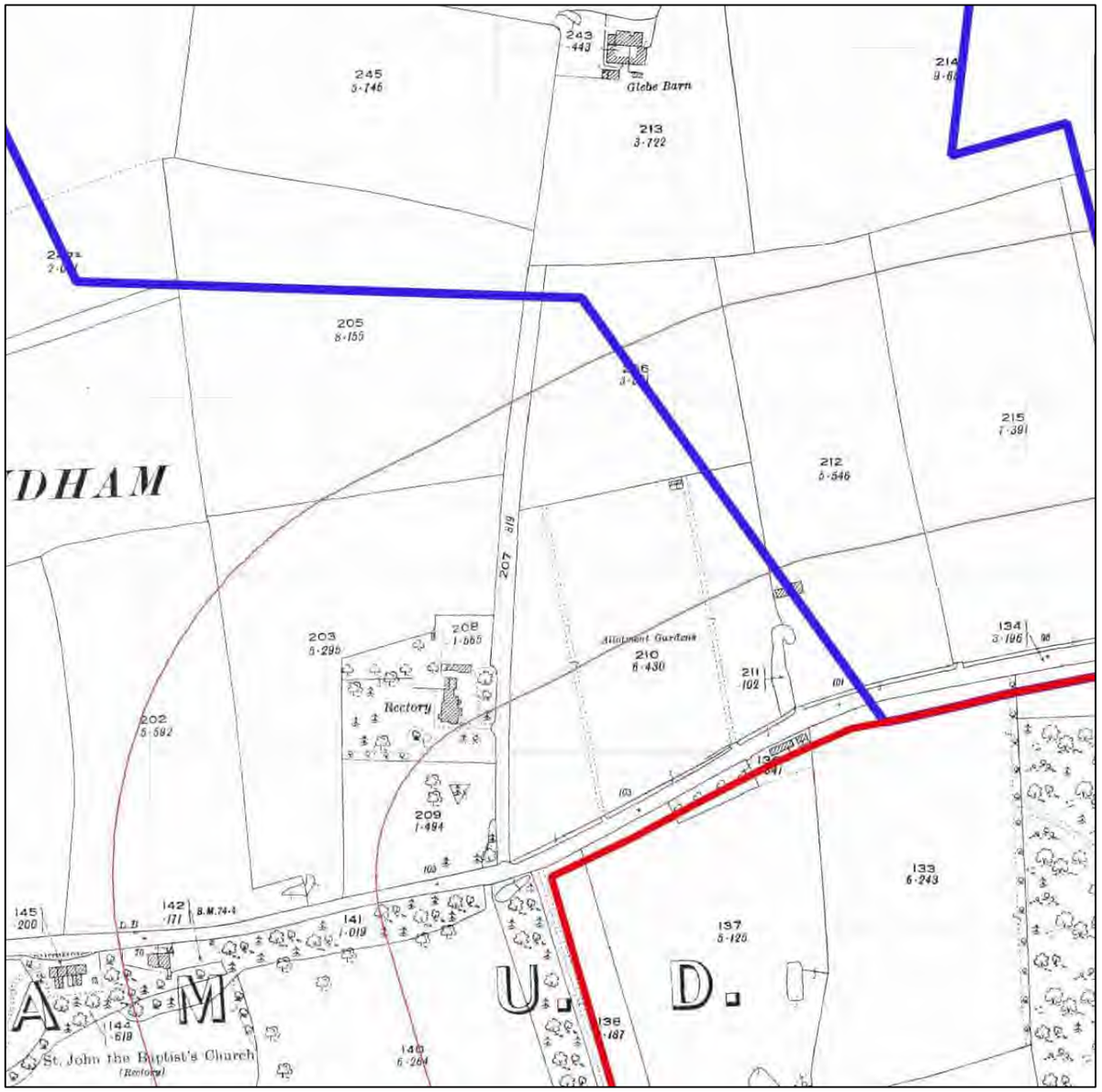
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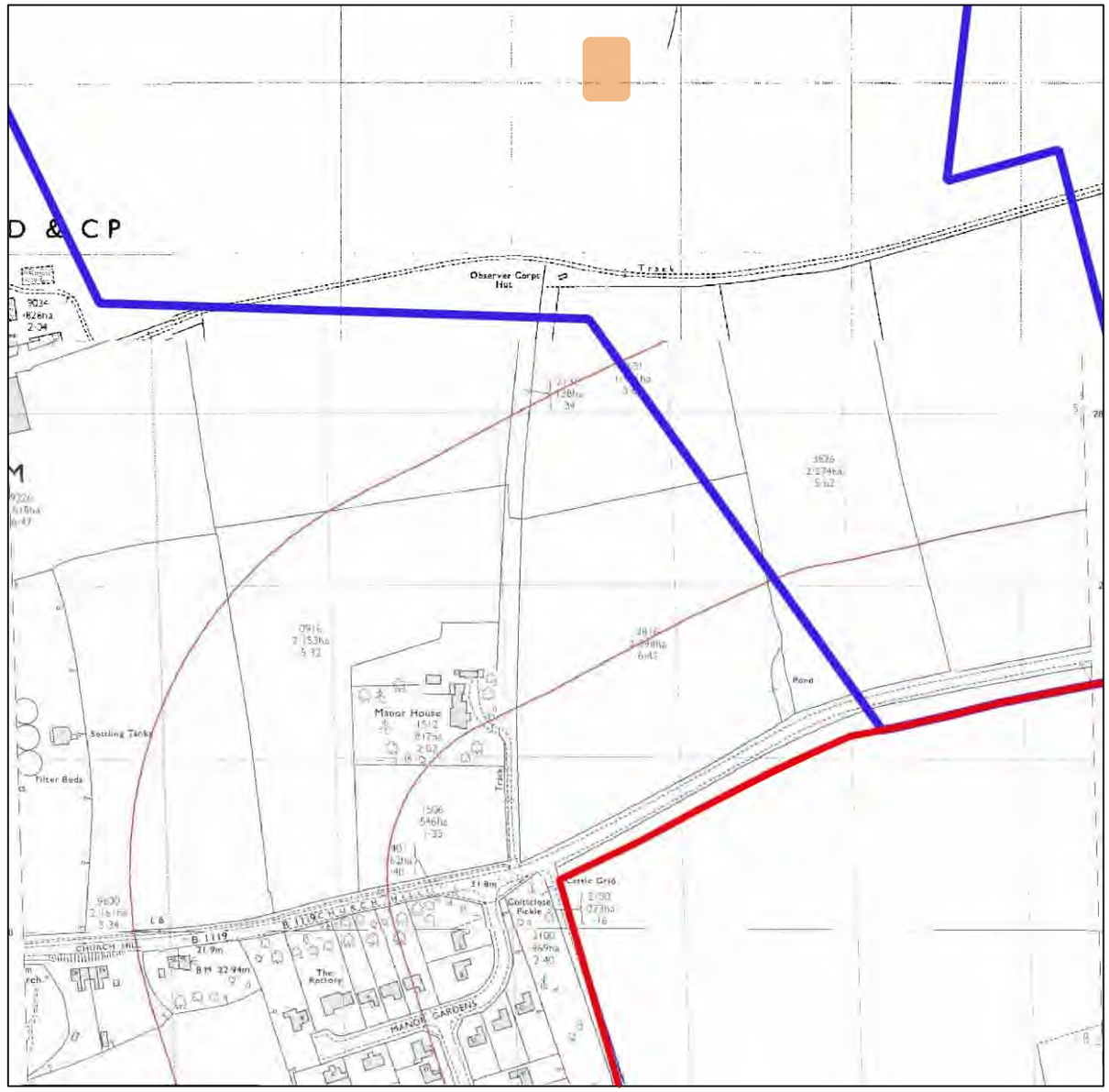
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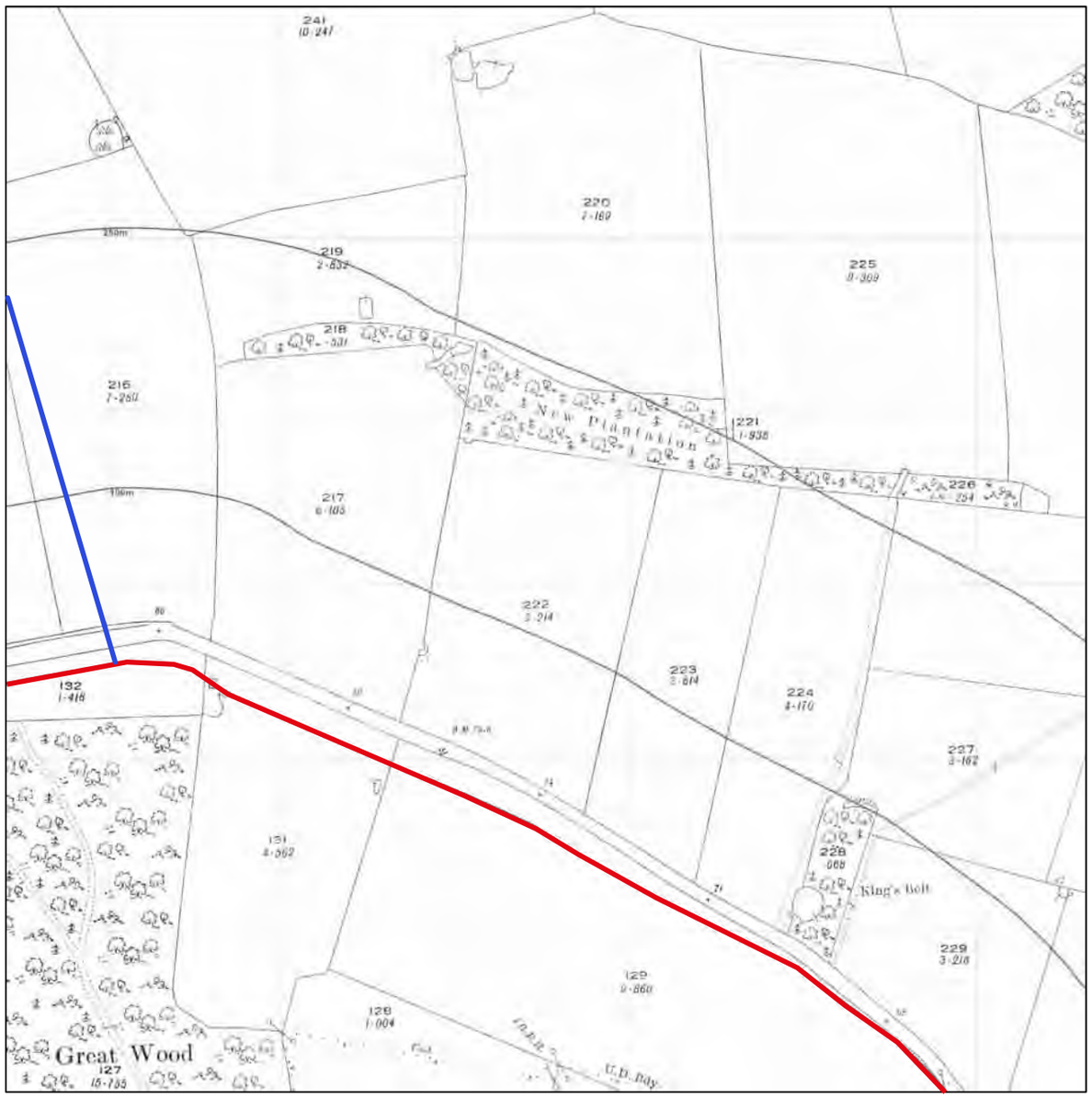
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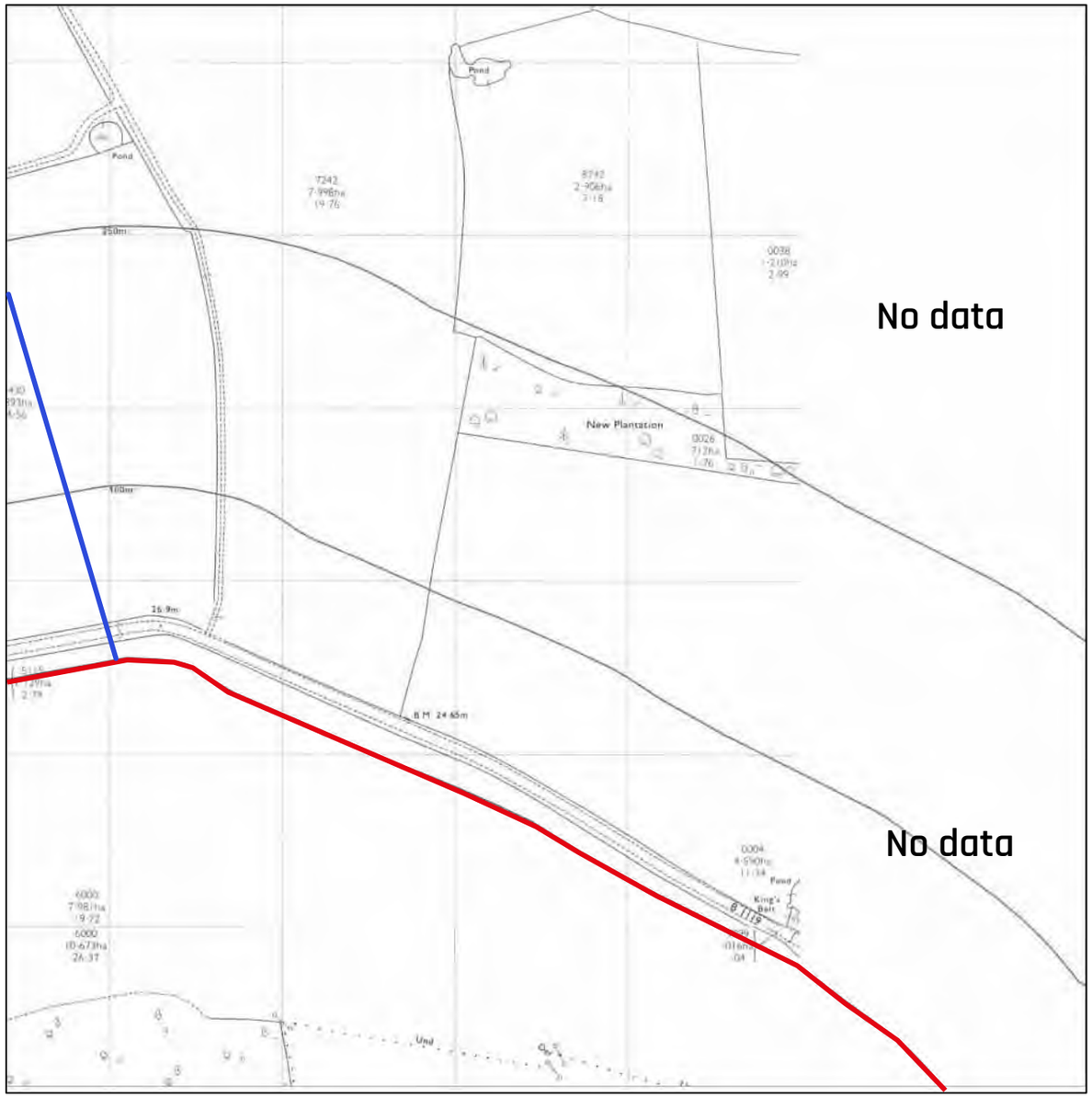
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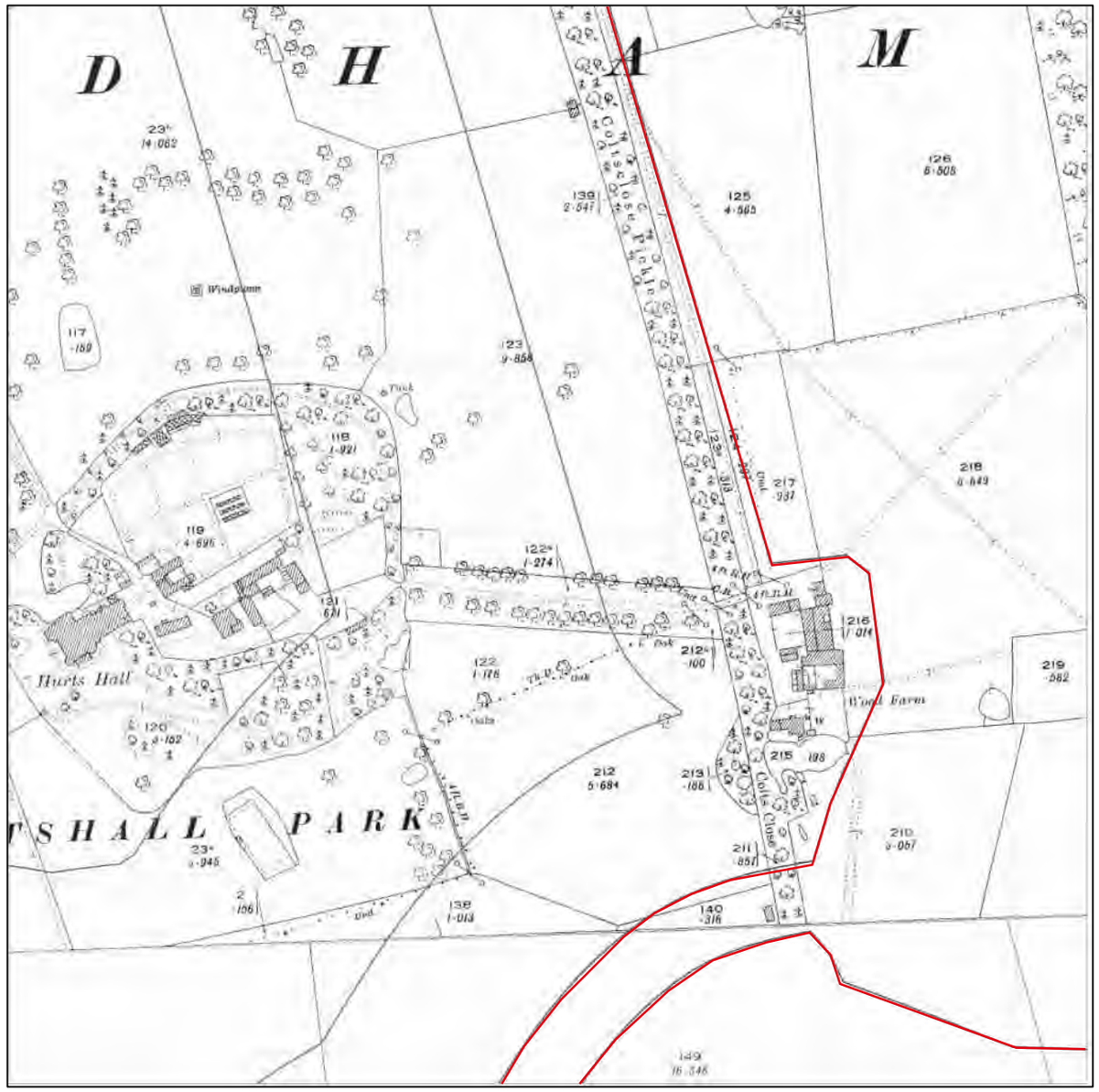


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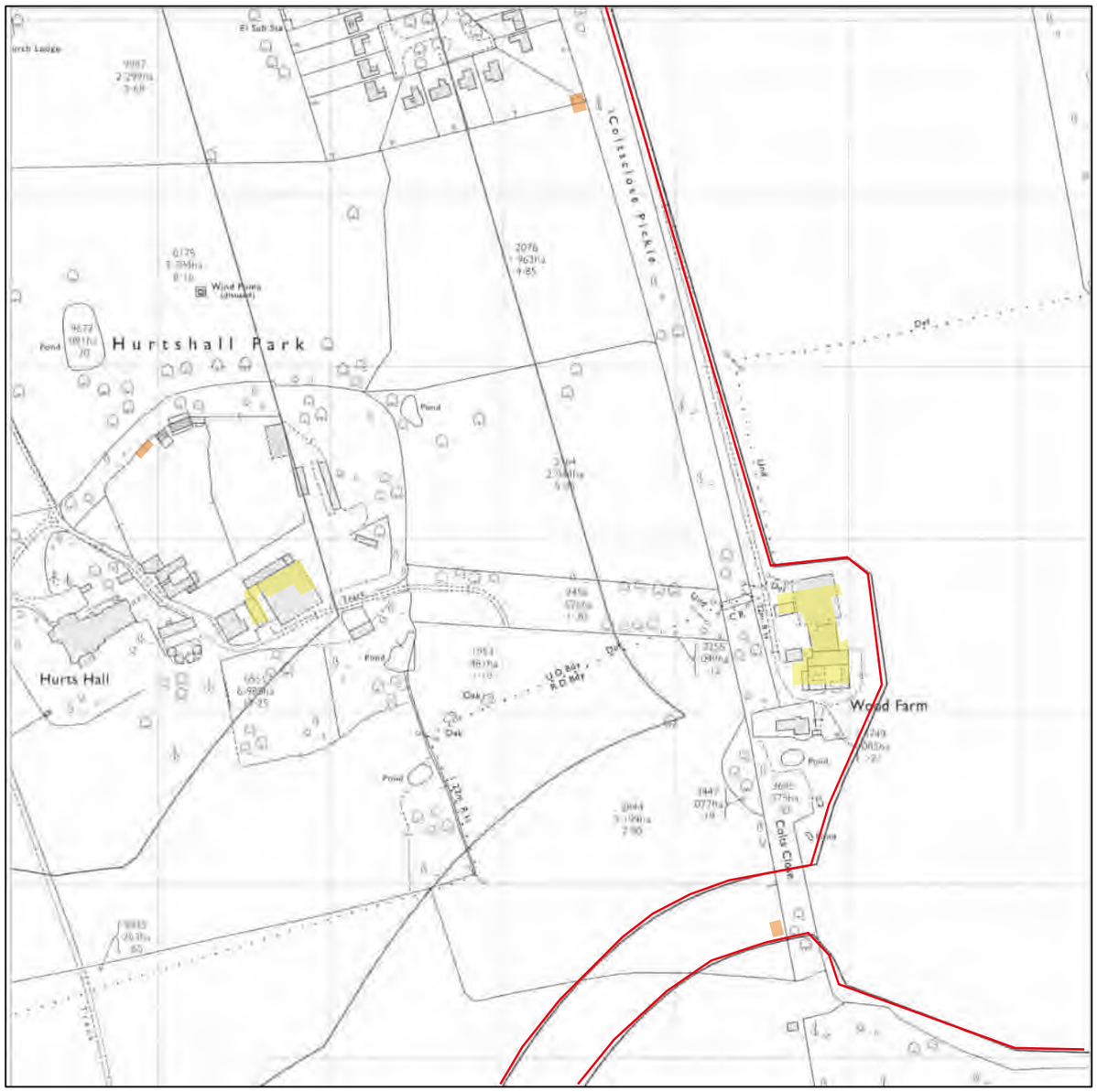
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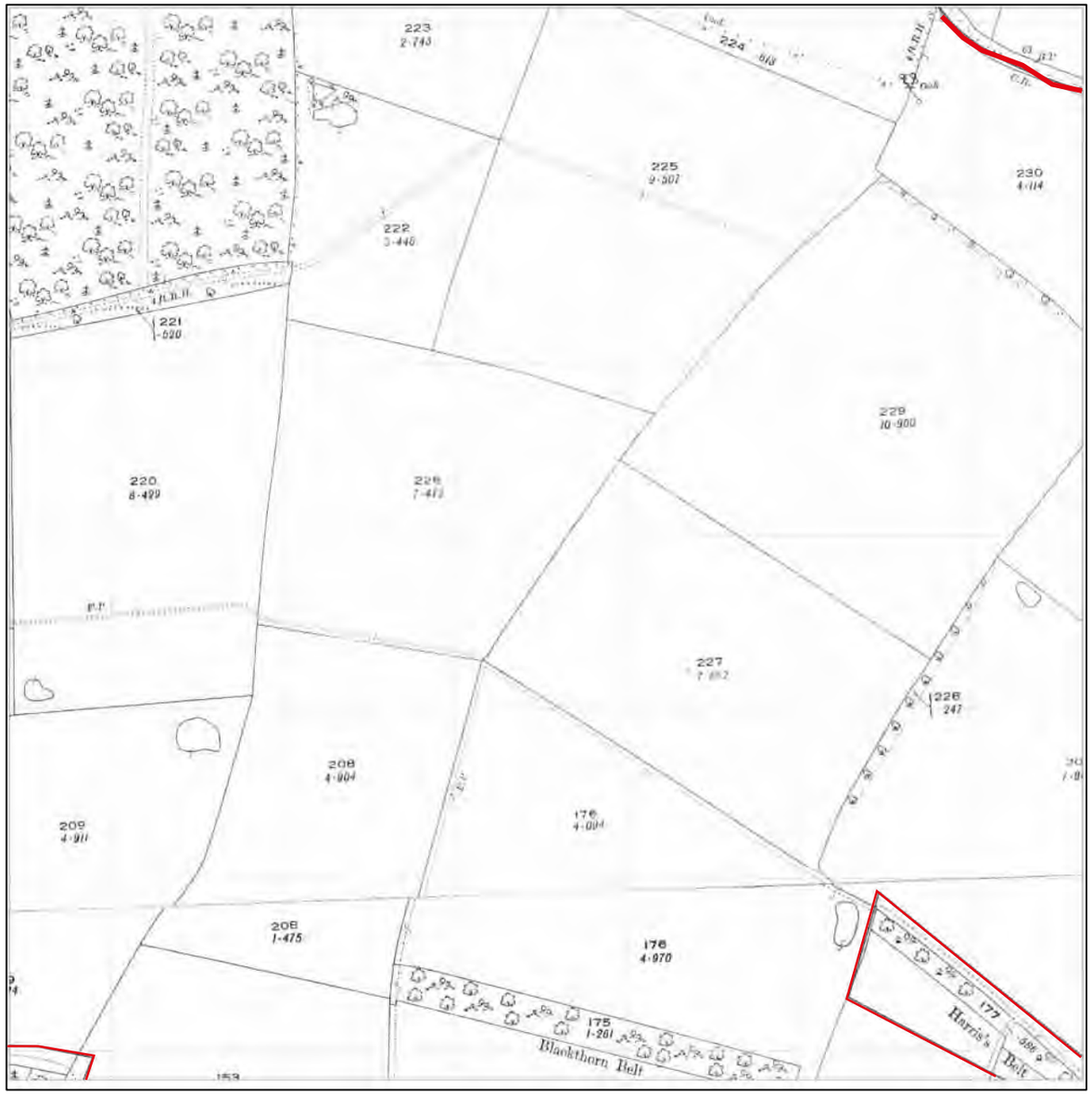
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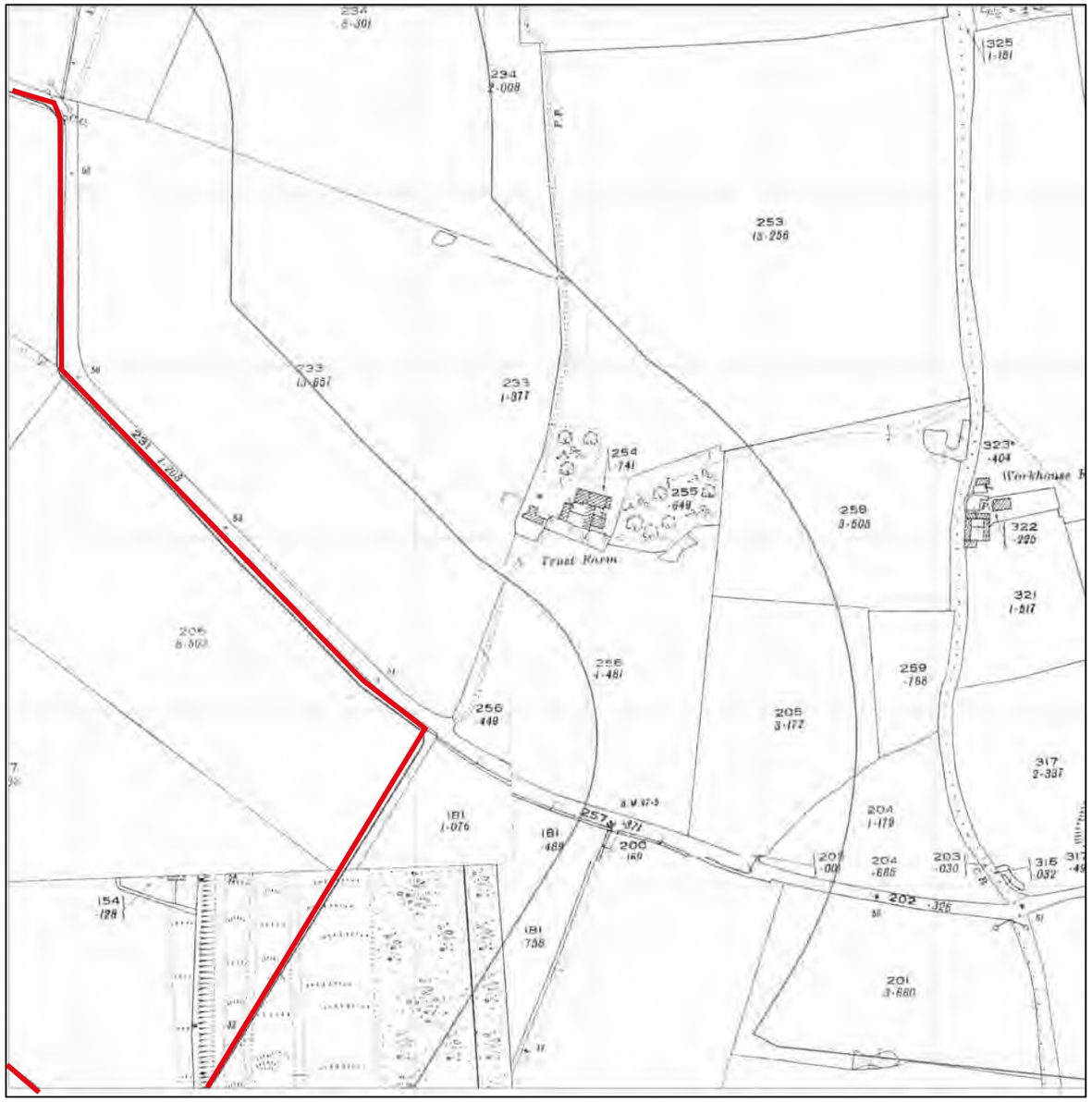
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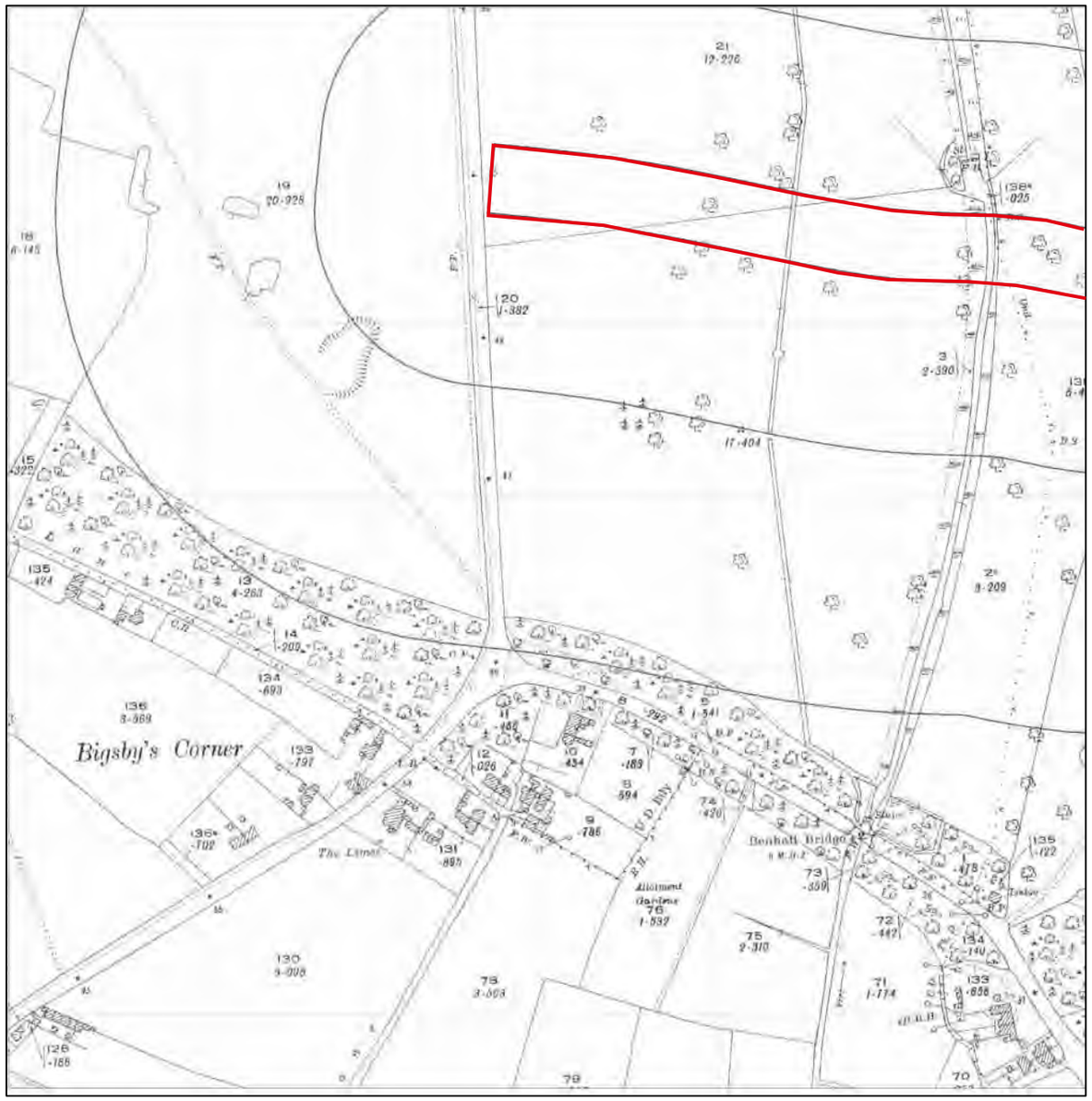
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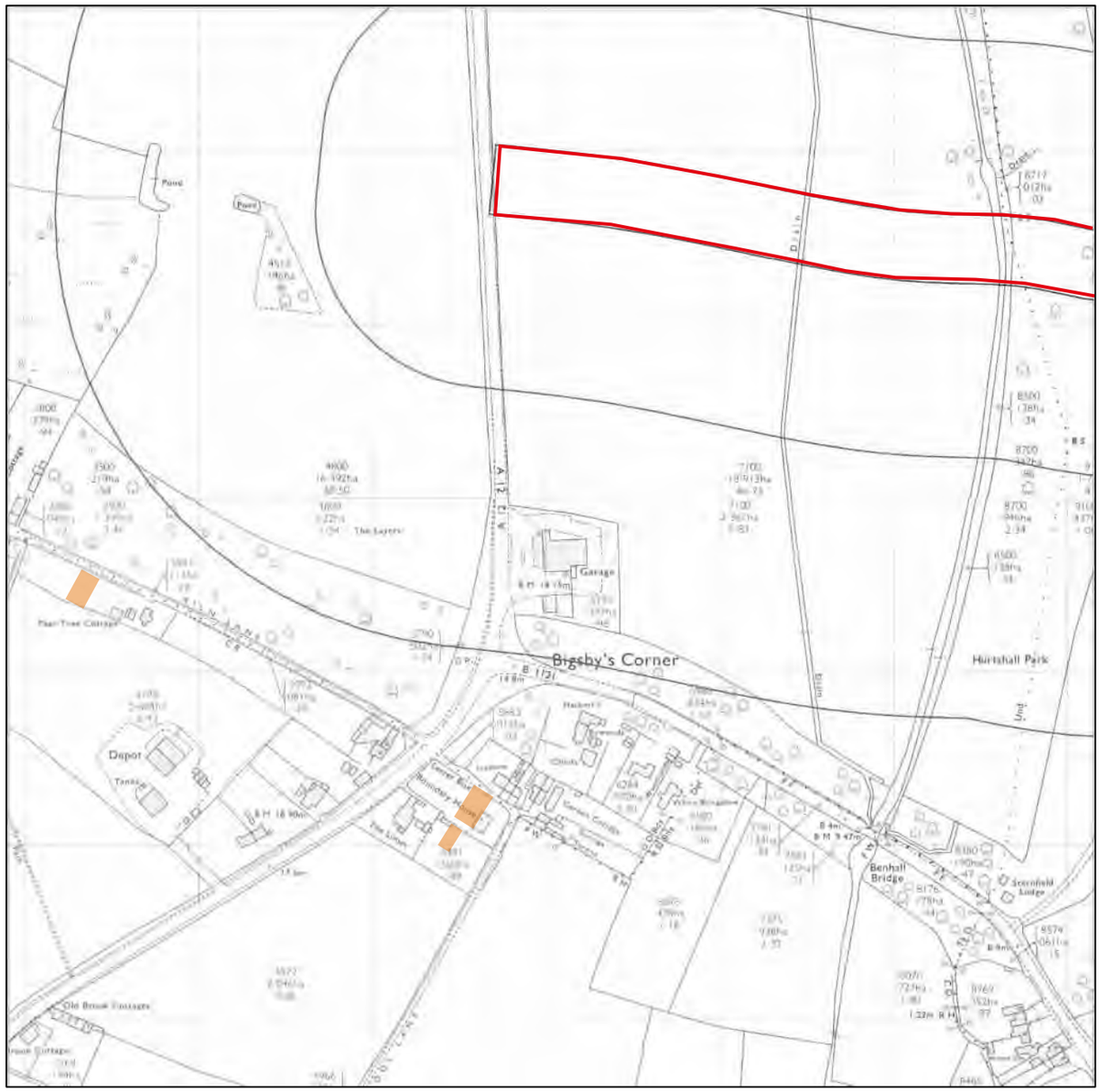
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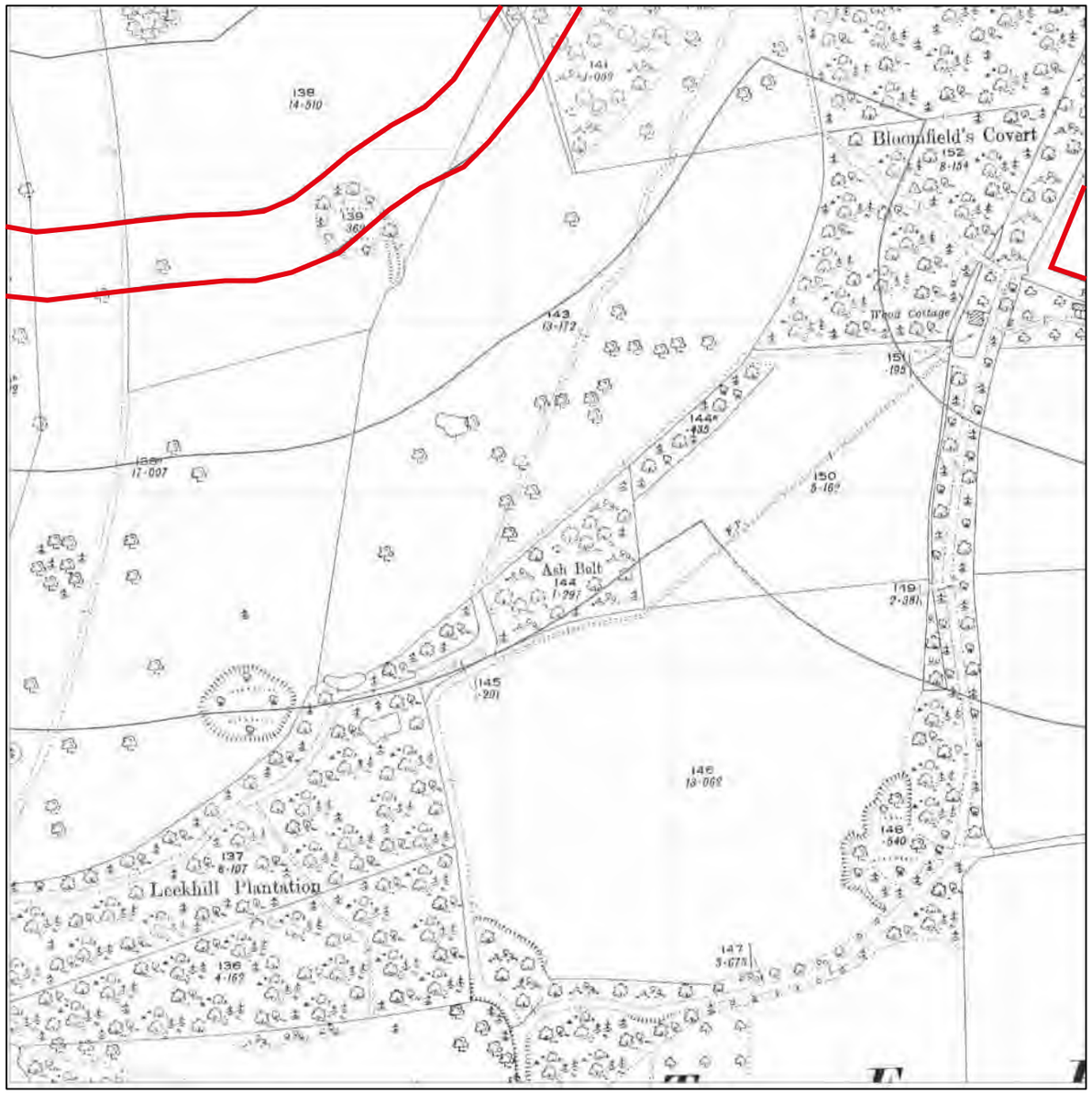
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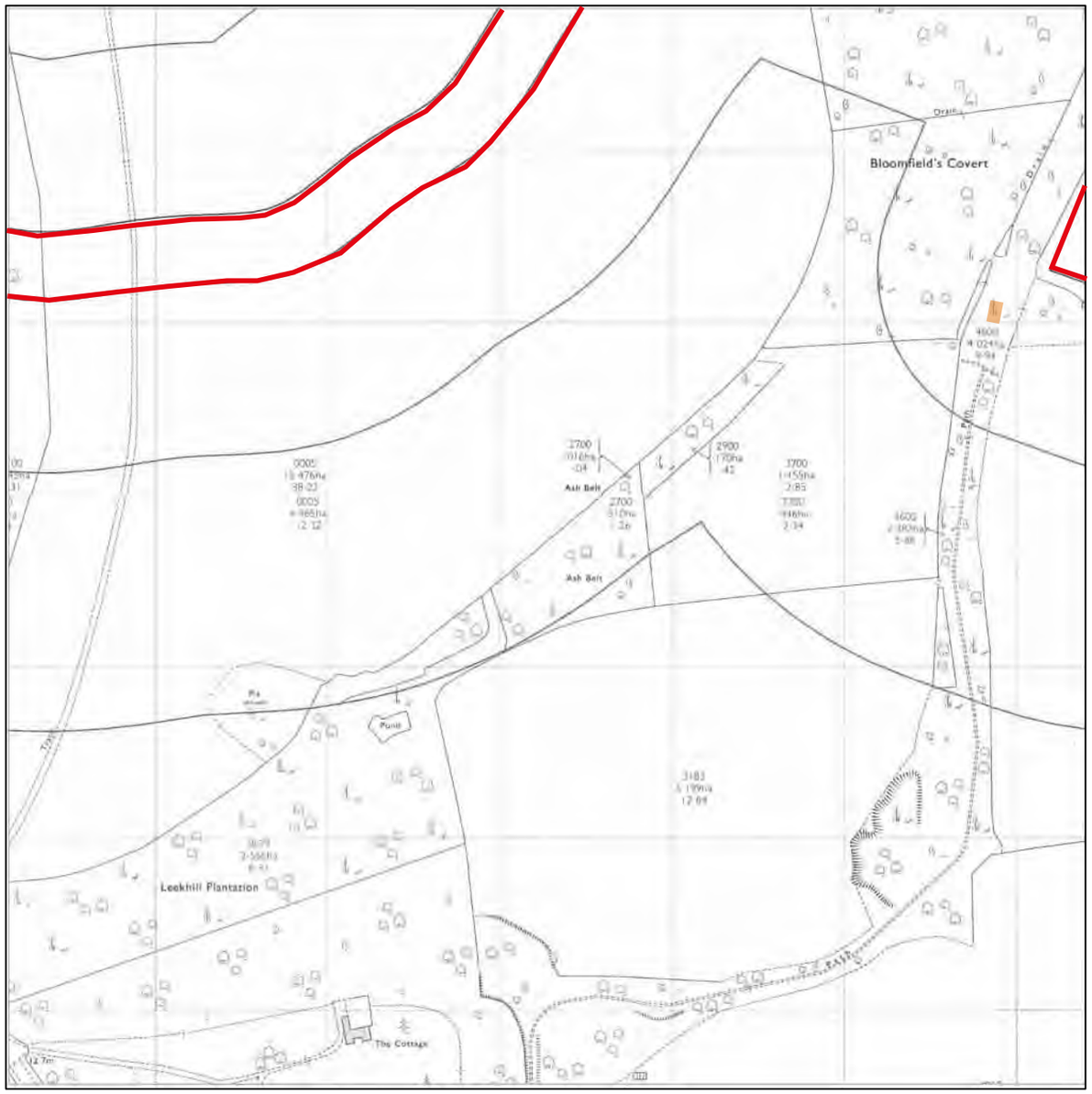
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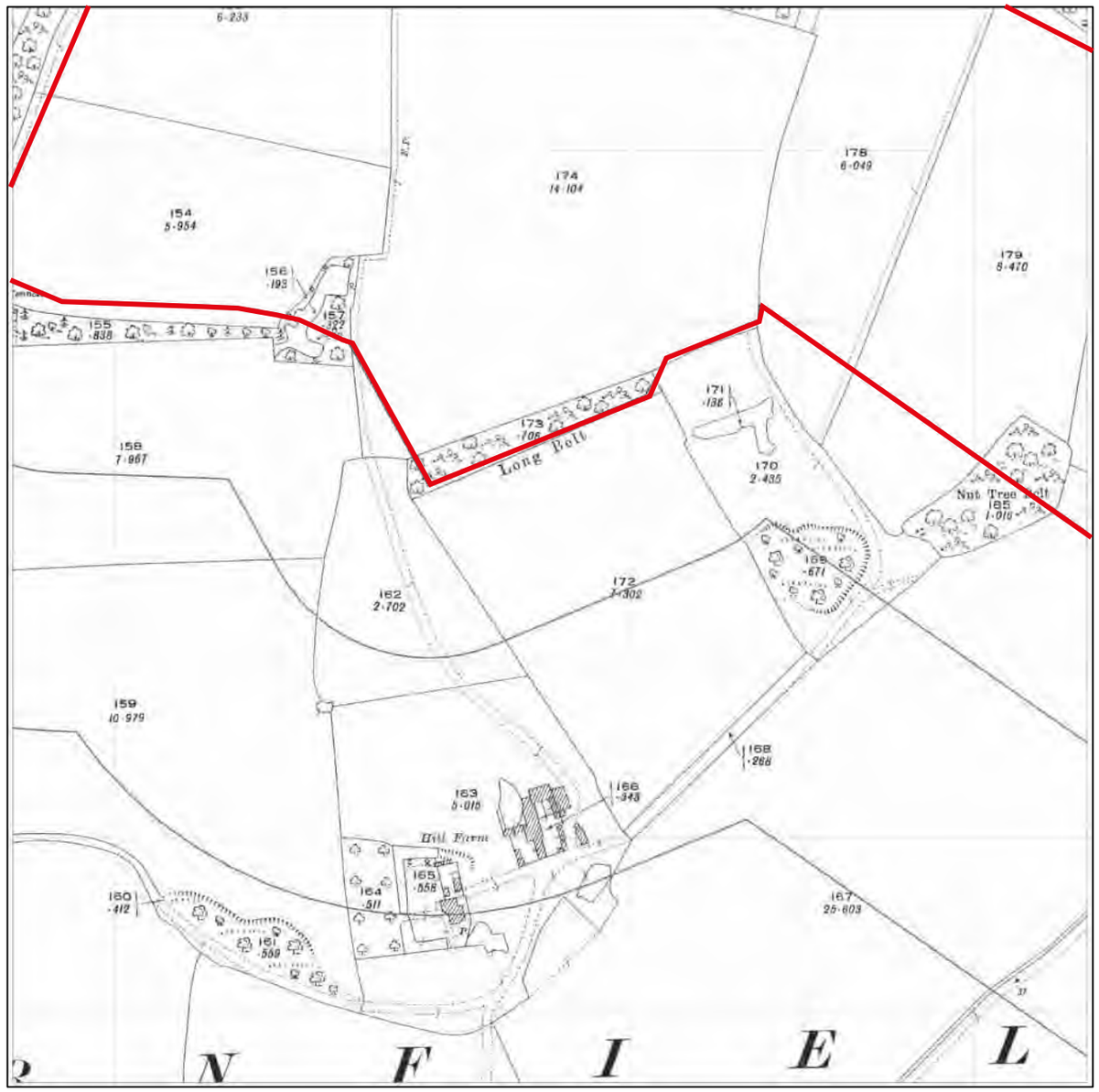
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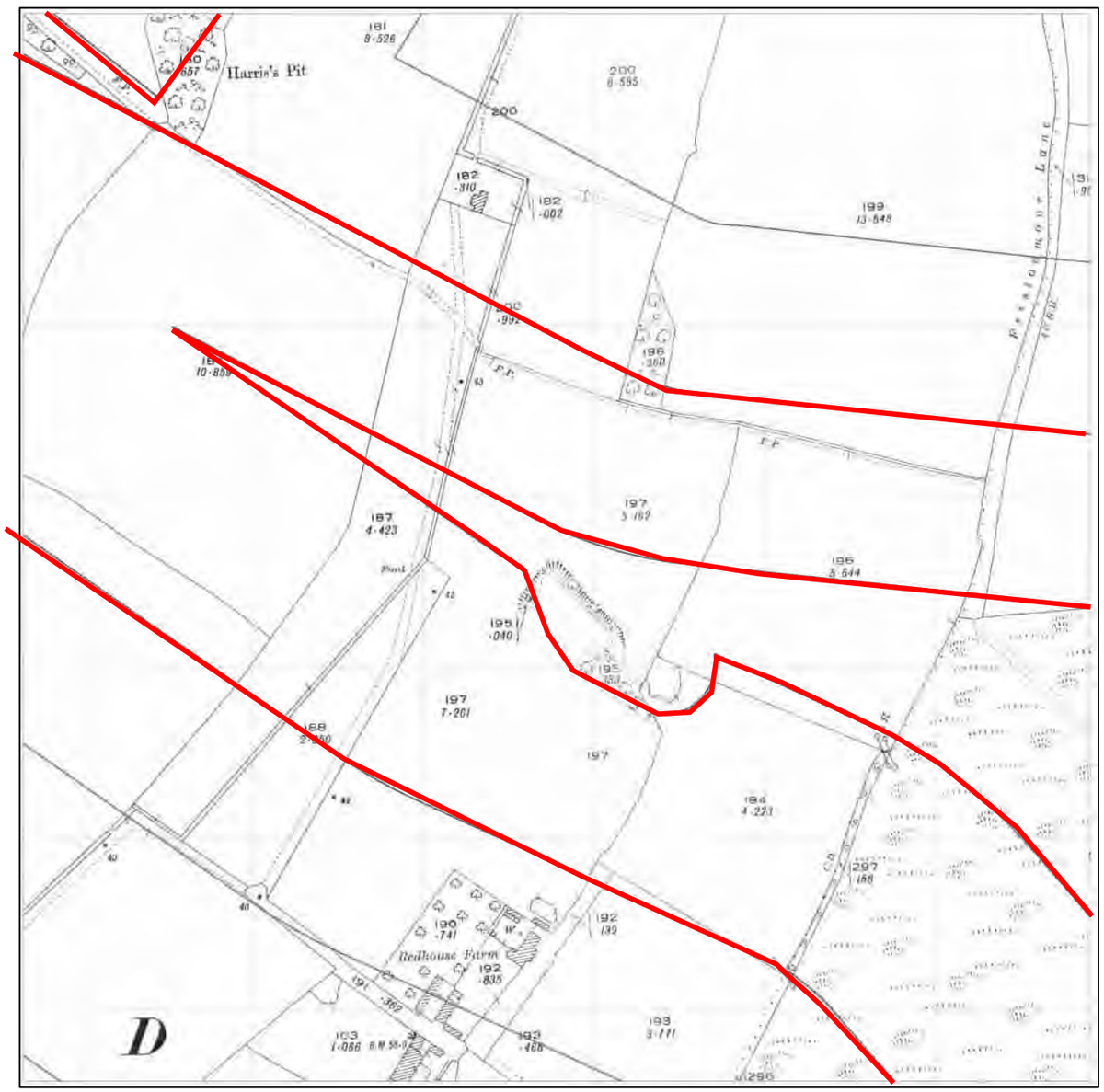


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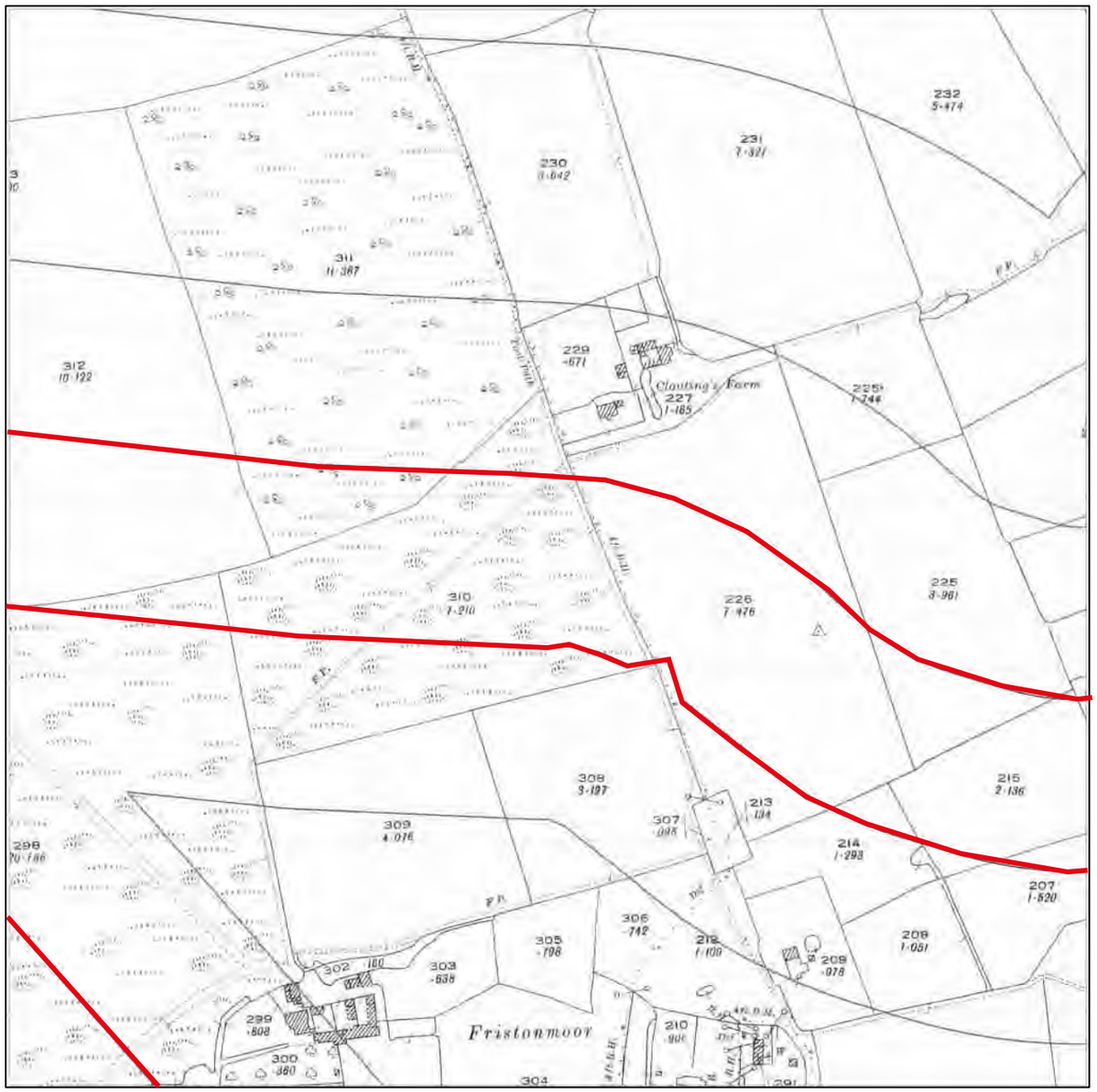
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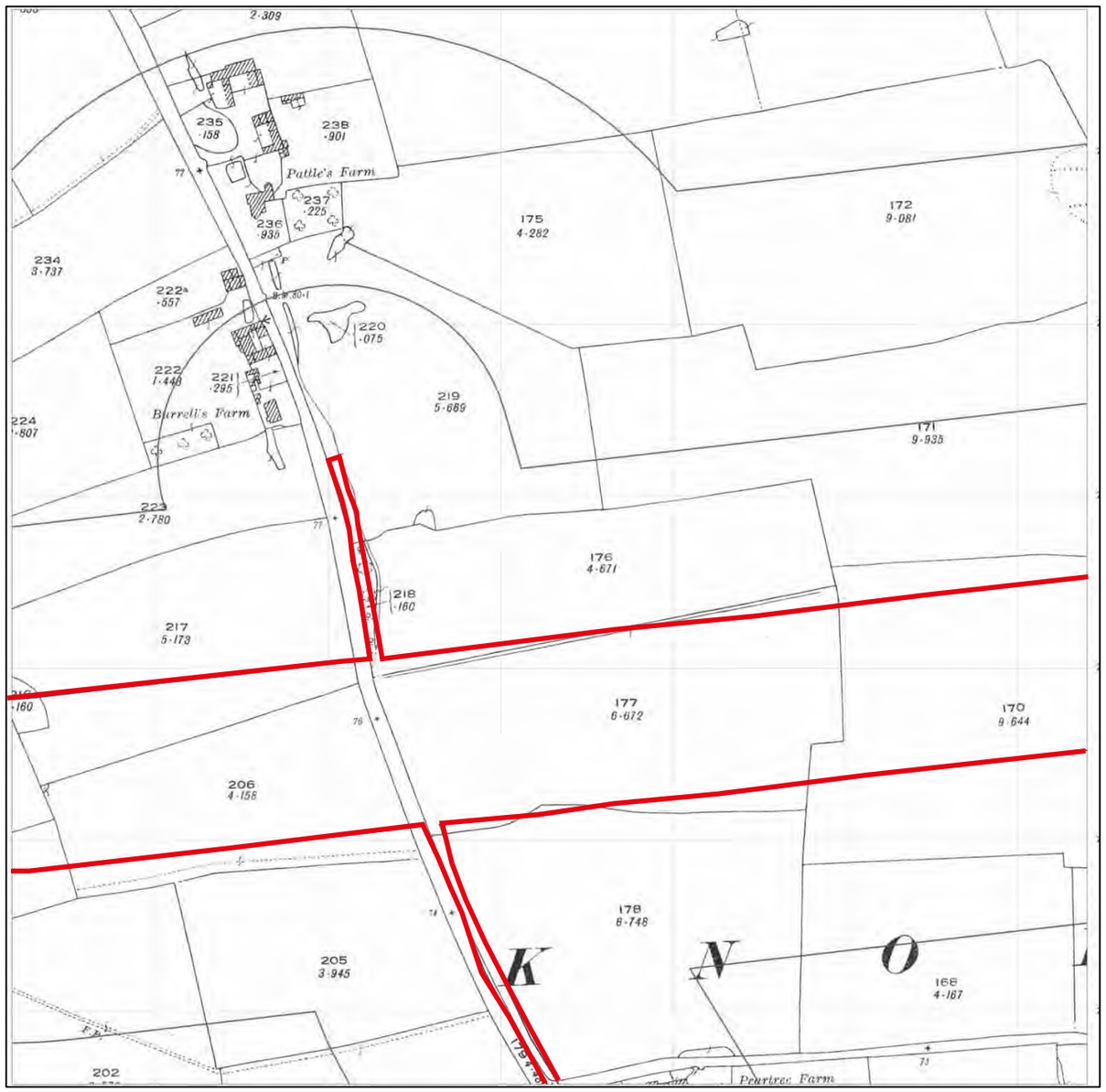
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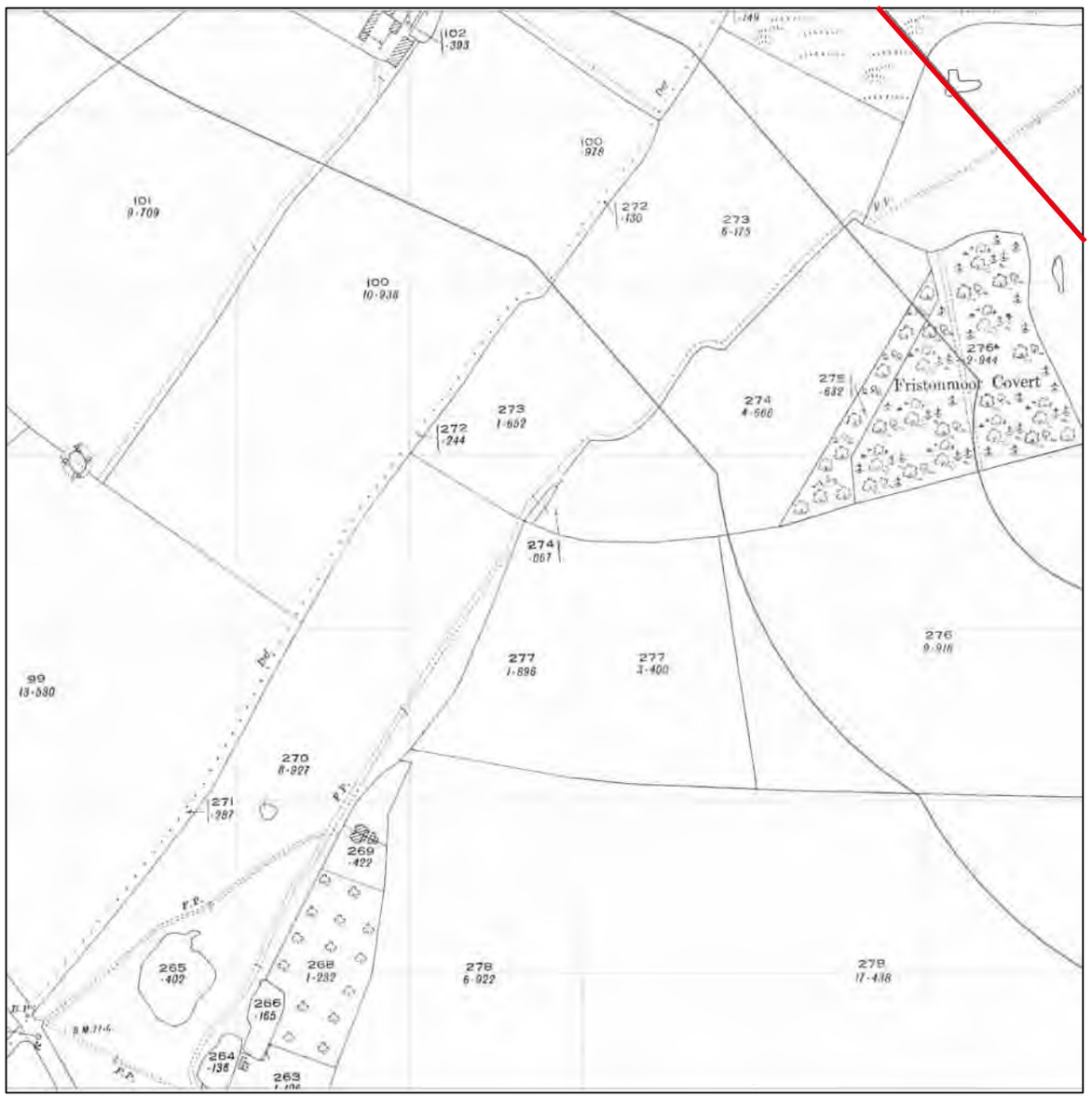
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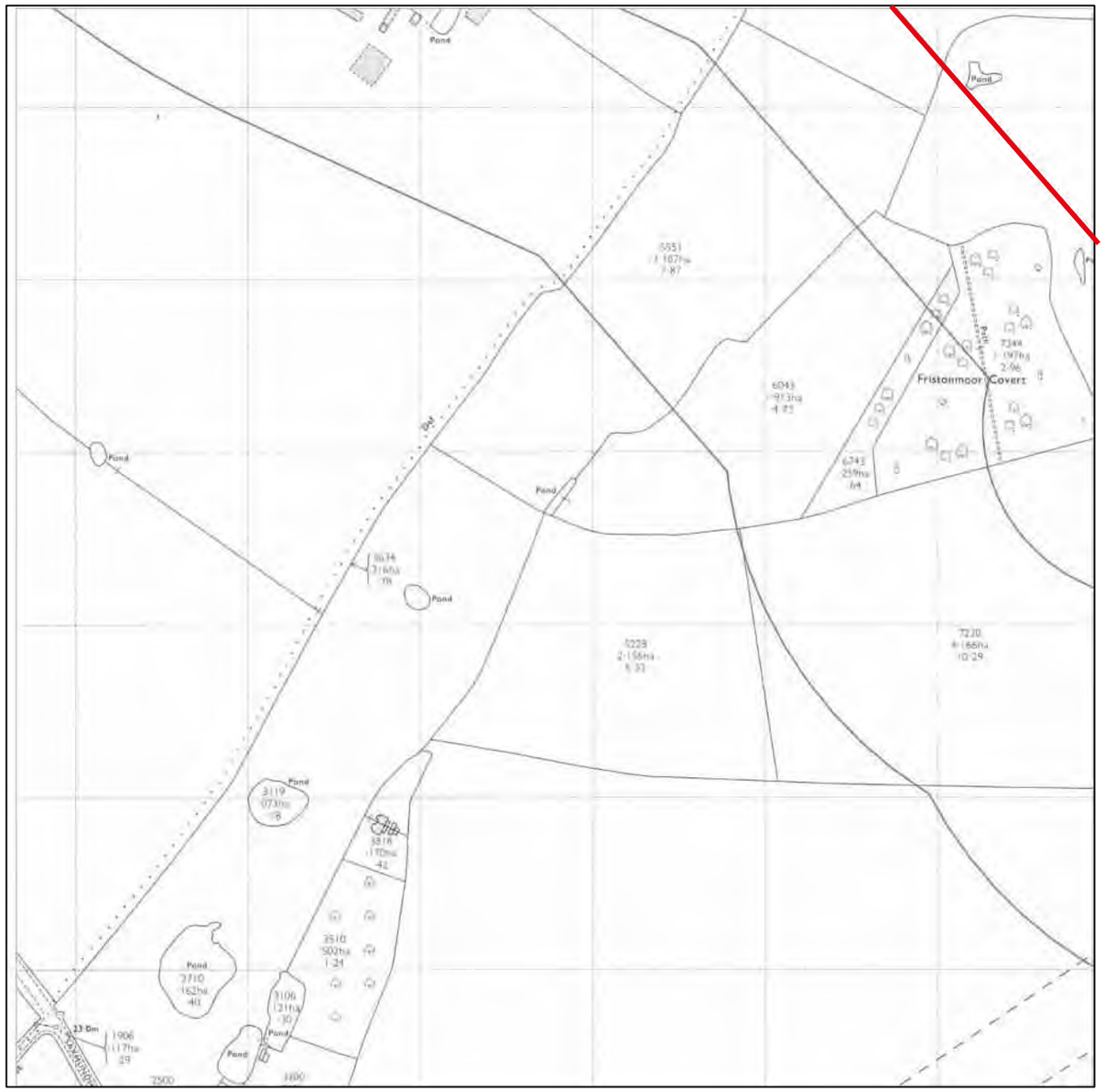
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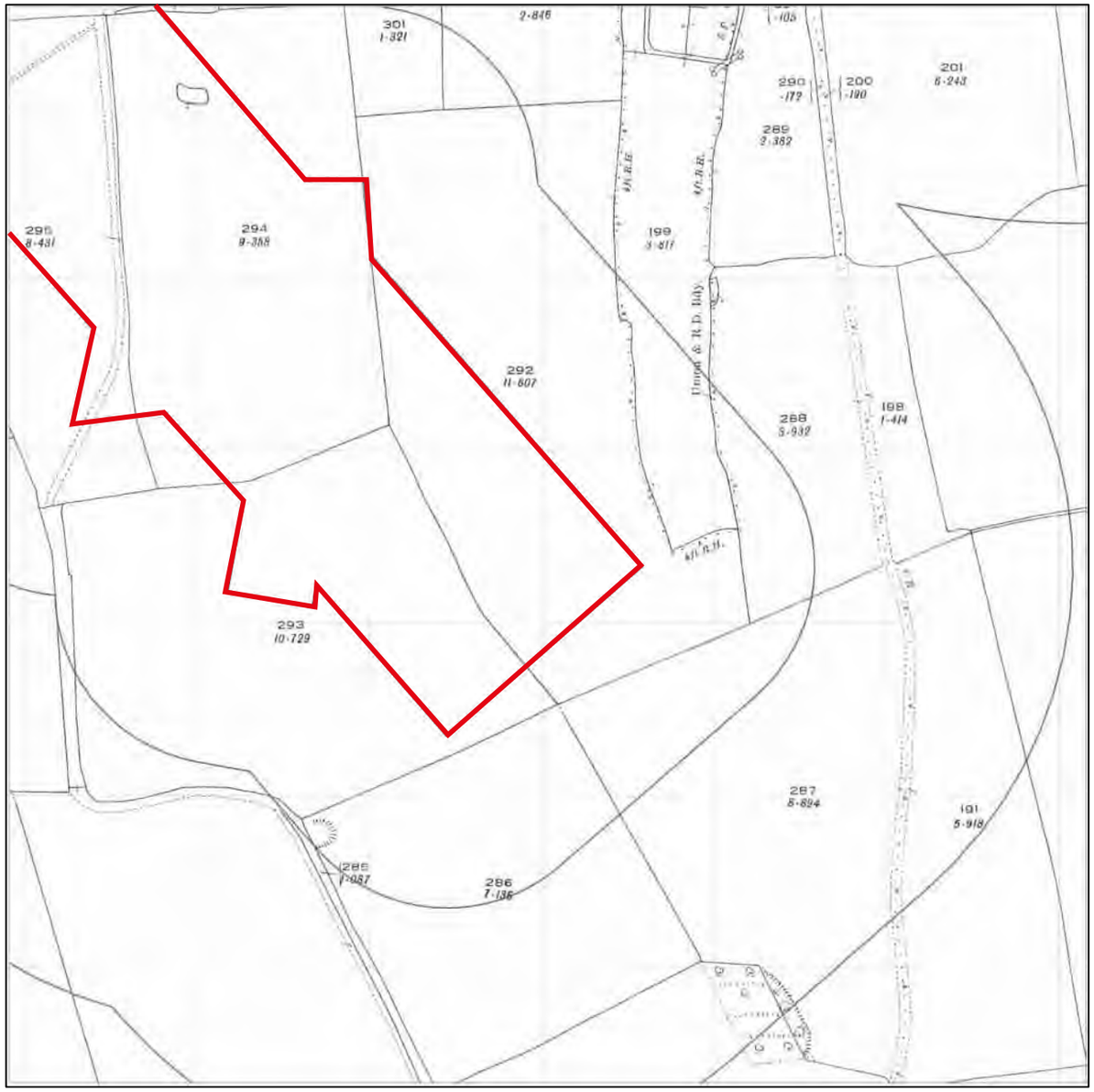
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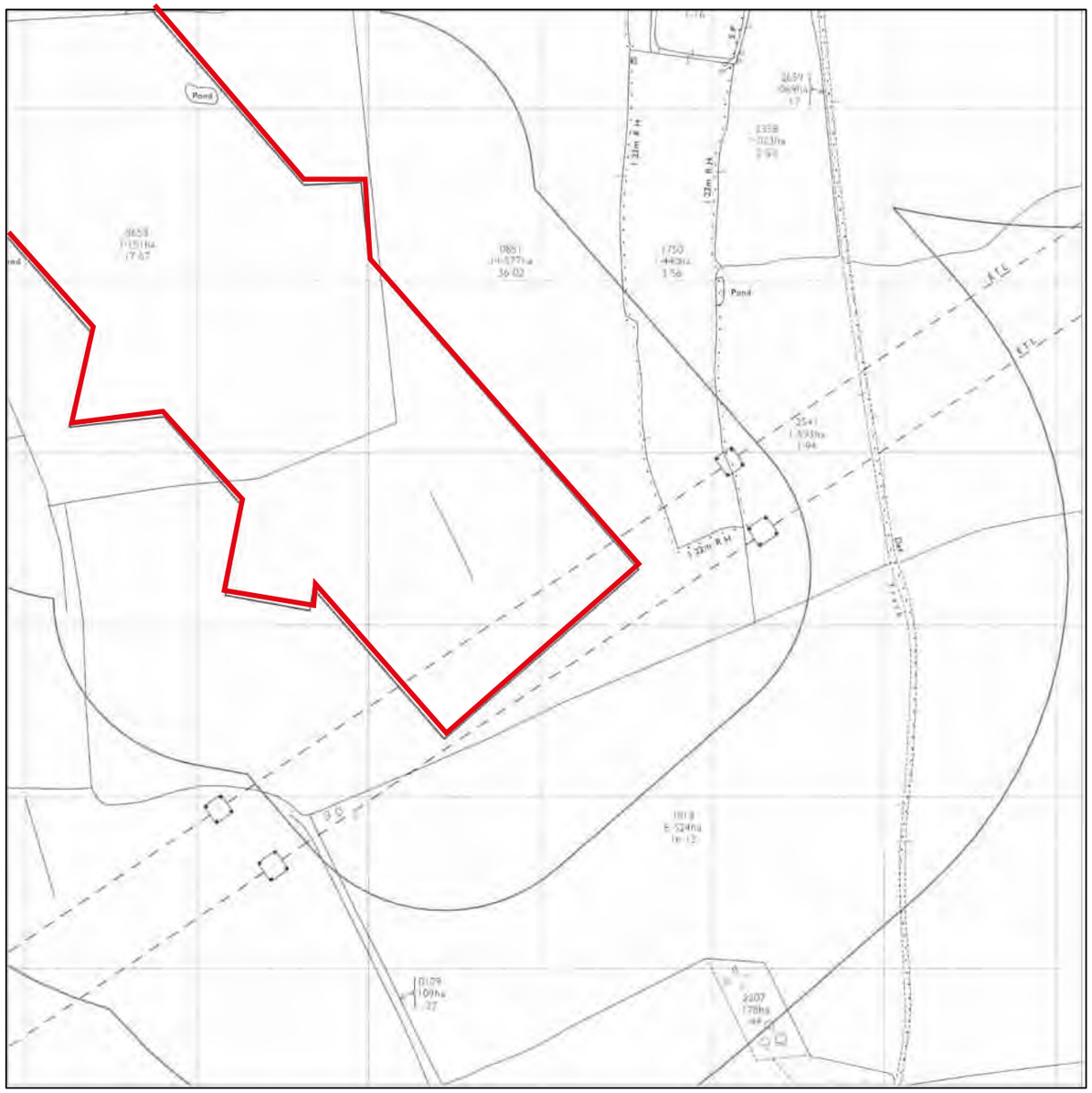
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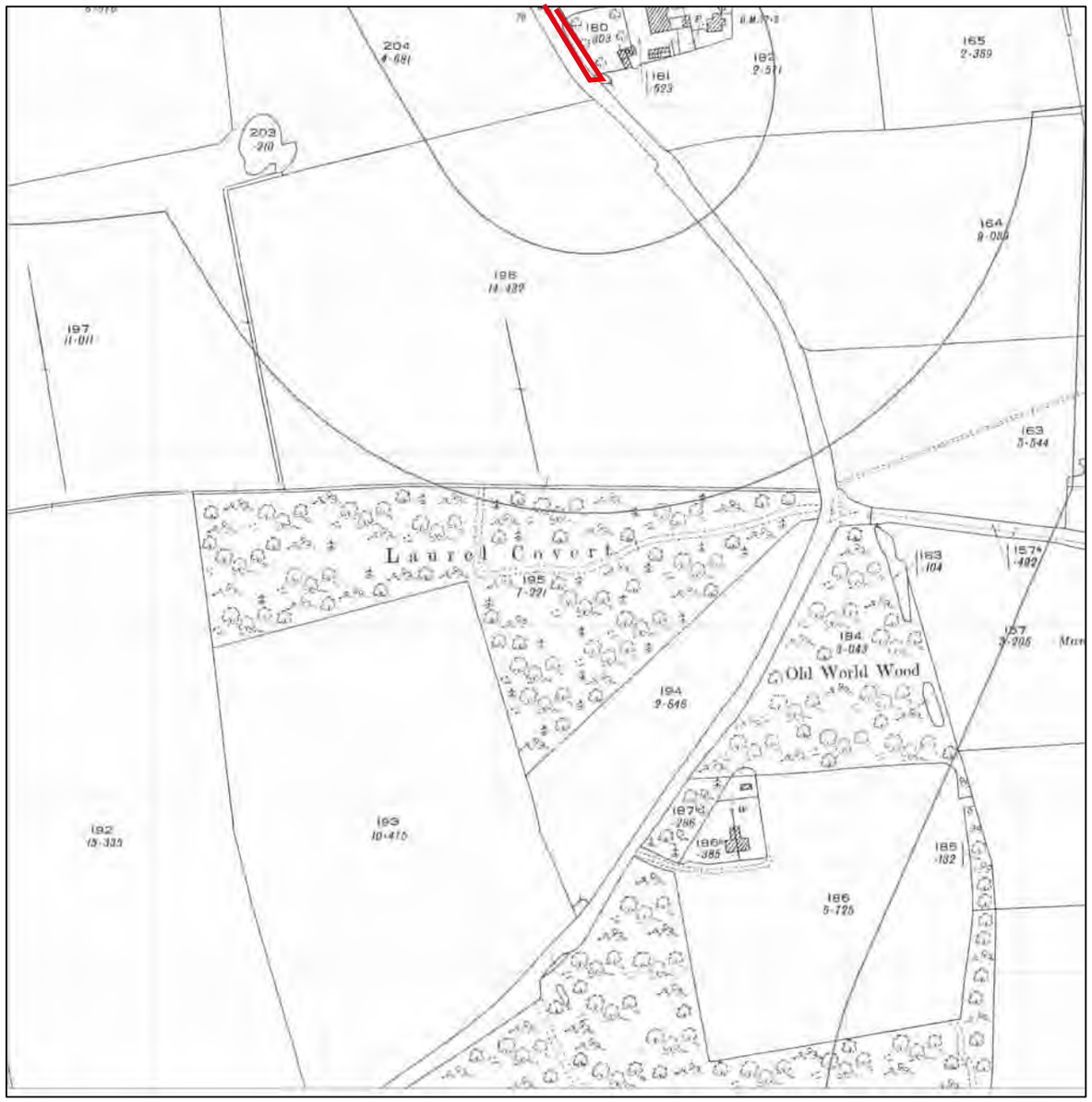
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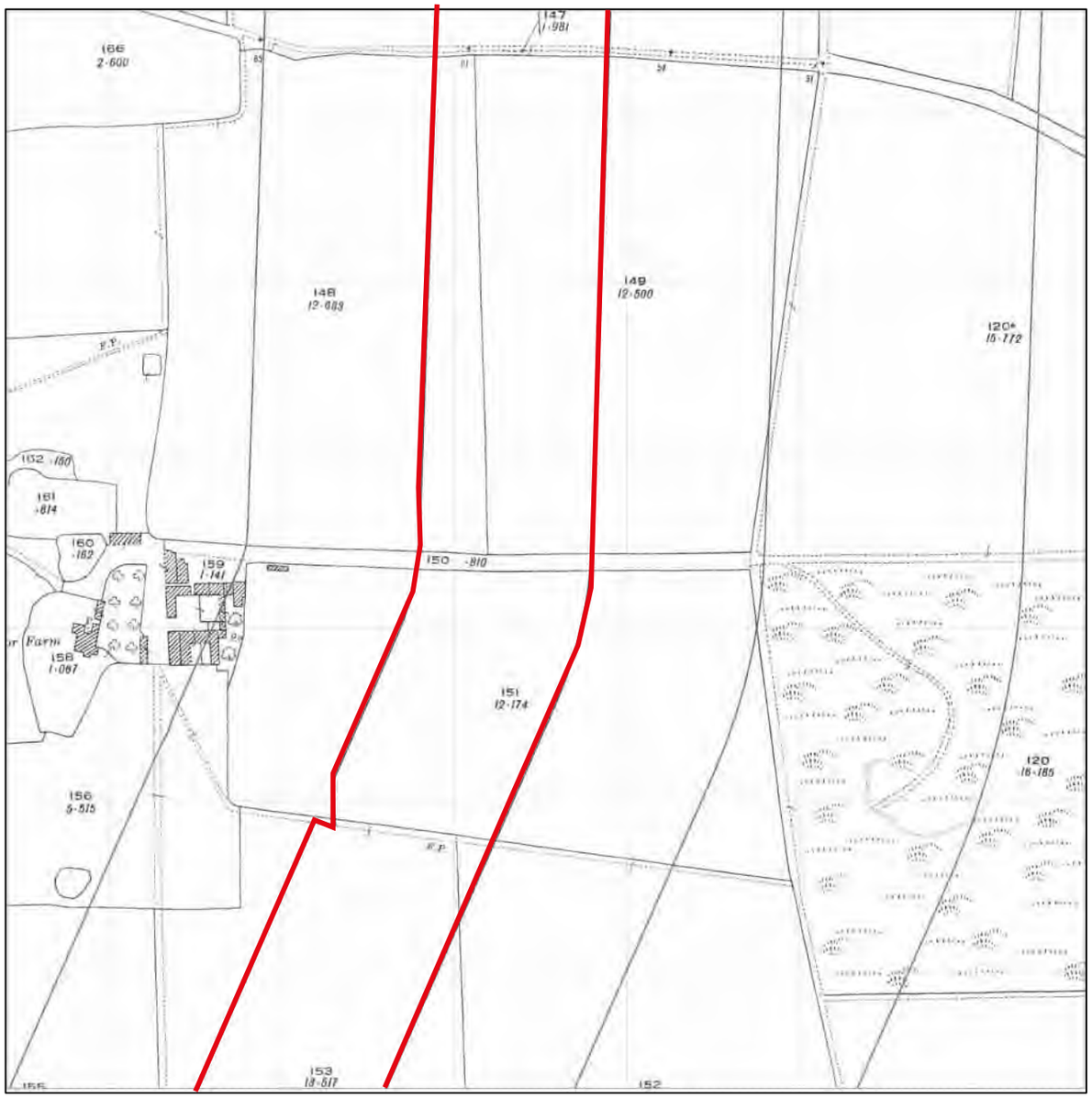
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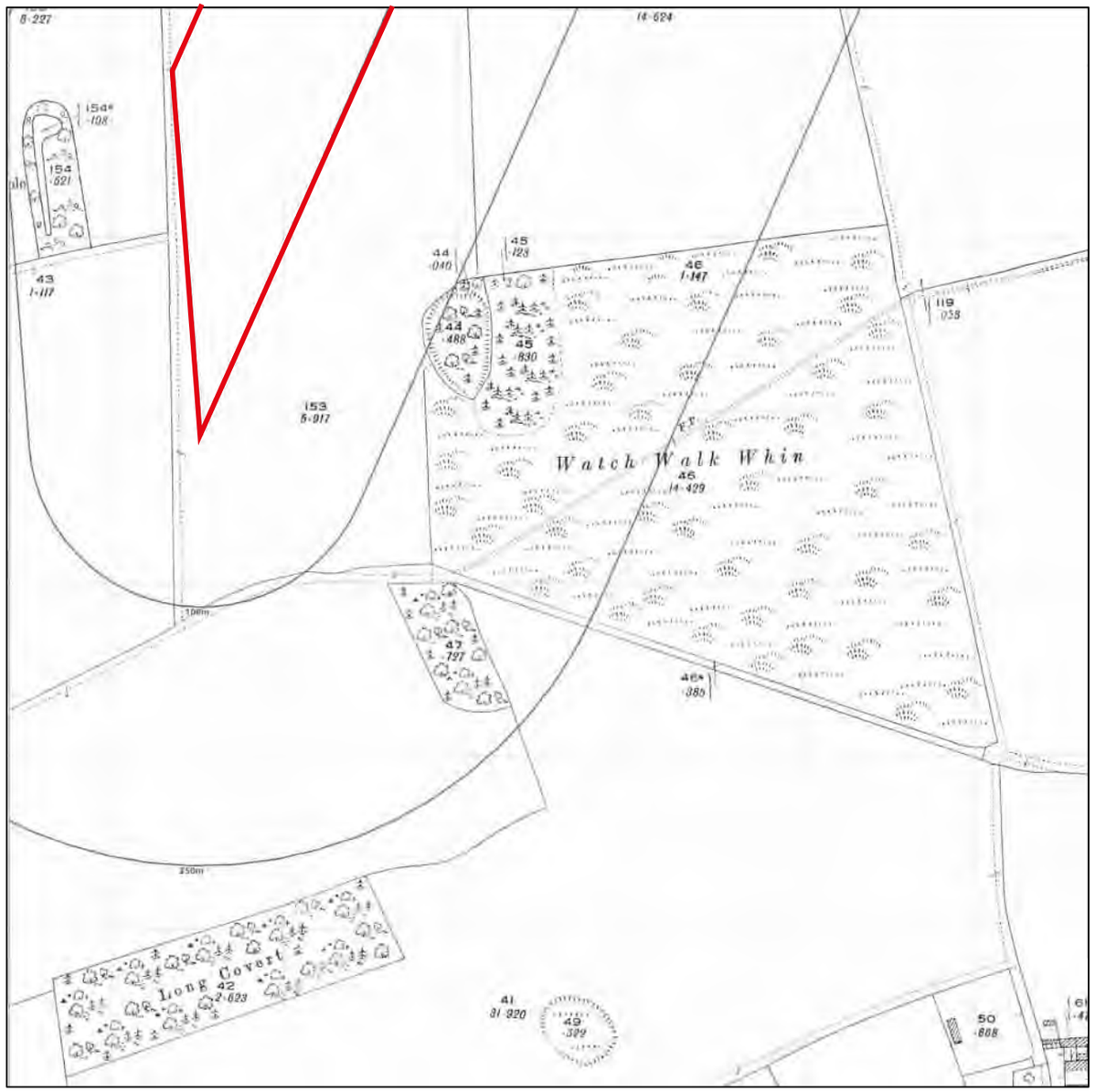


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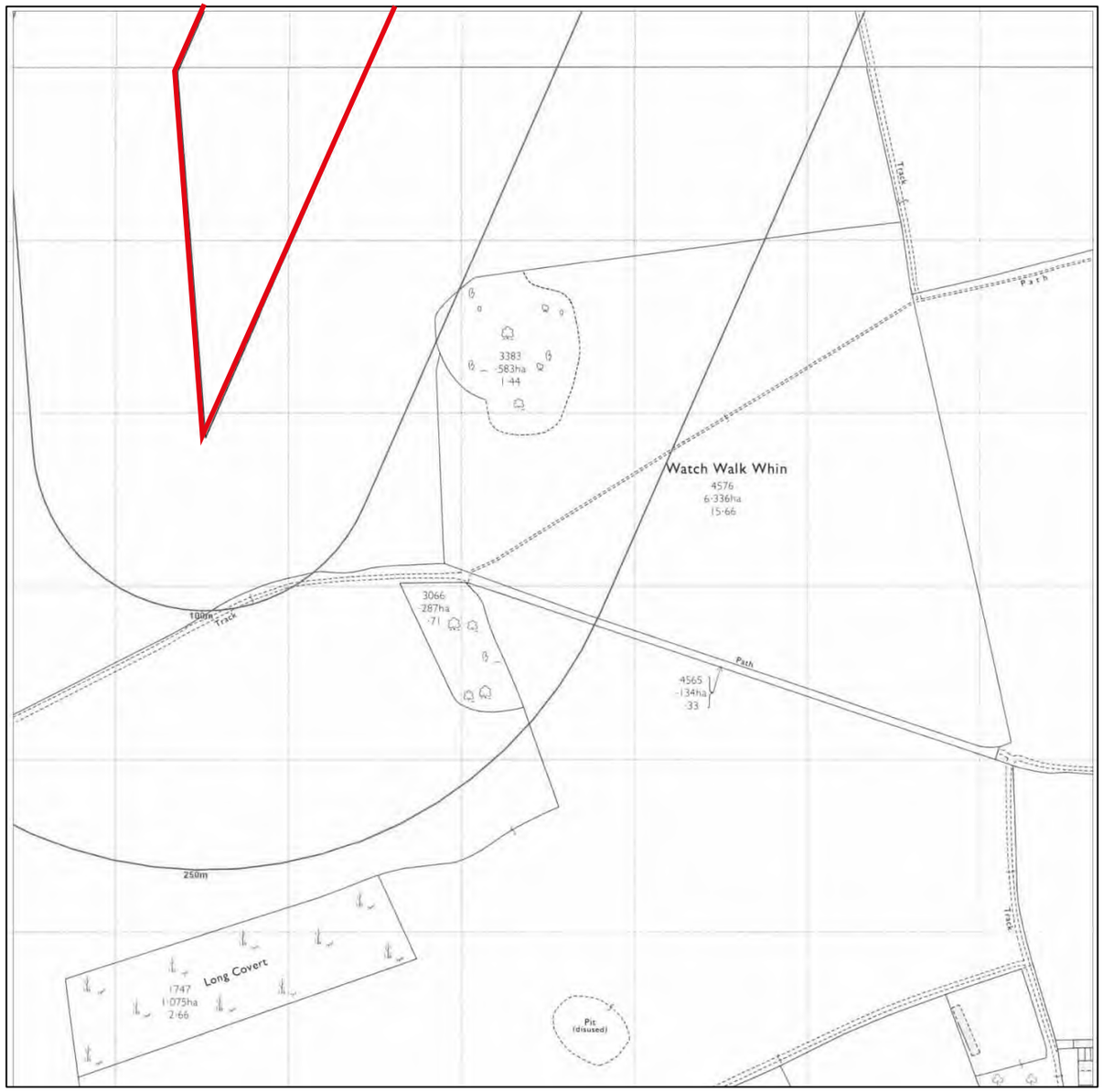
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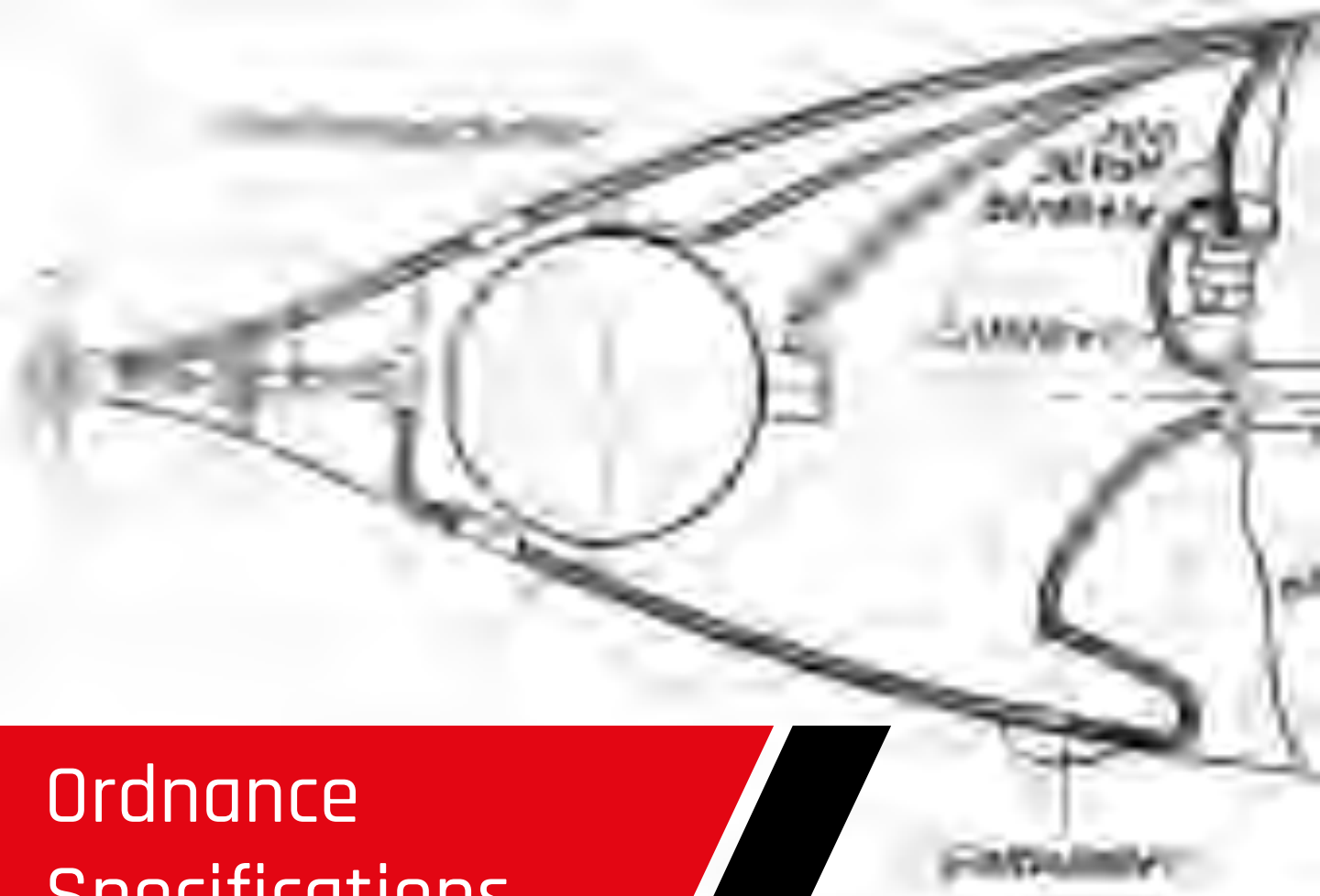
WWII-era RAF Aerial Photography – 28th July 1946



Approximate site boundary

RAF Aerial Collection

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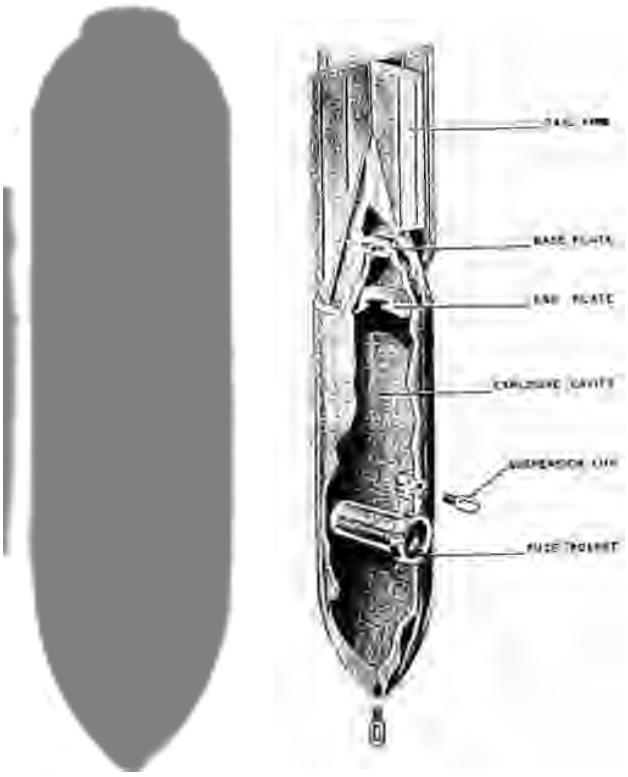


Ordnance Specifications and Information





German Ordnance





Sprengbombe Cylindrisch 50

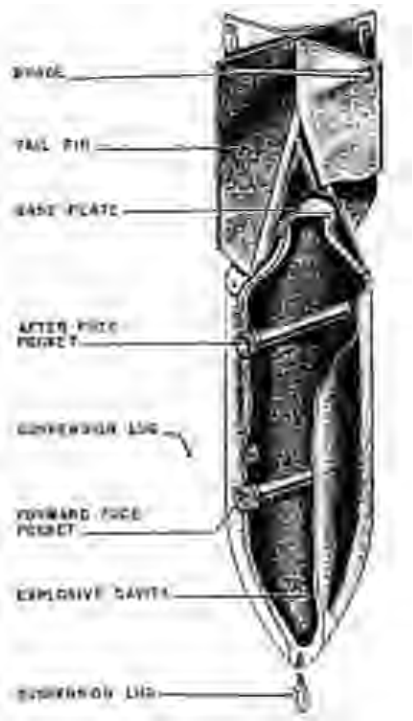
Bomb weight: 40-54kg
Fuze Type: Impact fuze / electro-mechanical time delay fuze
Bomb Dimensions: 1090 x 280mm
Body Diameter: 200mm
Use: Used against lightly damageable materials, hangars, railway rolling stock, ammunition depots, light bridges and buildings up to 3-storeys.
Remarks: The smallest and most common conventional German bomb. Nearly 70% of bombs dropped on the UK were 50kg.

SC50 found on site

In May 2015, an SC50 was found at a building site on Empire Way, Wembley, London. (*Image source: The Guardian*)







Sprengbombe Cylindrisch 250

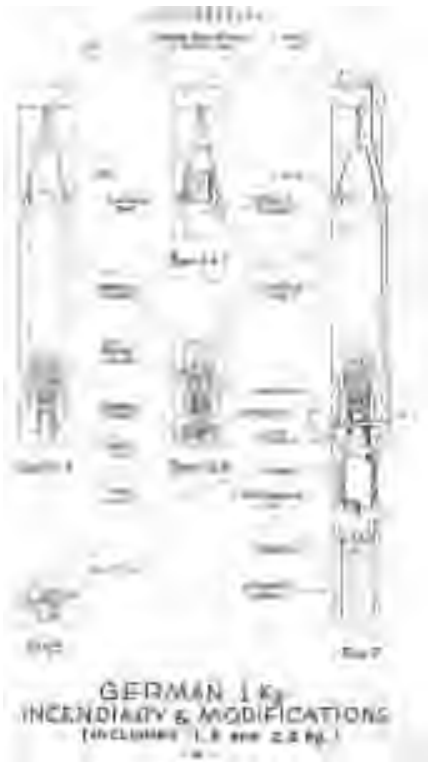
Bomb weight: 245-256k
Explosive Weight: 125-130kg
Fuze Type: Electrical impact / mechanical time delay fuze
Bomb Dimensions: 1640x512mm
Body Diameter: 368mm
Use: Used against railway installations, embankments, flyovers, underpasses, large buildings and below-ground installations.

SC250 found on site

In the year 2000, SafeLane Global discovered an SC250 whilst supervising construction work at Hawkinge, Kent.









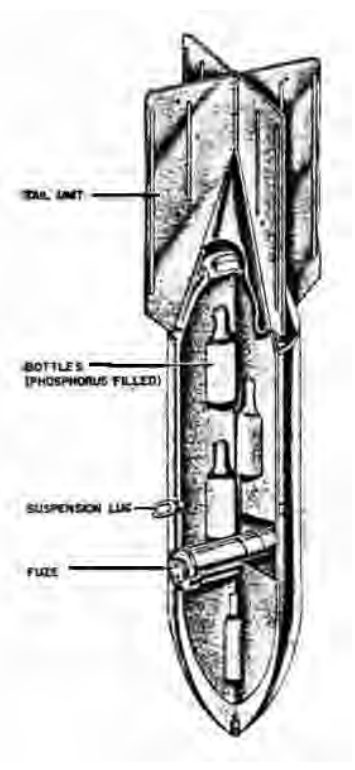
Above: Left – ordinary scaffold pipe, centre - 1kg incendiary bomb, right - incendiary bomb recently found on site in UK

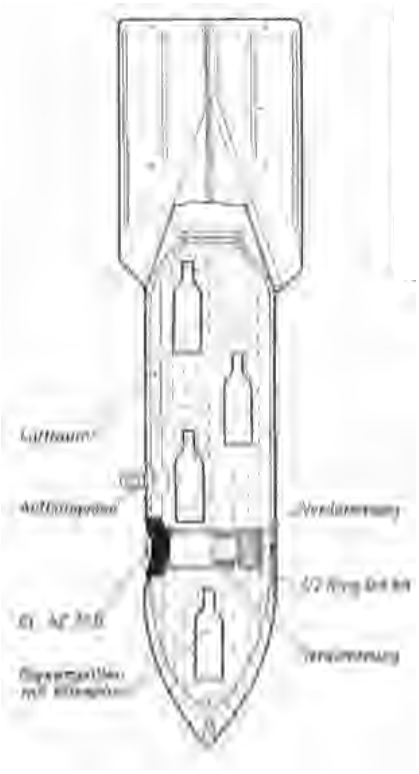
1kg Incendiary Bomb (IB)

Bomb weight: 1.0 & 1.3kg
Filling: 680g Thermite
Fuze Type: Impact fuze
Body Dimensions: 350x50mm
Body Diameter: 50mm
Use: As incendiary – dropped in clusters against towns and industrial complexes
Remarks: Jettisoned from air-dropped containers. Magnesium alloy case. Sometimes filled with high explosive charge.



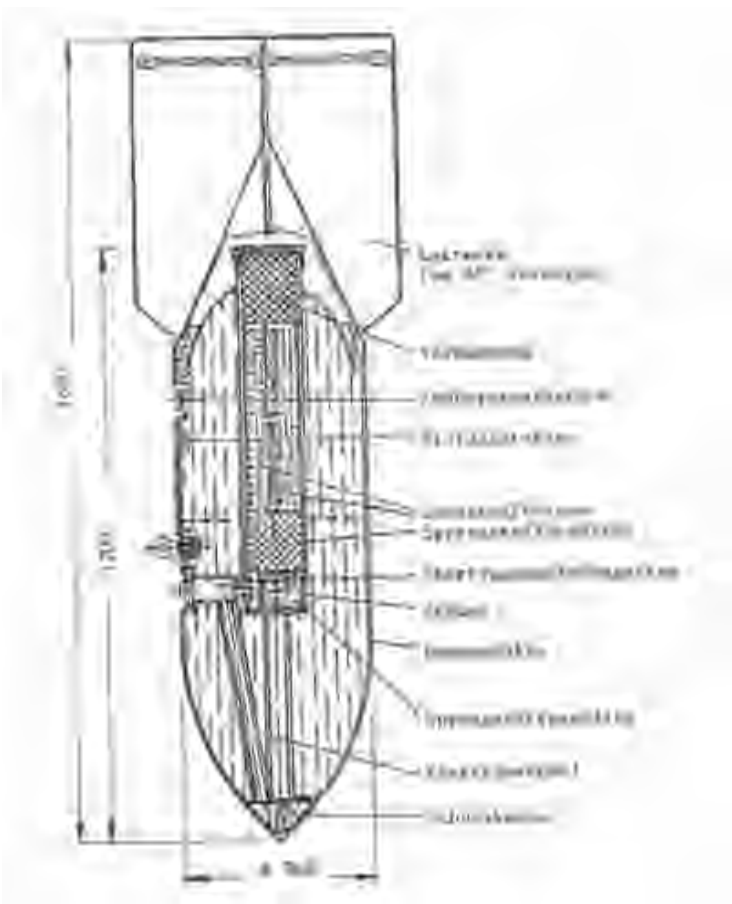






C-50 A Phosphorus Bomb

Bomb Weight: c.41kg
Explosive Weight: 0.03kg
Incendiary Filling: 12kg liquid filling with phosphor igniters in glass phials
Fuze Type: Electrical impact fuze
Bomb Dimensions: 1100x2800mm
Body Diameter: 200mm
Use: Against all targets where an incendiary effect is to be expected
Remarks: Early fill was a phosphorus / carbon disulphide incendiary mixture

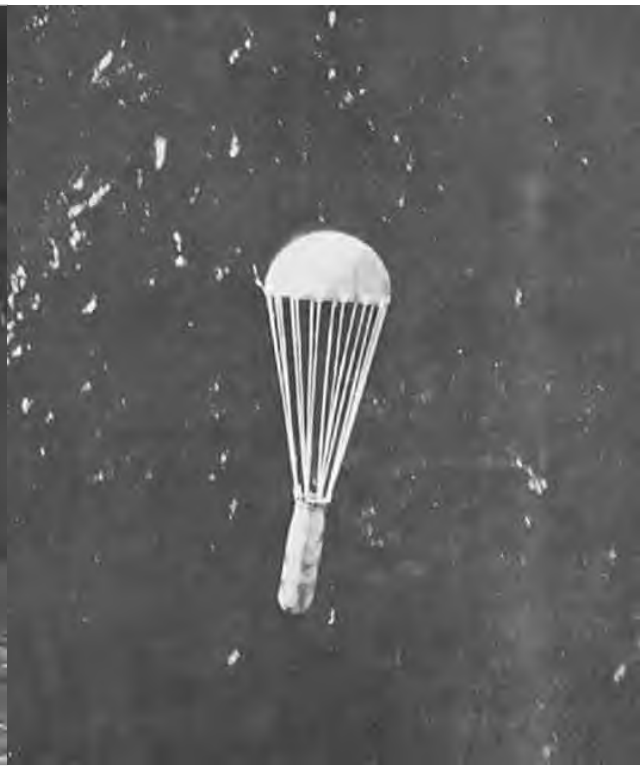




Flam C-250 'Oil Bomb'

Bomb Weight: 125kg
Explosive Weight: 1kg
Flammable Weight: 74kg
Filling: Mixture of 30% petrol and 70% crude oil
Fuze Type: Super-fast electrical impact fuze
Bomb Dimensions: 1650 x 512.2mm
Body Diameter: 368mm
Use: Often used for surprise attacks on living targets, against troop barracks and industrial installations
Remarks: Thin casing – not designed for ground penetration

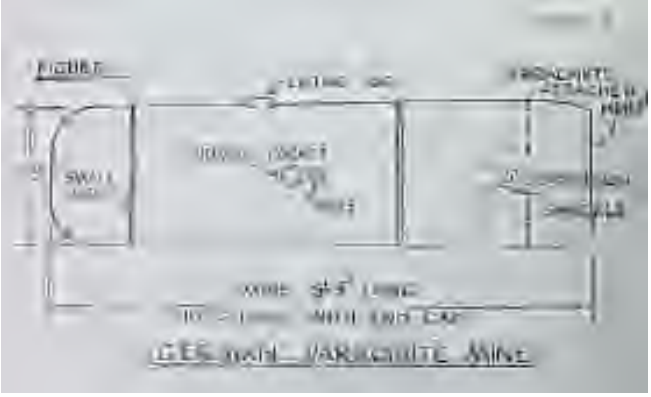


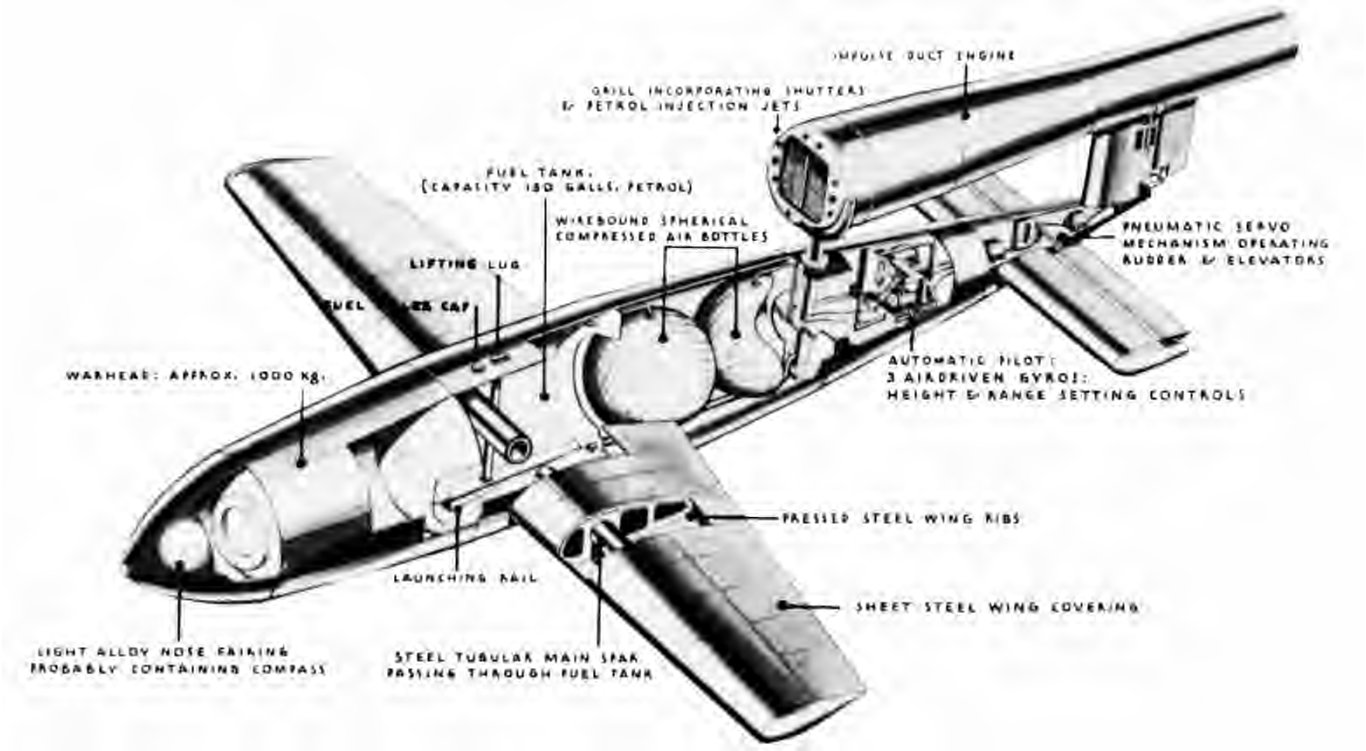


Luftmine A/B 'Parachute Mine'

Bomb Weight: A- 500kg, B – 1000kg
Fuze Type: Mechanical clockwork fuze
Bomb Dimensions: A – 1768mm, B – 2682mm
Use: Capable of creating severe blast damage in built-up areas.
Remarks: Parachute mines were standard German sea mines fitted with a suitable detonator. They were widely used against British cities.





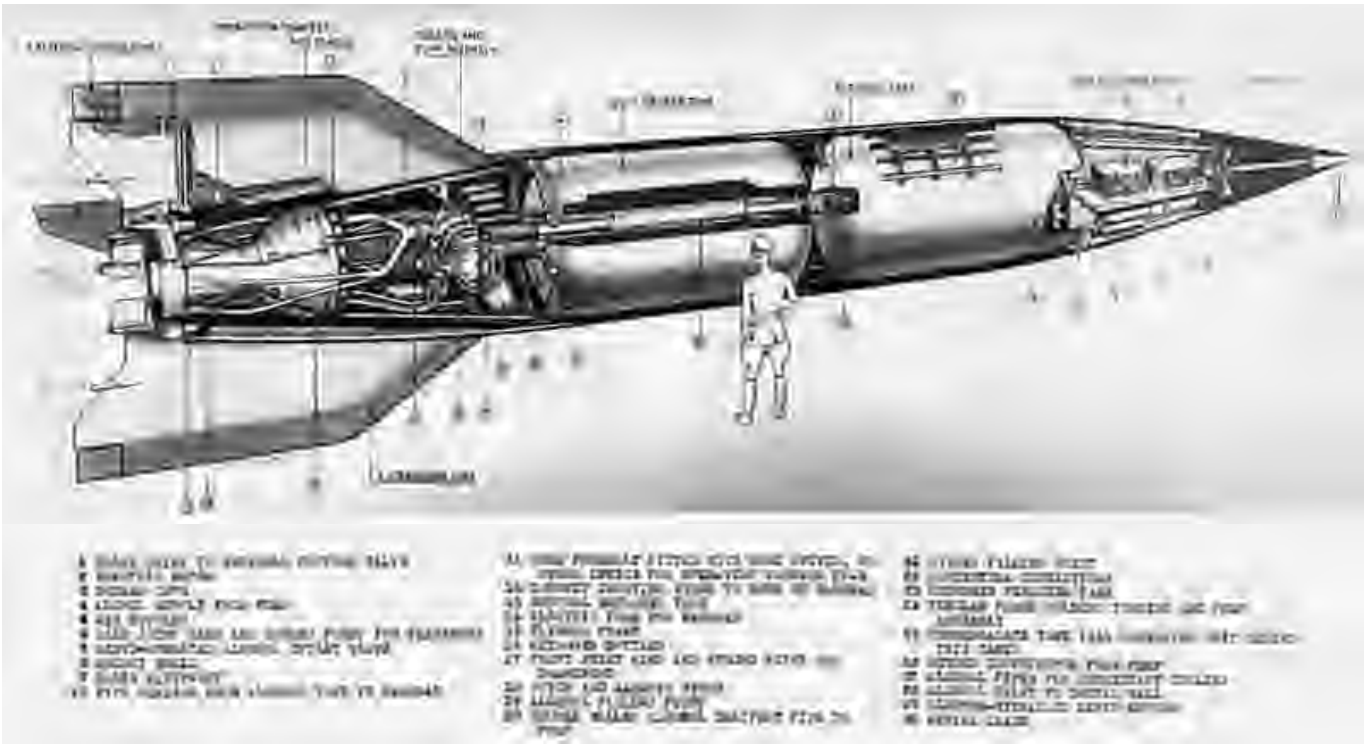


Vergeltungswaffe 1 (V-1) 'Fly' Bomb

Missile Weight: 2,150kg
Fuze Type: Electric Impact Fuze
Missile Length: 8.32m
Width: 5.37m
Range: 250km
Use: Pulsejet-powered guided cruise missile, designed to attack Allied cities.
Remarks: Armed with an 850kg warhead, around 10,000 V-1 flying bombs were fired at England, causing significant damage and killing approximately 6,000 people . There is a negligible risk from unexploded V-1s today, since the remains would have left incontrovertible evidence of the impact.



A V-1 'Fly' Bomb, captured over London seconds before impacting



Vergeltungswaffe 2 (V-2) Rocket

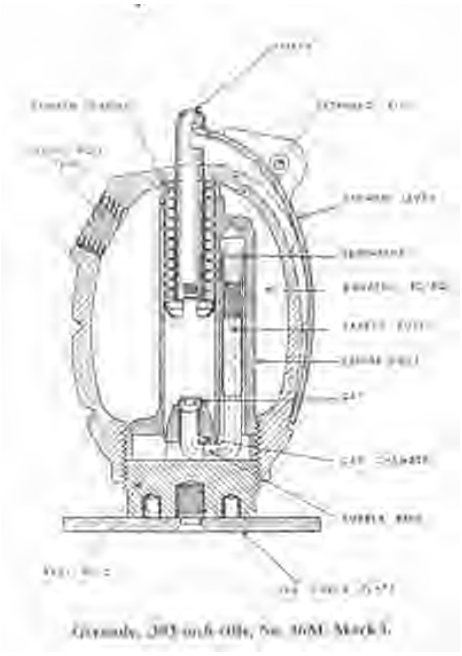
Rocket Weight: 12,500kg
Fuze Type: Electric Impact Fuze
Rocket Length: 14m
Body Diameter: 1.65m
Range: 320km
Use: Long-range ballistic missile, designed to attack Allied cities.
Remarks: Armed with a 975kg warhead and travelling at three times the speed of sound, the V-2 could cause widespread destruction. There is a negligible risk from unexploded V-2s today, since the remains would have left incontrovertible evidence of the impact.





British & Allied Ordnance

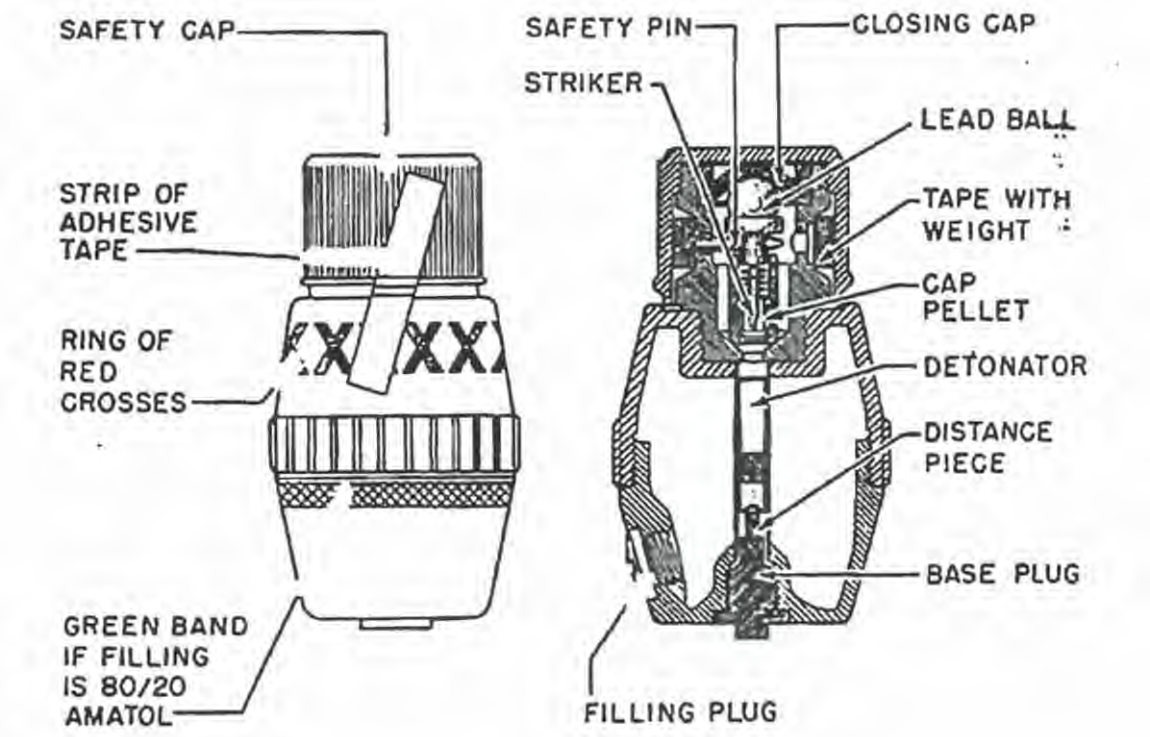




No. 36 “Mills” Grenade

Weight: 0.7kg filled
Type: Hand or discharger, fragmentation
Dimensions: 95 x 61mm
Filling: Alumatol, Amatol 2 or TNT
Remarks: 4 second hand-throwing fuze with approximate range of 30m. First introduced May 1918.



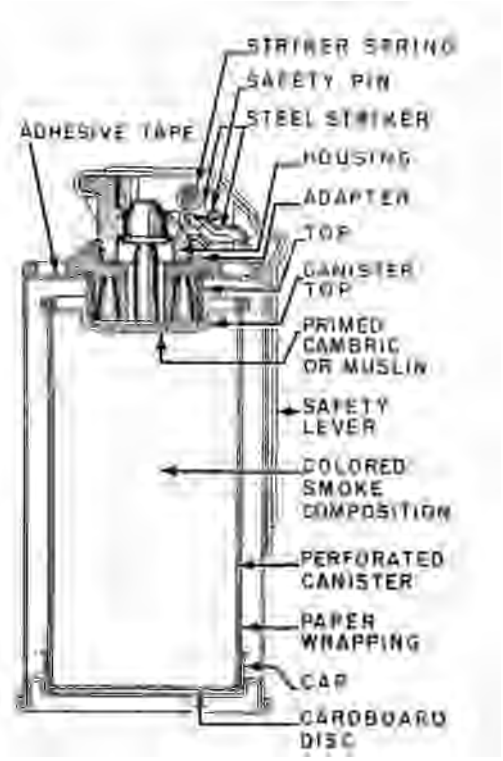


No. 69 Grenade

Weight: 038kg filled
Type: Percussion / Blast
Date Introduced: December 1940
Remarks: Black Bakelite body. Blast rather than fragmentation type. After unscrewing the safety cap, a tape is held when throwing the grenade releasing the safety bolt in the throwing motion. Detection is problematic due to its very low metal content.







Typical Smoke Grenade

Dimensions: Approx. 65 x 115mm
Type: Smoke
Date Introduced: Current MoD issue
Remarks: Smoke grenades are used as ground-to-ground or ground-to-air signalling devices, target or landing zone marking devices, and screening devices for unit movement.





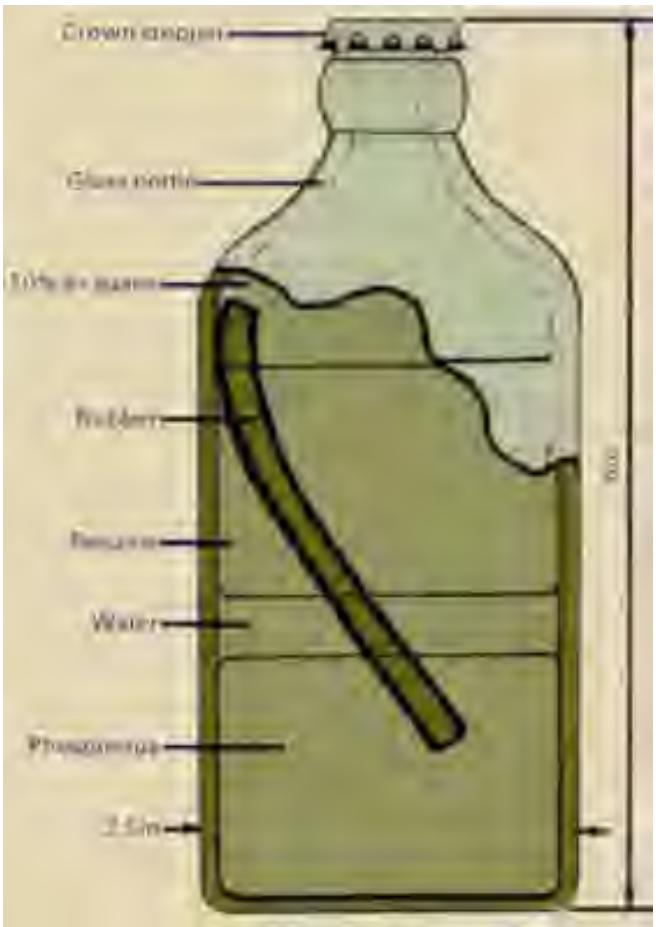


Self-Igniting Phosphorous (SIP) Grenade

Sometimes called the "A&W (Albright & Wilson)" grenade.

The grenade comprised a glass bottle with a total volume of approximately 1 pint. It was filled with white phosphorous, benzene, a piece of rubber and water. Over time, the rubber dissolved to create a sticky fluid which would self-ignite when the bottle broke.

Fired by hand or Northover Projector.

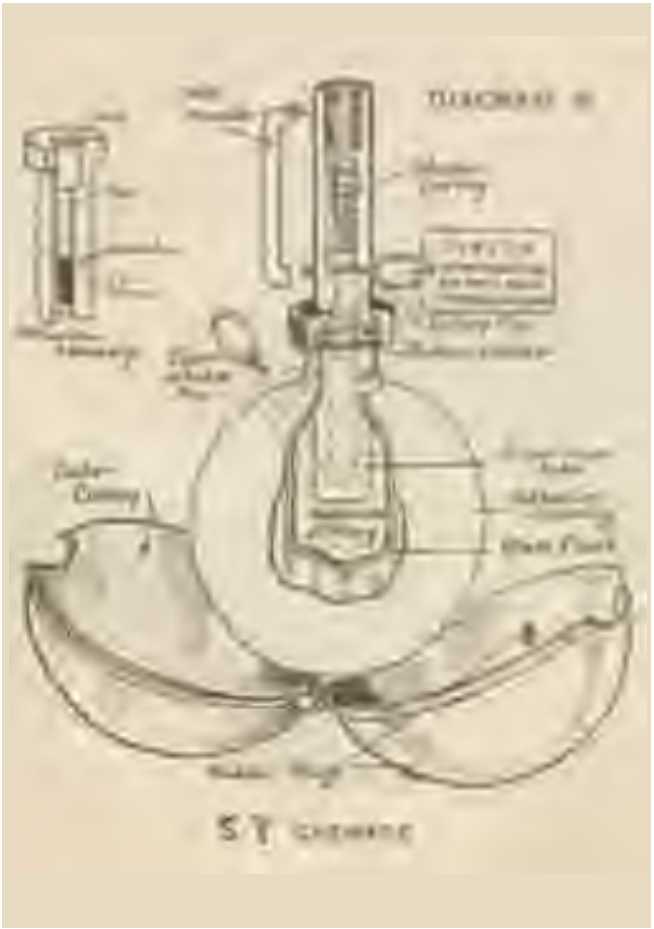






No. 74 Grenade (Sticky Bomb)

Designed as an anti-tank grenade and used by the Home Guard. The grenade consisted of a glass ball on the end of a Bakelite (plastic) handle. Inside the glass ball was an explosive filling whilst on the outside was a very sticky adhesive covering. Until used, this adhesive covering was encased in a metal outer casing.

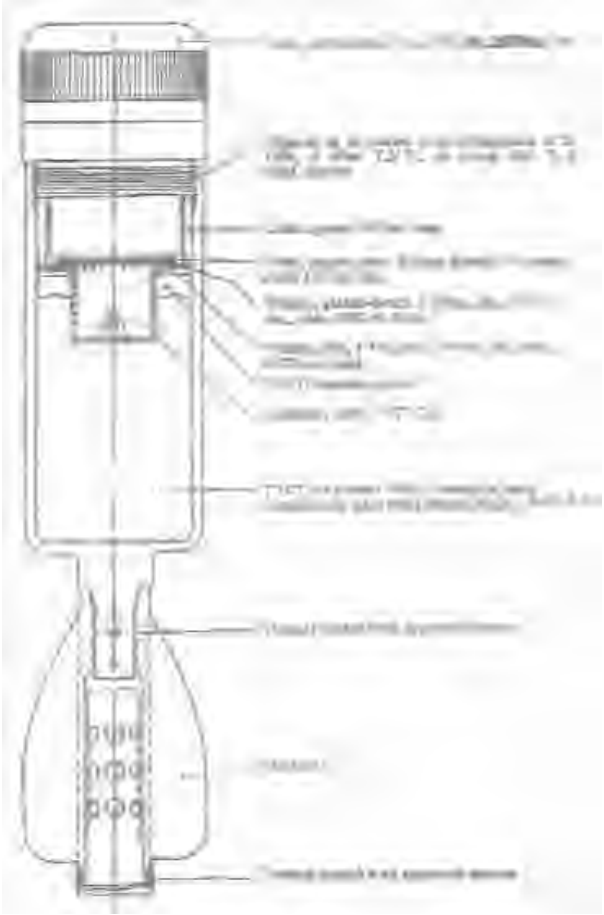






Typical 2" High Explosive Mortar

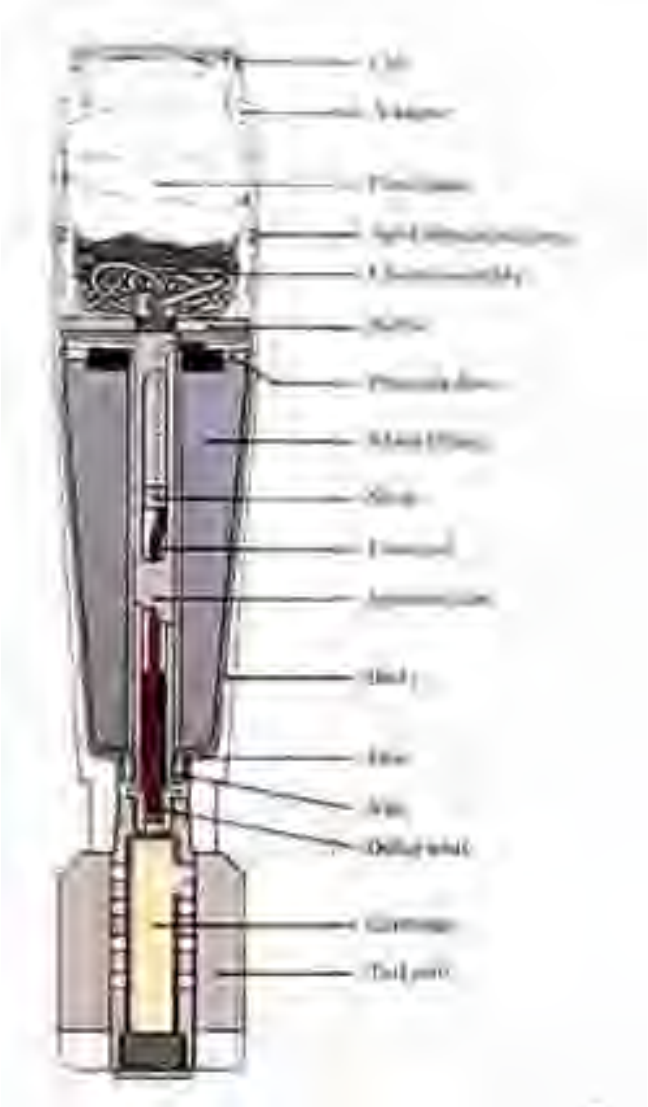
Bomb weight: 1.02kg
Fuze Type: High Explosive
Bomb Dimensions: 51 x 290mm
Filling: 200g RDX/TNT
Remarks: Fitted with an impact fuze which detonates the fuze booster charge (exploder) and, in turn, the high explosive charge. The main charge shatters the mortar bomb body, producing near optimum fragmentation and blast effect at the target.





Typical 2" Illuminating Mortar

Fuze Type: Illuminating
Bomb Dimensions: 51 x 290mm
Filling: Various
Remarks: The expulsion charge ignites and ejects the candle assembly. A spring ejects the parachute from the tail cone. The parachute opens, slowing the descent of the burning candle which illuminates the target.







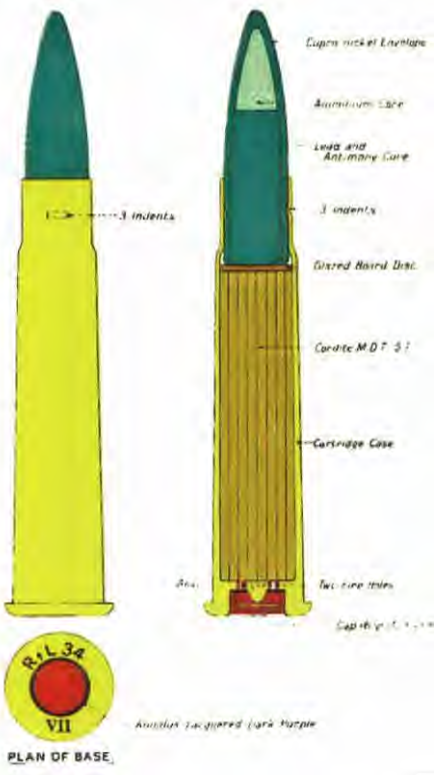


Typical 3" Smoke Mortar

Fuze Type: Smoke
Bomb Dimensions: c.490 x 76mm
Filling: Typically, white phosphorus
Remarks: On impact, the fuze functions and initiates the bursting charge. The bursting charge ruptures the mortar bomb body and disperses the white phosphorous filler. The white phosphorous produces smoke upon exposure to the air.



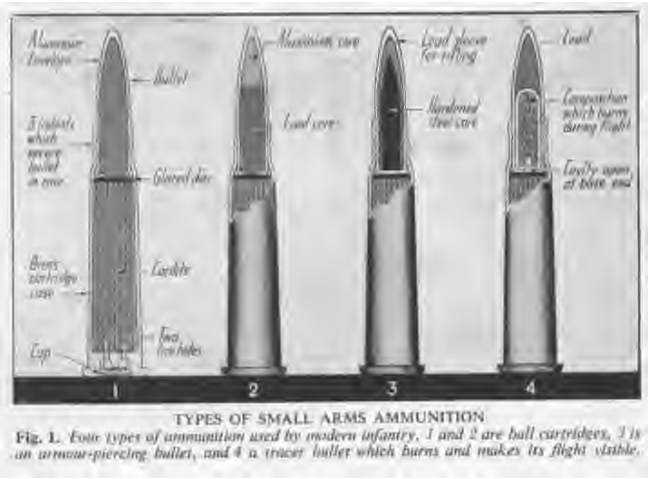




.303" Ammunition

Type: Rifle / machine gun round
Markings: Regular round – none. Tracer round – red primer
Bullet Weight: 150–180g
Dimensions: Total cartridge / projectile length – 182mm
Filling: Regular round – none. Tracer round – small incendiary fill
Threat: Explosive cordite within unspent cartridge
Deployment: Royal Navy, RAF and British Army Light Anti-Aircraft guns, machine guns and rifles. Standard British and Commonwealth military cartridge from 1889 until the end of the 1950s
Remarks: Cartridges are belted or supplied loose in cartons

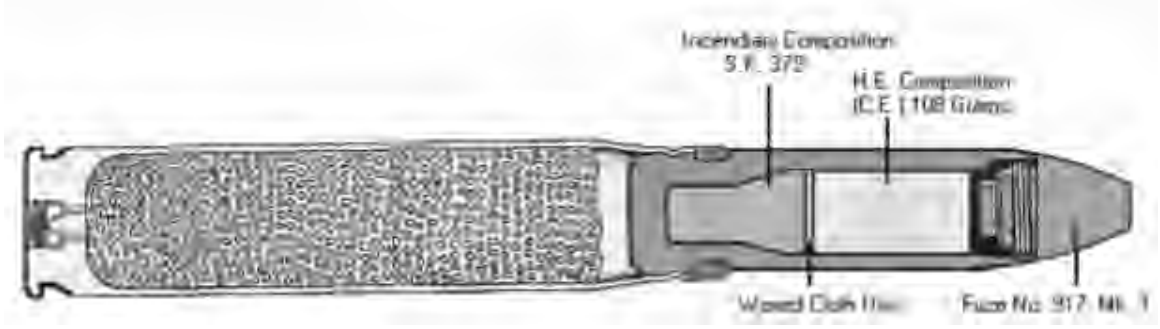




TYPES OF SMALL ARMS AMMUNITION
Fig. 1. Four types of ammunition used by modern infantry. 1 and 2 are ball cartridges, 3 is an armour-piercing bullet, and 4 a tracer bullet which burns and makes its flight visible.

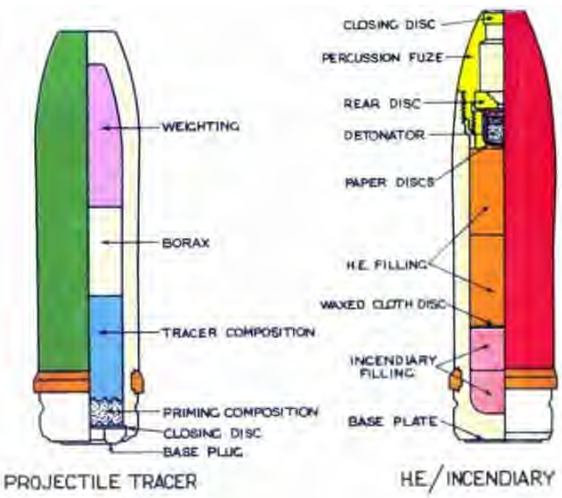






20mm Hispano HEI Ammunition

Type: Live cannon round
Markings: Upper half of projectile painted "buff" colour, lower half is red
Cartridge Weight: 256g
Dimensions: Total cartridge / projectile length – 182mm
Fuze: Contact fuze – No. 253, No. 254 or No. 917
Filling: 108g of contact explosive & 68g of SR. 379 incendiary composition
Threat: Explosives within unspent cartridge as well as the projectile
Deployment: Royal Navy, RAF and British Army Light Anti-Aircraft guns. Also RAF aircraft cannons.
Remarks: Cartridges are belted or supplied loose in cartons.



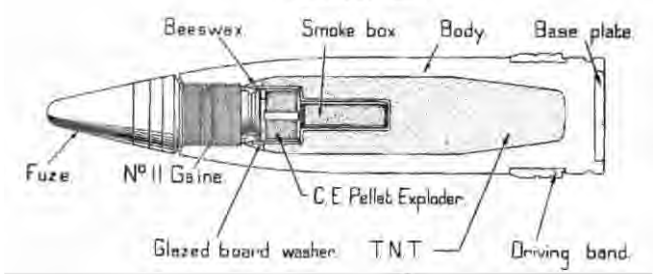
COLOUR IDENTIFICATION		
BRITISH		
NATURE OF SHELL	H.E. FILLING	COLOUR
H.E. TRACER	T.N.T.	
H.E.	T.N.T.	
PROJ. PRACTICE		
PROJ. TRACER		
H.E. INCENDIARY	T.N.T.	
H.E. INCENDIARY TRACER	T.N.T.	



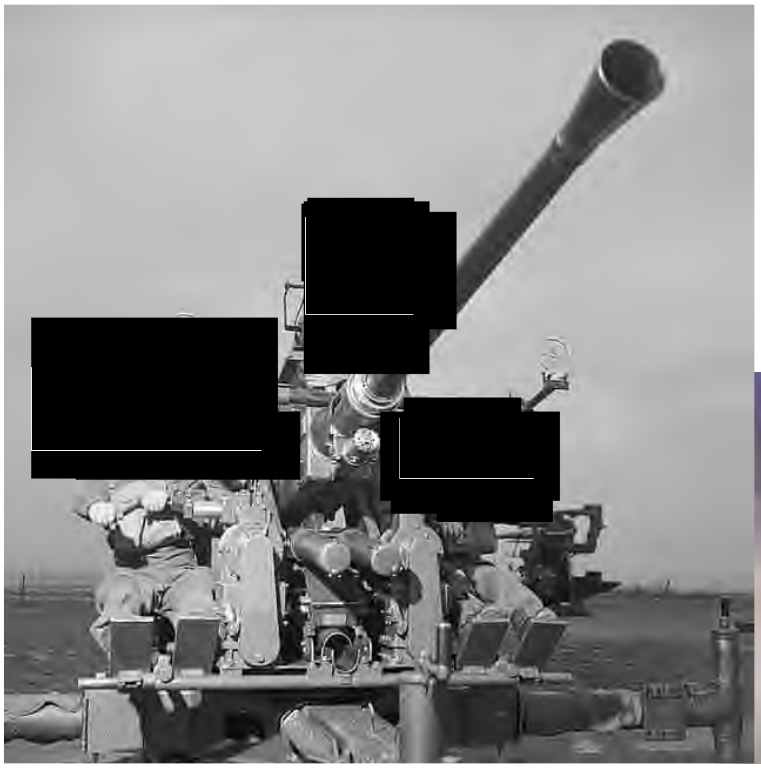
3.7" Anti-Aircraft Projectile

Weight: 12.7kg
Bomb Dimensions: 94 x 360mm
Rate of Fire: 10-20 rounds per minute
Carriage: Typically, white phosphorus
Ceiling: 9,000-18,000m
Muzzle Velocity: 72m/s
Remarks: 4.5" projectiles were also commonly utilized.







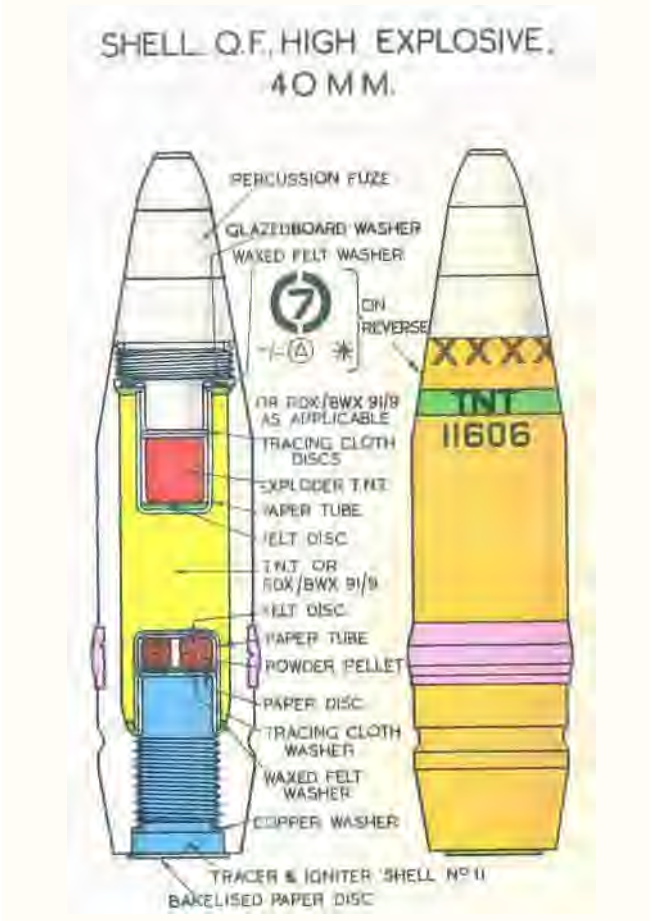




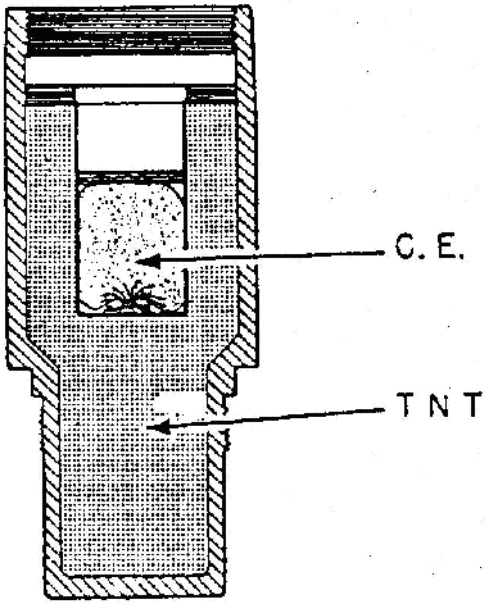


40mm Bofors Gun Projectile

Weight: 0.86kg
Bomb Dimensions: 40mm x 310mm
Rate of Fire: 120 rounds per minute
Ceiling: 7,000m
Muzzle Velocity: 881m/s
Remarks: Mobile batteries – normally few records of where these guns were located.

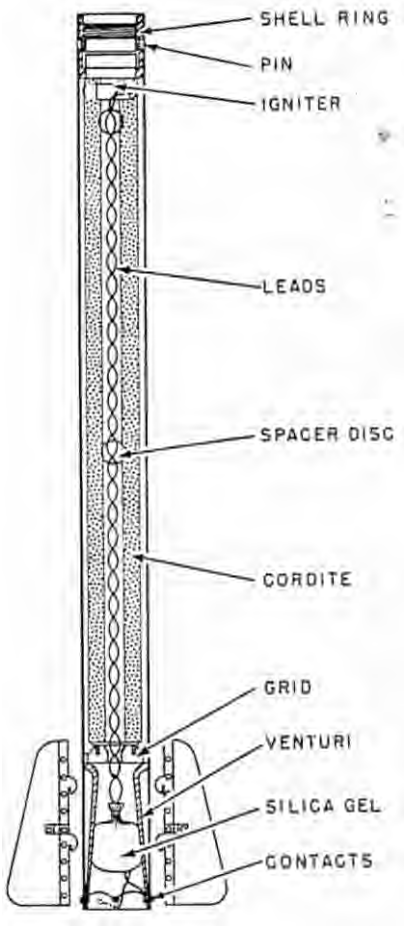






Rockets / Un-rotating Projectiles

Weight: 24.5kg
Bomb Dimensions: 94 x 360mm
Carriage: Typically, white phosphorus
Rate of Fire: 10-20 rounds per minute
Ceiling: 9,000-18,000m
Muzzle Velocity: 72m/s
Remarks: 4.5" projectiles were also commonly utilized.
Top-left image: Home Guard soldiers load an anti-aircraft rocket at a 'Z' Battery



SAFELANE
GLOBAL



Detailed Unexploded Ordnance
Risk Assessment

In Respect Of:
Richborough Option No.1

For:
Mott Macdonald

Report Reference:
9251-4 RA



safelaneglobal.com

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This Report has been produced in compliance with the Construction Industry Research and Information Association guidelines for the preparation of Detailed Unexploded Ordnance Risk Assessments in the management of UXO risks in the construction industry. This report has been compiled using all due diligence and expertise and having made all proper but reasonable enquiries within given time limitations. However, in accepting and implementing the recommendations contained in this report, the client does so strictly at his own risk.

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VAT Registration No. GB 171 628 112

Executive Summary

The Site	
Address:	Brook Lane, Minster, Thanet District, Kent, England, CT12 5DN
OS National Grid Reference:	TR 32624 63211
Site Description:	The site is primarily occupied by farmland, comprising of multiple fields. An access road is present at the site's centre, running from the south-eastern to the north-eastern extent. A railway line is adjacent to the western boundary. Two ponds lie on the north-eastern boundary, furthermore, small inlets of rivers akin to an irrigation system encroach multiple areas throughout the site.
Proposed Works	
The proposed ground investigation would include machine excavated trial pits to 4m bgl and cable percussion boreholes, maximum 30m bgl.	
Risk Assessment	
Risk Assessment Methodology: In accordance with CIRIA guidelines this assessment has carried out research, analysed the evidence and considered the likelihood that the site has been contaminated with unexploded ordnance; that such items remained on site; the risk that they could be encountered during any intrusive works and the consequences that could result. Appropriate risk mitigation measures have been proposed.	
UXO Risk Rating	**MEDIUM from the following UXO types:** • German Air-Delivered HE bombs • Anti-Aircraft Projectiles
The full UXO Risk Assessment and a breakdown of the UXO Risk Level can be found in Section 11.	
Maximum Bomb Penetration Depth	It has been assessed that a 500kg bomb would have had an approximate maximum bomb penetration depth of between **10-12m** below WWII ground level. Penetration depth could potentially have been greater if the UXB was larger (though only 4% of German bombs used in WWII over Britain were of that size). Note that UXBs may be found at any depth between just below the WWII ground level and the maximum penetration depth.

Recommended Risk Mitigation		
Risk Level	**Planned Site Activity**	**Recommendations**
Medium	**Shallow Intrusive Works eg excavations**	• UXO Safety & Awareness Briefing (Toolbox Brief, TBB) • Site Specific Safety Instructions (SSSIs) Training Course • Non-Intrusive (NI) Magnetometer Survey (Greenfield areas only)

		• Target Investigation (Required as a follow-on from NI magnetometer survey) • Explosive Ordnance Disposal (EOD) Engineer to support Site Investigation (SI)
	Deep intrusive works (eg piling)	• UXO Safety & Awareness Briefing (Toolbox Brief, TBB) • Site Specific Safety Instructions (SSSIs) Training Course • Intrusive Magnetometer Survey of pile/borehole positions
In making this assessment and recommending these risk mitigation measures, the proposed works outlined in the 'Scope of the Proposed Works' section were considered. Should the planned works be modified, or additional intrusive engineering works be considered, SafeLane Global should be consulted to see if re-assessment of the risk or mitigation recommendations is necessary.		

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Appendices

Ordnance Specifications and Information

Glossary of Terms

AAA	Anti-Aircraft Artillery
ARP	Air-raid Precautions
BDO	Bomb Disposal Officer
EOD	Explosive Ordnance Disposal (current term for "bomb" disposal)
HE	High Explosive
HG	Home Guard
IB	Incendiary Bomb
Kg	Kilogram
LM	Land Mine
LSA	Land Service Ammunition (includes grenades, mortars, etc.)
Luftwaffe	German Air Force
m bgl	Metres Below Ground Level
MoD	Ministry of Defence
OB	Oil Bomb
PM	Parachute Mine
RAF	Royal Air Force
SI	Site Investigation
SAA	Small Arms Ammunition (small calibre cartridges used in rifles & machine guns)
UXB	Unexploded Bomb
UXO	Unexploded Ordnance
V-1	"Doodlebug" the first cruise type missile, used against London from June 1944. Also known as 'Flying Bomb'
V-2	The first ballistic missile, used against London from September 1944
WWI	First World War (1914 -1918)
WWII	Second World War (1939 – 1945)

Detailed Unexploded Ordnance Risk Assessment

In Respect of

Richborough Option No.1

1 Introduction

Groundsure Ltd, on the behalf of Mott Macdonald has commissioned SafeLane Global to conduct a Detailed Unexploded Ordnance Risk Assessment of the Richborough Option No.1site.

Unexploded Ordnance (UXO) presents a significant risk to construction projects in parts of the UK as a result of enemy actions during the two 20th Century World Wars and historic British and Allied military activity.

One of the legacies of this conflict is buried unexploded air-dropped bombs or anti-aircraft projectiles resulting from the failure of a proportion of the weapons to function as designed. It is commonly accepted that the failure rate of these munitions was approximately 10% and, depending on their shape, weight, velocity and ground conditions, many penetrated the ground and came to rest at depth.

In addition, it is estimated that over 20% of the UK landmass has been used by the military at some point and between 2006 and 2009, over 15,000 items of British / Allied ordnance (excluding small arms ammunition) were found on UK construction sites (CIRIA).

Intensive efforts were made during and after the war to locate and render safe all UXO but, unsurprisingly, not all were found and dealt with. This is evidenced by the regular, on-going discoveries of UXO during construction-related intrusive ground works.

As a result of a generally increased risk awareness amongst professionals involved in ground engineering works and proactive health and safety measures, the risk to life and limb from UXO has been minimised. However even the simple discovery of a suspected device during on-going works can cause considerable disruption to production and cause unwanted delays and expense.

Such risks can be more fully addressed by a better understanding of the site-specific risk and the implementation of appropriate risk mitigation measures.

2 Construction Industry Duties and Responsibilities

2.1 The UK Regulatory Environment

There is no legal requirement for the control and mitigation of UXO risk in the construction industry, but guidelines for good practice, information, and solutions with regards to UXO risk are detailed within CIRIA (C681): Unexploded Ordnance (UXO) A Guide for the Construction Industry.

These guidelines provide the construction industry with a set process for the management of risk associated with UXO, from preliminary risk assessment to implementation of site-specific risk mitigation strategies.

Specific legislation does however exist for health and safety, and is addressed under a number of regulatory instruments, as outlined below.

In practice, the regulations impose a responsibility on the construction industry to ensure that they discharge their obligations to protect those engaged in ground-intrusive operations (such as archaeology, site investigation, drilling, piling or excavations) from any reasonably foreseeable UXO risk.

2.2 The Health and Safety at Work Act, 1974

The Act places a duty of care on an employer to put in place safe systems of work to address, as far as is reasonably practicable, all risks (to employees and the general public) that are reasonably foreseeable.

2.3 Construction (Design and Management) Regulations 2015

CDM 2015 ensures that health and safety within the construction industry is continually improved:

- Works are sensibly planned and managed.
- Competent staff are engaged in the works.
- Risks are identified and managed.
- All parties cooperate and coordinate activities.
- Communication flows to those who require it.
- Workers are consulted and engaged about risks and how they are being managed.

In line with CDM 2015 legislation, SafeLane Global are able to assist parties in their discharge of CDM duties as follows:

- Assist Principal Designers with pre-construction information and risk assessments.
- Assist the Designer with the Designer's Risk Assessment.
- Issue UXO risks as have been identified and manage risks accordingly.
- Assist the Principal Contractor with the construction phase information, in particular risk assessments and mitigation strategies.
- Plan, manage and monitor survey and clearance works under SafeLane Global's control.

2.4 Other Legislation

Other relevant legislation includes the "Management of Health and Safety at Work Regulations 1999" and "The Corporate Manslaughter and Corporate Homicide Act 2007".

3 The Role of the Authorities and Commercial Contractors

3.1 The Authorities

The Police have the responsibilities for co-ordinating the emergency services in the case of an ordnance-related incident on a construction site. They will make an initial assessment (i.e. is there a risk that the find is ordnance or not?) and if they judge necessary impose a safety cordon and/or evacuation and call the military authorities (JSEODOC - Joint Services Explosive Ordnance Disposal Operations Centre) to arrange for investigation and/or disposal. In the absence of an EOD specialist on site many Police Officers will use the precautionary principle, impose cordon(s)/evacuation and await advice from the JSEODOC.

The priority given to the request by JSEODOC will depend on their judgement of the nature of the risk (ordnance, location, people and assets at risk) and the availability of resources. They will respond immediately or as resources are freed up. Depending on the on-site risk assessment the item of ordnance may be removed or demolished (by controlled explosion) in situ. In the latter case additional cordons and/or evacuations may be necessary.

Note, that the military authorities will only carry out further investigations or clearances in very high profile or high-risk situations. If there are regular ordnance finds on a site, the JSEODOC may not treat each occurrence as an emergency and will encourage the construction company to put in place alternative procedures (i.e. the appointment of a commercial contractor) to manage the situation and relieve pressure from the JSEOD disposal teams.

3.2 Commercial Contractors

In addition to pre-construction site surveys and follow-on clearance work, a commercial contractor is able to provide a reactive service on construction sites. The presence of a qualified EOD Engineer with ordnance recognition skills will avoid unnecessary call-outs to the authorities and the contractor will be able to arrange for the removal and disposal of low risk ordnance. If high risk ordnance is discovered actions will be co-ordinated with the authorities with the objective of causing the minimum possible disruption to site operations whilst putting immediate, safe and appropriate measures in place.

4 This Report

4.1 Aims and Objectives

The aim of this report is to examine the possibility of encountering any explosive ordnance during any intrusive works at the site. Risk mitigation measures will be recommended in line with the CIRIA C681 guidelines, to reduce the risk of initiating UXO, and the subsequent risk of harm / damage during the envisaged works to as low as reasonably practicable (ALARP).

4.2 Risk Assessment Methodology

The following issues will be addressed in the report:

- The likelihood that the site was contaminated with unexploded ordnance.

- The likelihood that unexploded ordnance remains on site.
- The likelihood that ordnance may be encountered during any intrusive works.
- The risk that ordnance may be initiated.
- The consequences of initiating or encountering ordnance.

Risk mitigation measures, appropriate to the assessed level of risk and site conditions, will be recommended.

4.3 Approach

In preparing this Unexploded Ordnance Risk assessment, SafeLane Global has considered general and, as far as possible, site specific factors including:

- Evidence of German bombing and delivery of UXBs.
- Site history, occupancy and conditions during WWII.
- The legacy of Allied military activity.
- Details of any known EOD clearance activity.
- The extent of any post war redevelopment.
- Scope of the current proposed works.

4.4 Sources of Information

SafeLane Global has carried out detailed historical research for this Unexploded Ordnance Risk Assessment including accessing military records and archived material held in the public domain and in the MoD.

Material from the following sources has been consulted:

- The National Archives.
- Kent History & Library Centre.
- The GeoInformation Group.
- Groundsure Limited.
- Relevant information supplied by the client.
- Available material from 33 Engineer Regiment (EOD) Archive.
- SafeLane Global's extensive archives built up over many years of research and hands-on Explosive Ordnance Disposal activities in the UK.
- Open sources such as published books, local historical records and the internet.

4.5 Reliability of Historical Records

4.5.1 General Considerations

This report is based upon research of historical evidence. Whilst every effort has been made to locate all relevant material SafeLane Global cannot be held responsible for any changes to the assessed level of risk or risk mitigation measures based on documentation or other information that may come to light at a later date.

The accuracy and comprehensiveness of wartime records is frequently difficult or impossible to verify. As a result, conclusions as to the exact location, quantity and nature of the ordnance risk can never be definitive but must be based on the accumulation and careful analysis of all accessible evidence. SafeLane Global cannot be held responsible for inaccuracies or gaps in the available historical information.

4.5.2 Bombing Records

During WWII, considerable efforts were expended in recording enemy air raids. Air Raid Precautions (ARP) wardens were responsible for making records of bomb strikes either through direct observation or by post-raid surveys. However, their immediate priority was to deal with casualties and limit damage, so it is to be expected that records are often incomplete and sometimes contradictory. Record keeping in the early days of bombing was not comprehensive and details of bombing in the early part of the war were sometimes destroyed in subsequent attacks. Some reports may cover a single attack, others a period of months or the entire war.

Records of raids that took place on sparsely or uninhabited areas were often based upon third party or hearsay information and are not always reliable; records of attacks on military or strategic targets were often maintained separately from the general records and have not always survived.

5 The Site and Scope of Proposed Works

Site Address	Brook Lane, Minster, Thanet District, Kent, England, CT12 5DN	
OS National Grid Reference	TR 32624 63211	
Site Description	The site is primarily occupied by farmland, comprising of multiple fields. An access road is present at the site's centre, running from the south-eastern to the north-eastern extent. A railway line is adjacent to the western boundary. Two ponds lie on the north-eastern boundary, furthermore, small inlets of rivers akin to an irrigation system encroach multiple areas throughout the site.	
Proposed Works	The proposed ground investigation would include machine excavated trial pits to 4m bgl and cable percussion boreholes, maximum 30m bgl.	
References	**Site Location Maps**	**Annex A**
	Recent Aerial Photograph	**Annex B**

6 Ground Conditions

Data Source		Description
British Geological Survey Borehole	Borehole Reference	TR36SW97
	Location	Richborough, located on the south-eastern extent of the site.
	Date	24/02/92
	Recorded Shallow Geology	• 0.4m of Topsoil • 1.7m of Clay (silty and soft) • 3.0m of Clay (soft) • 19.0m of Clay (becomes stiff towards 8.50m to very stiff at the end of the borehole)
British Geological Survey Mapping	Superficial Deposits	Thanet Formation – Sand, Silt, and Clay.
	Bedrock	Tidal Flat Deposits – Clay and Silt.

7 Pre and Post-WWII OS Mapping

	Date	Observations	Reference	Source
Pre-WWII	1938	• The site is occupied by open ground with no apparent use, likely to be farmland, indicated by two small structures in the site's centre. • Numerous irrigation channels can be identified on site. • A railway runs adjacent to the site's western boundary.	Annex C-1	Groundsure Ltd
Post-WWII	1957	• The site and surrounding vicinity appear consistent with conditions present in pre-war OS mapping. • There appears to be no evidence of clearance, redevelopment, or ruins within the vicinity of the site. • These factors can often be indicators of bomb damage on historical OS mapping. • However, due to the lack of development within the area it is unlikely that these indicators would be present.	Annex C-2	Groundsure Ltd

8 The Threat from Aerial Bombing

8.1 General Bombing History of Kent

8.1.1 First World War

During WWI, Kent suffered extensive aerial bombardment from zeppelin airships and fixed-wing aircraft. The first attack by the German Air Force was launched against Dover on the 21st December 1914 using naval seaplanes.

Bombing continued in Kent throughout the war; areas such as Ashford, Canterbury, Dover, Folkestone, Gravesend, Margate, Maidstone and Sheerness suffered particularly severe raids. The last raid on the county was on the night of the 19th May 1918 when a total of 14.55 tonnes of bombs were dropped on London, Faversham and Dover. Ramsgate is situated approximately 3km east of the site and gained the reputation as the most bombed seaside town in WWI. The town suffered from both aerial bombing and naval bombardment during WWI, with Zeppelin's scattering a number of bombs in all districts in the area.

WWI bombs were generally smaller than those used in WWII and were dropped from a lower altitude, resulting in limited UXB penetration depths. Aerial bombing was often such a novelty at the time that it attracted public interest and even spectators to watch the raids in progress. For these reasons, there is a limited risk that UXBs passed undiscovered. When combined with the relative infrequency of attacks and an overall low bombing density the risk from WWI UXBs is considered low and will not be further addressed in this report.

8.1.2 Second World War

At the start of WWII, the Luftwaffe planned to destroy key military installations, including RAF airfields and Royal Navy bases, during a series of daylight bombing raids. After the Battle of Britain these tactics were modified to include both economic and industrial sites. Targets included dock facilities, railway infrastructure, power stations, weapon manufacturing plants and gas works. As a result of aircraft losses, daylight raids were reduced in favour of attacking targets under the cover of darkness.

Kent played a key role in the defence of Britain in WWII. It was at the frontline during the Battle of Britain during which the Luftwaffe attempted to destroy the RAF and its airfields in order to gain air superiority over the south-east of England ahead of the planned German invasion. Bombing raids began in July 1940 from German-occupied France and in the following months many of the towns and cities in Kent were subjected to bombing attacks.

Within Kent, Manston airfield was a key target for the Luftwaffe especially during the Battle of Britain, where RAF Manston sustained serious bomb damage. Most of the staff dispersed into the surrounding houses due to the destruction. The site is located just 1.6km south-east of the airfield.

By May 1941, concentrated attacks were reduced as the Luftwaffe was diverted east to prepare for 'Operation Barbarossa', the invasion of Russia. Note however that Canterbury was heavily bombed in mid-1942 as part of the Baedeker Blitz.

During 1942 and 1943, there were a number of minor raids carried out by small formations of fighter bombers and then between January and May 1944 the Luftwaffe returned to London en masse, for Operation Steinbock. These raids were executed by inexperienced Luftwaffe crews and were less frequent when compared to the original Blitz of 1940/41. Poor navigation and improved defences resulted in unsustainable Luftwaffe losses and many raids were unsuccessful.

Cliffsend was situated within 'Hellfire Corner'; an area of Kent where aerial 'dog fights' and 'tip and run' bombing incidents were frequent during the Battle of Britain. The region was also under artillery

bombardment from the coastal batteries located at Calais and Cap-Gris-Nez in occupied France. These batteries, including the *Lindemann* and *Todt Batteries*, bombarded the south coast until they were captured after the Allied D-Day Landings in 1944. The batteries covered an arc stretching from Ramsgate to Hythe and fired shells weighing approximately 1 ton each.

From mid-1944 the "V-weapon" (for Vengeance) campaign, using unmanned cruise missiles and rockets, represented Hitler's final attempt to reverse Germany's imminent defeat. The V1 (Flying Bomb or Doodlebug) and the V2 (Long Range Rocket) were launched from bases in Germany and occupied Europe. Totals of 2,419 V1s and 517 V2s were recorded in the London Civil Defence region.

Although these weapons caused considerable destruction, their relatively low numbers allowed accurate records of strikes to be maintained and these records have mostly survived. There is a negligible risk from unexploded V-weapons on land today since, even if an unexploded 1,000kg warhead had survived impact, the remains of the munition's body would have left incontrovertible evidence of the strike and would have been dealt with at the time.

8.2 Generic Types of WWII German Air-delivered Ordnance

The nature and characteristics of the ordnance used by the Luftwaffe allows an informed assessment of the hazards posed by any unexploded items that may remain today.

- HE Bombs: In terms of weight of ordnance dropped, HE bombs were the most frequent weapon deployed. Most bombs were 50kg, 250kg or 500kg (overall weight, about half of which was the high explosive) though large bombs of up to 2,000kg were also used. HE bombs had the weight, velocity and shape to easily penetrate the ground intact if they failed to explode. Post-raid surveys would not always have spotted the entry hole or other indications that a bomb penetrated the ground and failed to explode, and contemporary ARP documents describe the danger of assuming that damage, actually caused by a large UXB, was due to an exploded 50kg bomb. Unexploded HE bombs therefore present the greatest risk to present–day intrusive works.
- Blast Bombs/Parachute Mines: Blast bombs generally had a slow rate of descent and were extremely unlikely to have penetrated the ground. Non-retarded mines would have shattered on most ground types, if they had failed to explode. There have been extreme cases when these items have been found unexploded, but this was where the ground was either very soft or where standing water had reduced the impact. SafeLane Global does not consider there to be a significant risk from this type of munition on land.
- Large incendiary bombs: This type of bomb ranged in size from 36kg to 255kg and had a number of inflammable fill materials (including oil and white phosphorus), and a small explosive charge. They were designed to explode and burn close to the surface, but their shape and weight meant that they did have penetration capability. If they penetrated the ground, complete combustion did not always occur, and, in such cases, they remain a risk to intrusive works.
- 1kg Incendiary Bombs (IB): These bombs, which were jettisoned from air-dropped containers, were just over 30cm in size and therefore highly likely to go unnoticed. They had the potential to penetrate soft ground and left a very small entry hole. Furthermore, if bombs did not initiate and fell in water or dense vegetation or became mixed with rubble in bomb damaged areas, they could have remained hidden to this day. Some variants had explosive heads, and these present a risk of detonation during intrusive works, particularly due to their shape, which leads them to often be misidentified.
- Anti-personnel (AP) Bomblets: AP bombs had little ground penetration ability and should have been located by the post-raid survey unless they fell into water, dense vegetation or bomb rubble.

- Specialist Bombs (smoke, flare, etc): These types do not contain high explosive and therefore a detonation consequence is unlikely. They were not designed to penetrate the ground.

Examples of the most commonly deployed German bombs are presented in the *Ordnance Specifications and Information* appendices at the end of this document.

8.3 Second World War Bombing Statistics

The following table summarises the quantity of German bombs (excluding 1kg incendiaries and anti-personnel bombs) falling on the Municipal Borough of Ramsgate between 1940 and 1945.

Record of German Ordnance Dropped on the Municipal Borough of Ramsgate	
Area Acreage	3,624
High Explosive Bombs (all types)	771
Parachute Mines	5
Oil Bombs	3
Phosphorus Bombs	-
Fire Pots	-
Pilotless Missile (V1)	-
Long Range Rocket (V2)	-
Total	774
Items Per 1,000 Acres	**213.6**

Source: Home Office Statistics

Detailed records of the quantity and locations of the 1kg incendiary and anti-personnel bombs were not routinely maintained by the authorities as they were frequently too numerous to record.

Although the incendiaries are not particularly significant in the risk they pose, they nevertheless are items of ordnance that were designed to cause damage and inflict injury and should not be overlooked in assessing the general risk to personnel and equipment. The anti-personnel bombs were used in much smaller quantities and are rarely found today but are potentially more dangerous. This table does not include UXO found during or after WWII.

8.4 Site Specific WWII Bombing Records

8.4.1 Kent Bomb Census Maps

A review was conducted of the Kent Bomb Census Maps, obtained from the National Archives. Those showing incidents on or close to the site are listed below. Note, the maps are small in scale and lack any clear geographical indicators, therefore the site and distance(s) listed below can be considered an approximate.

Date	Weapon	Details
9th July 1940	Incendiary and HE bombs	Approximately on or adjacent to the site.
27th October 1940	2 x HE bombs	Approximately 1.8km to the north-east of the site.
29th October 1940	HE bomb	Approximately on or adjacent to the site.
6th December 1940	Incendiary bomb	Approximately 200m south to the site.
Reference		**Annex D**

8.4.2 Original ARP Bombing Incident Records

Throughout WWII, records of bombing incidents were kept by the ARP and Civil Defence Office. These records were kept in the form of typed or hand-written notes and/or presented on bomb plot maps. Some other organisations, such as port authorities and railways, maintained separate records. Sections of these ARP records (with map references) have been plotted in **Annex E**.

Written ARP records were reviewed for	Ramsgate
Source	Kent History & Library Centre
Records of bombing on / near the site were found	✓

Date	Weapon	Details
18th September 1940	Unspecified	"Unexploded bomb located in St. Augustine's Golf Links about 30 yards from Ramsgate – Sandwich Road." Map reference 780/820. Approximately 1.8km north-east of the site.
20th October 1940	Unspecified	Bomb dropped in open ground in Ramsgate. Location of incident unknown.
24th October 1940	HE bombs	An enemy aircraft dropped HE bombs at Pegwell End and Cliffsend Ramsgate. Proximity to site potentially on or adjacent.
6th November 1940	HE bombs	West of Ebbsfleet Farmhouse. Map reference – 770/810 Approximately 800m north-west of the site.
6th February 1941	10 x HE bombs	10 x 50KG HE's were dropped in a line from Map reference 788/839 – 789/819.

		Approximately 2.0km north of the site.
4th May 1941	1 x HE bomb	Cottington Hill, Minister. Map reference 776/819. Approximately 1.5km north-west of the site.
4th May 1941	1 x HE bomb	South of Cottington Hill, Minister. Map reference 775/817. Approximately 1.2km north-west of the site.

8.4.3 Home Office Intelligence Reports

The Home Office Intelligence reports document enemy action on British domestic soil and were prepared twice a day for the Home Security War Room. The summaries were prepared by intelligence staff, who compiled reports received from the twelve civil defence regions.

However, available records only document time and general location of attack and numbers of casualties. The intelligence officials generally only recorded locations on municipal level (town, village, or city), rarely providing specific addresses.

Date	Location	Details
5th July 1940	Ramsgate	0 casualties
8th/9th July 1940	Ramsgate	0 casualties
12th August 1940	Manston, Ramsgate	12 casualties
14th August 1940	Manston, Ramsgate	0 casualties
16th/17th August 1940	Manston, Ramsgate	0 casualties
22nd/23rd August 1940	Manston, Ramsgate	0 casualties
24th August 1940	Ramsgate	65 casualties
24th August 1940	Manston, Ramsgate	0 casualties
28th August 1940	Ramsgate	1 casualty
13th September 1940	Ramsgate	0 casualties

16th September 1940	Ramsgate	0 casualties
28th September 1940	Ramsgate	Unspecified
7th October 1940	Ramsgate	0 casualties
8th October 1940	Ramsgate	0 casualties
11th October 1940	Ramsgate	4 casualties
20th October 1940	Ramsgate	0 casualties
27th October 1940	Ramsgate	1 casualty
2nd November 1940	Ramsgate	29 casualties
10th November 1940	Ramsgate	4 casualties
11th November 1940	Ramsgate	9 casualties
12th November 1940	Ramsgate	2 casualties
13th November 1940	Ramsgate	1 casualty
18th November 1940	Ramsgate	4 casualties
29th November 1940	Ramsgate	0 casualties
5th December 1940	Ramsgate	0 casualties
29th December 1940	Ramsgate	0 casualties
3rd/4th January 1941	Ramsgate	17 casualties
11th January 1941	Ramsgate	2 casualties
15th January 1941	Ramsgate	1 casualty

17th/18th January 1941	Ramsgate	0 casualties
3rd February 1941	Ramsgate	4 casualties
12th February 1941	Ramsgate	0 casualties
22nd February 1941	Ramsgate	0 casualties
3rd March 1941	Ramsgate	4 casualties
13th/14th March 1941	Ramsgate	0 casualties
18th March 1941	Ramsgate	2 casualties
20th March 1941	Ramsgate	12 casualties
9th/10th April 1941	Ramsgate	2 casualties
4th/5th May 1941	Ramsgate	0 casualties
7th May 1941	Ramsgate	0 casualties
10th/11th May 1941	Ramsgate	0 casualties
13th/14th June 1941	Ramsgate	16 casualties
6th/7th August 1941	Ramsgate	1 casualty
16th/17th August 1941	Ramsgate	0 casualties
30th/31st August 1941	Ramsgate	3 casualties
7th/8th September 1941	Ramsgate	26 casualties
9th/10th November 1941	Ramsgate	6 casualties
27th November 1941	Ramsgate	1 casualty

29th/30th May 1942	Ramsgate	0 casualties
4th September 1942	Ramsgate	0 casualties
31st October 1942	Ramsgate	0 casualties
26th January 1943	Ramsgate	6 casualties
9th February 1943	Ramsgate	0 casualties
2nd March 1943	Ramsgate	0 casualties
3rd/4th March 1943	Ramsgate	0 casualties
18th/19th May 1943	Ramsgate	0 casualties
19th/20th May 1943	Ramsgate	0 casualties
28th/29th May 1943	Ramsgate	3 casualties
12th/13th June 1943	Ramsgate	0 casualties
15th/16th June 1943	Ramsgate	5 casualties
16th/17th August 1943	Ramsgate	5 casualties
17th August 1943	Ramsgate	5 casualties
22nd/23rd August 1943	Ramsgate	0 casualties
3rd/4th October 1943	Ramsgate	12 casualties
4th/5th November 1943	Ramsgate	0 casualties
19th/20th January 1944	Ramsgate	0 casualties
21st/22nd January 1944	Ramsgate	0 casualties

21st/22nd January 1944	Ramsgate	0 casualties
24th/25th January 1944	Ramsgate	0 casualties
29th June 1944	Ramsgate	0 casualties
31st/1st August/September 1944	Ramsgate	20 casualties

8.4.4 Secondary Source / Anecdotal Evidence

Anecdotal evidence of local bombing incidents was sought from publications and web resources. The following references to incidents on site or in the surrounding area were found.

Date	Weapon	Details
August 1940	150> HE Bombs	Multiple attacks were made on RAF Manston during the Battle of Britain over the course of a few months, particularly in August. 12th August – "About 150 bombs were dropped, leaving some 100 craters. Two hangars were damaged and a workshop destroyed. Unfortunately, a civilian clerk in the workshop was killed. …some craters remained near the edge of the airfield, which were close to unexploded bombs."[1] Approximately 2.5km north of the site.
31st August 1940	Aircraft crash	A fighter plane crash landed in Sandwich Flats in Pegwell Bay. Proximity to site potentially within 2.5km.

[1] https://www.bbc.co.uk/history/ww2peopleswar/stories/17/a6812417.shtml

8.4.5 WWII-era RAF Aerial Photography

The following WWII-era aerial photography was reviewed for the site:

Date	Circa. 1946
Source	The GeoInformation Group
Image Type	Aerial
Image quality	Low resolution and low scale
Observations	• The site remains accurate to historical OS mapping, the fields are largely covered in soft vegetation. • There are several small circular holes that are indicative of possible bomb damage located in and within the site's immediate vicinity. These have been highlighted on the Annex. • There is limited evidence to corroborate bombs landing on site, but due to its rural location, it is possible that these would have gone undetected. • Approximately 200m south of the study area there are craters in the field, these are indictive of localised bombing and bomb damage.
Reference	**Annex E**

8.4.6 Abandoned Bombs

A post-air raid survey of buildings, facilities and installations would have included a search for evidence of bomb entry holes. If evidence was encountered, Bomb Disposal Officer teams would normally have been requested to attempt to locate, render safe and dispose of the bomb. Occasionally evidence of UXBs was discovered but due to a relatively benign position, access problems or a shortage of resources the UXB could not be exposed and rendered safe. Such an incident may have been recorded and noted as an Abandoned Bomb.

Given the inaccuracy of WWII records and the fact that these bombs were 'abandoned', their locations cannot be considered definitive, nor the lists exhaustive. The MoD states that 'action to make the devices safe would be taken only if it was thought they were unstable'. It should be noted that other than the 'officially' abandoned bombs, there will inevitably be UXBs that were never recorded.

SafeLane Global holds records of officially registered abandoned bombs at or near the site	✓
Additional Comments	• 2 items of unknown ordnance in a field approximately 180m north-east of the site, within close proximity to the railway embankment. • 2 items of unknown ordnance in a field approximately 220m north of the site, south of Brook Lane, adjacent to the two ponds. • 1 item of unknown ordnance in the marshes near Brook Lane, approximately 550m north-east of the site.

8.5 UXB Ground Penetration

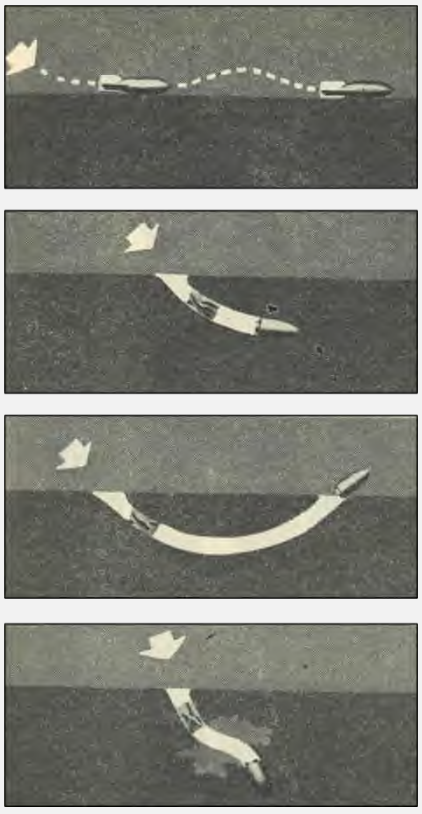
8.5.1 General Considerations

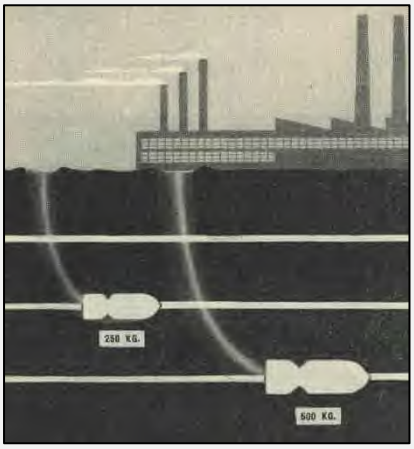
The actual penetration depth of aerial delivered bombs into the ground will have been determined by the mass and shape of the bomb, the velocity and angle of the bomb on impact (dependent on the height of release) and the nature of the ground and ground cover; the softer the ground, the greater the potential penetration. Peat, alluvium and soft clays are easier to penetrate than gravel and sand. Bombs are brought to rest or are commonly deflected by bedrock or large boulders.

8.5.2 The "j" Curve Effect

An air-dropped bomb released from normal bombing altitude (approx. 5,000m) on its curved trajectory can reach a terminal velocity of between 350-400 ms-1. In this case of high-level bombing, the angle of which the bomb enters the earth is approx. 15° from the perpendicular and its exact path is difficult to trace. The bomb is being driven by its kinetic energy can unless deflected, will continue its line of flight and can turn in an upwards curve towards the ground surface as it comes to rest. The upwards curve is caused by the transfer of energy as the bomb travels through the ground. The nose of the bomb travels slower than the rear of the bomb due to the drag/friction of it passing through the ground. The rear of the bomb, having more energy due to less drag/friction is travelling much quicker.

The location of the bomb is thus ''offset'' from the hole of entry. This ''offset'' from vertical is generally understood to be about one third of the penetration depth but can reach up to (and have been found at) 15m/50 ft from point of entry, dependent on ground conditions and the bomb's angle of impact. The figure below depicts the various paths of UXB through homogenous ground, showing how the J-curve effect can lead to a UXB coming to rest beneath undamaged buildings.





A UXB can come to rest beneath undamaged buildings due to the J-Curve effect if it lands in nearby soft ground.

Image source: Field Manual for Unexploded Bombs: Organisation and Operation For Disposal, United States War Department 1943

Left: Path of UXB in soft ground:

1. Ricochet resulting from low level attack: UXB stays perpendicular to ground and rests at surface.
2. Buried UXB with J-Curve: Bomb curves horizontally and rests perpendicular to surface.
3. UXB returning to surface due to J-Curve: Bomb points towards surface but may remain partially or completely below ground level.
4. UXB deflected by buried objects: Results in unpredictable path and unusual shift.

8.5.3 Second World War Bomb Penetration Studies

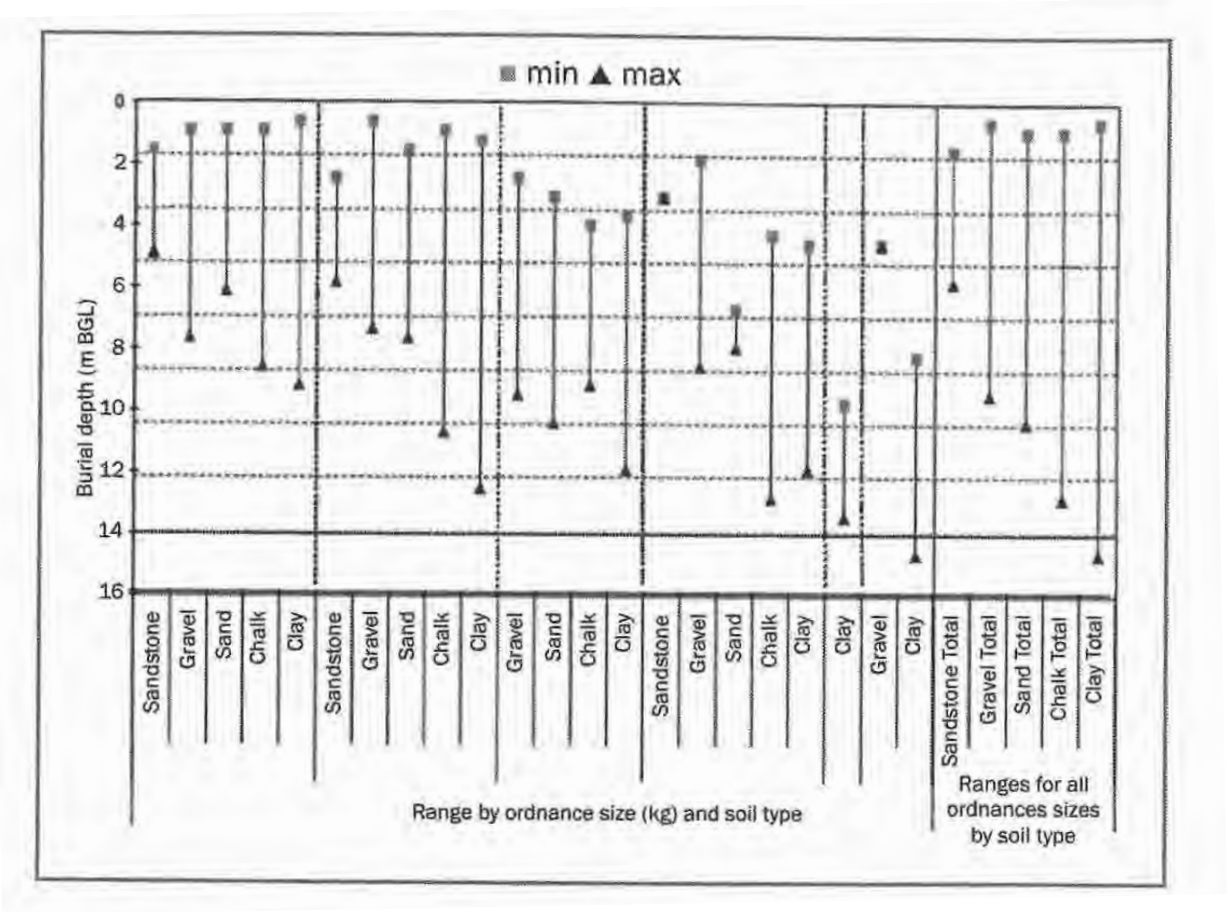
During WWII, the Ministry of Home Security undertook a major study on actual bomb penetration depths, carrying out statistical analysis on the measured depths of 1,328 bombs as reported by Bomb Disposal, mostly in the London area. They then came to conclusions as to the likely average and maximum depths of penetration of different sized bombs in different geological strata.

The median penetration of 430 x 50kg German bombs in London Clay was 4.6m and the maximum penetration observed for the SC50 bomb was 9m.

They concluded that the largest common German bomb, 500kg, had a likely penetration depth of 6m in sand or gravel but 8.7m in clay. The maximum observed depth for a 500kg bomb was 10.2m and for a 1,000kg bomb 12.7m. Theoretical calculations suggested that significantly greater penetration depths were probable.

8.5.4 CIRIA Bomb Penetration Depth Specifications

As stated within C681, the ground conditions at any individual site are likely to be highly variable and this results in a large range of burial depths for each different size bomb. The below chart shows the observed variation in burial depths of various sizes of air-delivered UXO for different ground conditions.



8.5.5 Site Specific Bomb Penetration Considerations

When considering an assessment of the bomb penetration at the site, the following parameters would be used:

- Geology – 0.4m of Topsoil and >24m of Clay.

- Impact Angle and Velocity – 80-90° from horizontal and 267 metres per second.
- Bomb Mass and Configuration – The 500kg SC (General Purpose) HE bomb, without retarder units or armour piercing nose. This was the largest of the common bombs used against Britain.

Taking into account the above-mentioned factors it has been assessed that a 500kg bomb would have had an approximate maximum bomb penetration depth of between 10-12m below WWII ground level. Penetration depth could potentially have been greater if the UXB was larger (though only 4% of German bombs used in WWII over Britain were of that size). Note that UXBs may be found at any depth between just below the WWII ground level and the maximum penetration depth.

8.6 Likelihood of Post-raid UXO Detection

Utilising the available historical bombing records as reviewed in Section 8.4, it is possible to make an assessment of the likelihood that evidence of UXO would have been noted on a site during the war and the incident dealt with or recorded at the time. Factors such as bombing density, frequency of access, ground cover, damage and failure rate have been taken into consideration.

8.6.1 Density of Bombing

Bombing density is an important consideration for assessing the possibility that UXBs remain in an area. A very high density of bombs will have increased the likelihood of errors in record keeping at the time, as civil defence personnel and emergency services may have been overwhelmed. A higher density of bombing also increases the number of UXBs actually occurring in a given area.

The type and specific location of recorded bomb strikes is also an important consideration. If a stick of bombs (one individual aircraft's bomb load) is plotted in line with a site or is shown to straddle a site, then this raises the possibility that an unrecorded UXB from the same stick struck that site.

8.6.2 Bomb Damage

In Blitzed cities / towns throughout Britain, bomb sites were often not cleared of rubble until after the war and mid-war repairs to buildings were only carried out on the most vital facilities (power stations, gas works, weapons factories etc.). However, if a building only sustained bomb damage to its upper floors, any subsequent UXB strike to the structure will still have caused obvious damage, at ground floor level, which would have been reported and dealt with at the time.

HE bomb strikes to open ground will have resulted in a large crater and local soil disturbance. Any subsequent UXB strike will not have resulted in an easily identifiable entry hole and as such is likely to have gone unnoticed amongst the disturbed ground.

In London and south-east England, the German V1 Flying Bomb and V2 Long Range Rocket campaigns caused widespread devastation. However, as these weapons began to be utilised after the final significant Luftwaffe air raids had occurred, any serious damage caused by such weapons does not necessarily indicate an increased risk of Luftwaffe freefall UXB contamination. However, it is quite possible that serious damage inflicted during the 1940-1944 campaigns by Luftwaffe freefall bombs could have been erased by a subsequent V Weapon strike.

8.6.3 Frequency of Access

A UXB strike at a site where human access was infrequent would have had a lower chance of being observed, reported and recorded compared to a site which was developed and subject to regular access. UXB strikes during night time raids (when German planes could more easily evade anti-

aircraft defences) are also more likely to have fallen unobserved than ones dropped during a daylight attack.

In frequently bombed cities / towns, ARP Wardens were tasked with carrying out searches for UXBs within recently bombed residential areas and schools. Similarly, many important home front facilities (factories, gas works, power stations, docks etc.) had their own dedicated ARP teams or Fire Watchers tasked with observing local air raids. Fire Watchers were mainly responsible for extinguishing 1kg incendiary bombs as well as reporting any UXB strikes. Anecdotal evidence however indicates that Fire Watchers did not always turn up for their shifts and therefore such UXB mitigating activities should not be assumed in the absence of site-specific evidence. Less important buildings sustaining bomb damage would have been abandoned until after the German bombing campaign in that area had ceased and repairs could be made, greatly decreasing the level of access to that site.

Schools closed due to the evacuation of children were often requisitioned by the Civil Defence authorities to be utilised as night time First Aid posts and reception centres (providing emergency accommodation for bombed out civilians). Therefore, an increased level of access is likely at these locations.

8.6.4 Ground Cover

The entry hole of a 50kg UXB (the most commonly deployed German HE bomb) could have been as little as 20cm in diameter. Wartime records also confirm that small German Incendiary Bombs, weighing just 1kg, were capable of significant penetration into soil, resulting in very small entry holes (5cm) or complete burial.

The quantity and type of ground cover present on a site during WWII would have had a significant effect, at ground level, on the visual evidence of buried UXO.

Evidence of UXO could be obscured in dense vegetation, soft ground, rubble, railway ballast or amongst stockpiled material (such as aggregate, coal or refuse heaps). A UXB strike to waterlogged ground or open water would have been immediately obscured from view beneath the waterline. Had such an incident occurred within a tidal mudflat or river bank, the resulting entry hole will have remained only temporarily, before becoming in-filled by water and sediment. Any HE UXB strike to elevated risk ground cover could potentially have come to rest beneath neighbouring undamaged buildings or hard-standing due to the 'J-Curve' Effect.

UXB strikes to undamaged/superficially damaged buildings and hard-surfaced ground will still have caused substantial damage or an easily identifiable and persistent entry hole. Similarly, it is unlikely that an HE UXB entry hole on well-maintained / manicured lawns (tennis courts, bowling greens, golf course fairways / greens, gardens in affluent areas etc), would have been overlooked. Such incidents would have been reported and the UXB subsequently removed.

8.6.5 German Air-Delivered Ordnance Failure Rate

Based on empirical evidence, it is generally accepted that 10% of the German HE bombs dropped during WWII failed to explode as designed. This estimate is probably based on the statistics of wartime recovered UXBs and therefore will not have taken account of the unknown numbers of UXBs that were not recorded at the time and is probably an underestimate.

The reasons for failures include:

- Fuze or gaine malfunction due to manufacturing fault, sabotage (by forced labour) or faulty installation.
- Clockwork mechanism failure in delayed action bombs.

- Failure of the bomber aircraft to arm the bombs (charge the electrical condensers which supplied the energy to initiate the detonation sequence) due to human error or equipment defect.
- Jettison of the bomb before it was armed or from a very low altitude. Most likely if the bomber was under attack or crashing.

War Office Statistics document that a daily average of 84 bombs which failed to function were dropped on civilian targets in Great Britain between 21st September 1940 and 5th July 1941. 1 in 12 of these (probably mostly fitted with time delay fuzes) exploded sometime after they fell; the remainder were unintentional failures.

From 1940 to 1945 bomb disposal teams dealt with a total of 50,000 explosive items of 50kg and over (i.e. German bombs), 7,000 AAA shells and 300,000 beach mines. These operations resulted in the deaths of 394 officers and men. However, UXO is still regularly encountered across the UK.

Note, due to manufacturing fault or failure of the bomber crew to correctly arm their munitions, whole bomb loads often failed to detonate. Therefore, the presence of reported UXBs increases the likelihood of an additional unrecorded UXB in the vicinity.

8.6.6 Site Specific Analysis

The following table will place the site in context with these factors, in order to assess the likelihood of post-raid UXO detection within the project site.

Likelihood of Post Raid UXO Detection on Site			
Site-Specific Factors			**Additional Comments**
Density of Bombing Assessment	Based on wartime records or secondary source information, what was the bombing density over the site?	High	The site is within close proximity to Manston airfield and a small port (Richborough). Ramsgate experienced a bombing density of 213.6 items per 1000 acres. 5 x abandoned bombs are recorded within 500m of the site.
	Was the site ever subjected to one or more large-scale (>100 tons of ordnance) night time Blitz raids?	✘	
	Were any HE bomb strikes recorded on site?	✓	Kent Bomb Census Maps highlight a HE bomb landed within the immediate vicinity of the site. However, due to the scale of the mapping, it is difficult to accurately identify the exact location of these strikes.
	What is the distance between the site boundary and the closest recorded large bomb strike?	On / adjacent	
	How many HE, Parachute Mine, Oil Incendiary, Phosphorus Incendiary or Fire Pot	1	

	bombs (large bombs) were recorded within a 300m radius of the site?		
	Were any nearby sticks of large bombs recorded in line with the site?	✗	
	Were any 1kg incendiary bomb showers recorded over the site?	✓	
Bomb Damage Assessment	A comparison of the historical records confirms that buildings within the site boundary sustained serious bomb damage.	✗	
	Direct or indirect evidence of HE bomb craters in open ground (within the site boundary) has been found.	Possibly	Ground disturbance has been highlighted on and to the south of the site.
	Buildings on site were seriously damaged by a V1 and / or V2 strike.	✗	
	Buildings on site could have been seriously damaged prior to the nearby V1 or V2 strike?	✗	
Frequency of Access Assessment	The site was situated in a densely populated urban area during WWII and therefore would have been accessed at the outbreak of WWII.	✗	
	The site was exclusively or partially developed during WWII.	✗	
	Buildings on site survived WWII intact and therefore likely remained inhabited or in use, suggesting these localities and their immediate environs were accessed throughout the war.	n/a	
	The site was crossed by roads / pavements or footpaths which would have been regularly used / subject to daily footfall.	✓	*Brook Lane* encroaches through the site. It's possible that this would have been accessed.
	The site was occupied by small residential back yards / gardens, likely to have been put to use for cultivation as a result of the government's Dig for Victory Campaign.	✗	
	The site was occupied by a school during WWII.	✗	
	Part of the site is likely to have been subject to post-raid searches for UXO.	✗	

	Buildings on site sustained serious bomb damage and as a result were likely abandoned (along with any associated gardens / open ground) for the remainder of the war.	✖	
	The site was occupied by peripheral open ground / wasteland, with no apparent use, which may have been neglected.	✓	
	The site may have been occupied by recreational land / sports fields which may have only experienced seasonal access.	✖	
	The site was occupied by a graveyard which would have experienced limited access.	✖	
	The site was occupied by agricultural land, rural countryside or woodland which would not have been accessed in full, either regularly or frequently.	✓	Historical aerial and OS mapping has illustrated that the site appears to be used for agricultural purposes.
	The site was occupied by railway sidings which may not have been as regularly checked for buckling as mainline railway tracks.	✖	
	The site was occupied by soft railway embankments which are likely to have been neglected during the war.	✖	The fields within the western section of the site lie adjacent to the railway line.
Ground Cover Assessment	The site was partially or entirely abandoned, due to bomb damage, resulting in associated open ground likely becoming overgrown.	n/a	
	The site was occupied by dense, inaccessible vegetation during WWII.	✖	
	The site may have been susceptible to waterlogged conditions during WWII.	✓	The irrigation system present on site may have caused waterlogged conditions.
	The site was occupied by (possibly) unmaintained grass field during WWII.	Possibly	
	The site was part occupied by a canal, river, dock basin, lake or reservoir during WWII.	✖	Multiple irrigation channels are present on site.
	The site was occupied by tidal mud or marshland during WWII.	✖	

	The site was occupied by railway tracks crossing soft ground during WWII.	Adjacent	
	The site was occupied by stockpiled material during WWII.	n/a	
	The site was occupied by buildings, hard-standing or other manmade structures that did not sustain any degree of bomb damage.	n/a	
	A comparison of the historical records confirms that buildings on site sustained inconsequential minor / moderate damage.	n/a	
	The site was occupied by well-maintained, manicured lawn during WWII.	✗	
	Undamaged, developed parts of the site would have been vulnerable to the J-Curve Effect.	✓	Had a bomb impacted the soft vegetation on site, it is possible that the J-curve effect would have to come into consideration.
Bomb Failure Rate Assessment	Evidence has been found which suggests that the bomb failure rate in the vicinity of the site would have been different from the "approximately 10%" figure normally used.	✗	

9 The Threat from Allied Military Ordnance

The following potential historical and modern sources of UXO contamination on site or in the surrounding area have been considered:

Potential Source of Contamination on Site	
Army, Navy and RAF Bases / Installations	✗
Military Training Areas / Weapons Ranges	✗
Ordnance / Explosives Factories and Storage Depots	✗
Sites Requisitioned for Military Use	✗
Sites Used or Occupied by the Home Guard	✓
Military Fortifications and Coastal Defences	✗
Locations of Army Explosive Ordnance Clearance Tasks	✗
WWII Anti-Aircraft Batteries	✓
WWII Pipe Mined Locations and Beach Minefields	✗

The risk of contamination from Allied UXO on site is discussed below.

9.1 Port Richborough

Port Richborough, nicknamed port "Q", was established in 1914 on the banks of the River Stour. The facility was kept a secret and served as a significant military outpost. Throughout WWI, the port was used for manning and arming barges being sent to Dover and subsequently France.[2] The port became militarised during the First World War, with multiple stores for equipment used for supplying the barges erected in and around the banks. Moreover, defensive positions were established around the Port especially on the flats towards the mouth of the river Stour.

During WWII the port still served a purpose as a military outpost for the Royal Marines in 1942, named H.M.S Robertson. The Port was considered "a hive of industry" in preparation for D-Day, with many troops stationed in the nearby Richborough Camp. In addition, factory workers would work throughout the blackout in the port factory.[3] The port was located approximately 1.2km south-east of the site.

9.2 Home Guard Activity

The Home Guard (HG) was a defence organisation of the British Army, operational between 1940 and 1944. It comprised 1.5 million local volunteers, otherwise ineligible for military service and acted as a secondary defence force in case of enemy invasion. The HG guarded the coastal areas of Britain and other important facilities such as airfields, factories and explosives stores. They were also active in county towns and cities.

Official records were rarely kept by the HG and therefore any present-day evidence is usually anecdotal. However, it is known that HG personnel often carried out training (including weapons training) in open countryside on the outskirts of cities / towns. Today, items of ordnance related to the HG are occasionally encountered by members of the public and the construction industry in the British countryside. This suggests a culture of ill-discipline regarding live ammunition within HG units.

HG personnel are known to have purposefully buried caches of ammunition and weapons in tactical positions, to be exhumed and used in case of invasion. Records of such caches were not rigorously kept, and some were therefore forgotten about. This is substantiated by several HG UXO finds over recent years. The below table shows just a handful of examples:[4]

[2] https://blog.railwaymuseum.org.uk/port-of-richborough-and-the-birth-of-the-cross-channel-train-ferry/
[3] http://www.open-sandwich.co.uk/town_history/richborough_port.htm
[4] Various News Sources

Home Guard UXO Finds:	
	Unexploded Spigot Mortar Round, used by the Home Guard in WWII, found and disposed of in Hayle, Cornwall – January 2021
	24 x WWII grenades found buried in a field in Sibton, Suffolk – May 2019
	A cache of 80 phosphorous grenades buried by the Home Guard found in Eastbourne – September 2015
	Home Guard Phosphorous Grenades found buried beneath a bridge in Herne Bay – July 2015

9.3 Anti-Aircraft Gun Batteries

At the start of the war two types of AAA guns were deployed: Heavy Anti-Aircraft Artillery (HAA) and Light Anti-Aircraft Artillery (LAA). The LAA batteries were intended to engage fast low flying aircraft and were typically deployed around airfields or strategic installations. These batteries were mobile and could be moved to new positions with relative ease when required. With four guns per battery firing several rounds per minute, AA batteries could expel numerous shells in even the shortest engagements. Numerous unexploded AAA shells were recovered during and following WWII and are still occasionally encountered on sites today.

The maximum ceiling height of fire at that time was around 11,000m however, as the war progressed, improved variants of the 3.7" gun were introduced and, from 1942, large 5.25-inch weapons were brought into service. These had significantly improved ceiling heights of fire reaching over 18,000m.

When the supply of clockwork fuses from Switzerland was cut off, Britain was forced to make its own. After four years of war, the country still lacked the engineering skills to produce a reliable fuse. This resulted in a considerable number of AA projectiles exploding prematurely, killing the gunners or failing to explode at all and falling to the ground as UXBs. In January 1944, more people in London were killed by HAA shells than by German bombs.

9.4 Site-Specific Threat from Allied Military Ordnance

The following table identifies the potential threat to the site of contamination from British / Allied UXO.

Potential Source	Details
Nearest Home Guard Battalion to the site	6th Kent (Thanet) Battalion.
Home Guard Activity on site	• The Thanet battalion primarily operated out of Margate, approximately 7.0km from the site. However, the exact locations of their HQs or training areas were not found. • Typically, HG soldiers would take part in training exercises in areas occupied by open countryside such as the fields on site. However, there is no evidence to corroborate training activity within the study area. • HG personnel are known to have purposefully buried caches of ammunition and weapons in tactical positions, to be exhumed and used in case of invasion. • The HG were active within defensive features within the vicinity of Richborough Port approximately 1.6km south-east, but there is no evidence to suggest such activity in the study area.
Defensive features within the vicinity	• 1 Pillbox is located within approximately 1.2km east on *Sandwich Road*. • "Port Richborough & machine gun position" located approximately 1.1km to the site.[5]

[5] https://storymaps.arcgis.com/stories/336078a0a78f474ba05e74bf25c6c49a

	• Nissen Hut – a prefabricated shelter used by the military, approximately 1.5km to the site.[6] • Slit trench or PAD trench – A small v-shaped dugout feature remains in the port area, approximately 1.6km to the site.[7] • WWII gun emplacement that is circular, pictured in military photographs (not annexed) approximately 1.2km south.
Number of HAA batteries within 5km of the site	4
Threat to the site from unexploded AA shells	• The nearest HAA battery was approximately 1.45km south-east to the site, located on the open ground near Richborough Port. This lay adjacent to the Nissen Hut and other recorded defensive features.[8] • The other HAA's were located around RAF Manston, approximately 3.0km to the north-east. • RAF Manston was targeted and attacked by the Luftwaffe several times during WWII. During such attacks, it is likely that a degree of AA fire would have occurred over the site. • One anecdotal account notes that "the intensity of the anti-aircraft fire put up around Manston and Hawkinge airfields during the raids of 15th August 1940" led to the towns of Ramsgate getting bombed more frequently.[9] • During the height of the Battle of Britain, several LAA positions may have been established in open fields within the site's proximity. Secondary sources have confirmed the likelihood of an LAA battery being established adjacent to the HAA.[10] • Had an exploded shell landed onto the soft vegetation on site, it is conceivable it could have remained undetected.

9.5 Generic Types of WWII British / Allied Unexploded Ordnance

9.5.1 Land Service Ammunition (LSA)

9.5.1.1 General

The term Land Service Ammunition covers all items of ordnance that are propelled, placed or thrown during land warfare. They may be filled or charged with explosives, smoke, incendiary or pyrotechnics. They can be broken into five main groups:

a. Mortars

b. Grenades

c. Projectiles

d. Rockets

e. Landmines

[6] https://storymaps.arcgis.com/stories/336078a0a78f474ba05e74bf25c6c49a
[7] https://storymaps.arcgis.com/stories/336078a0a78f474ba05e74bf25c6c49a
[8] https://storymaps.arcgis.com/stories/336078a0a78f474ba05e74bf25c6c49a
[9] Hylton, Stuart, *Kent and Sussex 1940: Britain's Front Line,* (Barnsley, Pen & Sword Books Limited, 2004)
[10] https://storymaps.arcgis.com/stories/336078a0a78f474ba05e74bf25c6c49a

Unexploded or partially unexploded Mortars and Grenades are among the most common items of UXO encountered in the UK. They are commonly encountered in areas used by the military for training and are often found discarded on or near historic military bases.

Examples of the most commonly used British / Allied Land Service Ammunition types are presented in the *Ordnance Specifications and Information* appendices, at the end of this document.

9.5.1.2 Mortars

A mortar bomb is a fin-stabilised munition, normally nose-fuzed and fitted with its own propelling charge (primary cartridge). Range is increased by adding extra propellant (augmenting charges). They are either HE or Carrier and generally identified by their tear-dropped shape (older variants however are parallel sided) and a finned 'spigot tube' screwed or welded to the rear end of the body housing the propellant charge.

A mortar relies on a striker hitting a detonator for explosion to occur. It is possible that the striker may already be in contact with the detonator and that only a slight increase in pressure would be required for initiation. Discarded augmenting charges are often encountered around mortar firing areas/bases.

9.5.1.3 Grenades

A grenade is a short-range weapon which may be thrown by hand, fired from the end of a rifle or projected/propelled from a special purpose grenade launcher. They are divided into two categories; HE and Carrier (generally smoke). As with mortars, a grenade striker may either be in contact with the detonator or still be retained by a spring under tension, and therefore shock may cause it to function. A grenade can have an explosive range of 15-20m. Common older variants have a classic 'pineapple' shape; modern grenades tend to be smooth-sided.

9.5.2 Small Arms Ammunition (SAA)

The most likely type of ordnance to be encountered on site are items of SAA (bullets), especially .303" ammunition which was the standard British and Commonwealth military cartridge from 1889 until the 1950s.

However even if an item such as this functioned, the explosion would not be contained within a barrel and detonation would only result in local overpressure and very minor fragmentation from the cartridge case.

Some LAA guns and RAF fighter cannons in use with British forces during WWII utilised the 20mm round. These bullets had a small fuse and a ~4gram HE or incendiary charge. Although small, this fill quantity still has the potential to cause serious injury.

Examples of the most commonly used British / Allied Small Arms Ammunition types are presented in the *Ordnance Specifications and Information* appendices, at the end of this document.

9.5.3 Anti-Aircraft Shells

At the start of the war two types of AAA guns were deployed: Heavy Anti-Aircraft Artillery (HAA) using large calibre weapons such as the 3.7" QF (Quick Firing) gun and Light Anti-Aircraft Artillery (LAA) using smaller calibre weapons such as 40mm Bofors gun which could fire up to 120 x 40mm HE shells per minute to over 1,800m. During the early war period there was a severe shortage of AAA so older WWI 3" and modified naval 4.5" guns were also deployed.

These shells are frequently mistakenly identified as small German air-delivered bombs but are differentiated by the copper driving band found in front of the base. Although the larger unexploded projectiles could enter the ground, they did not have great penetration ability and are therefore likely to be found close to WWII ground level. With a HE fill and fragmentation hazard these items of UXO also present a significant risk if encountered.

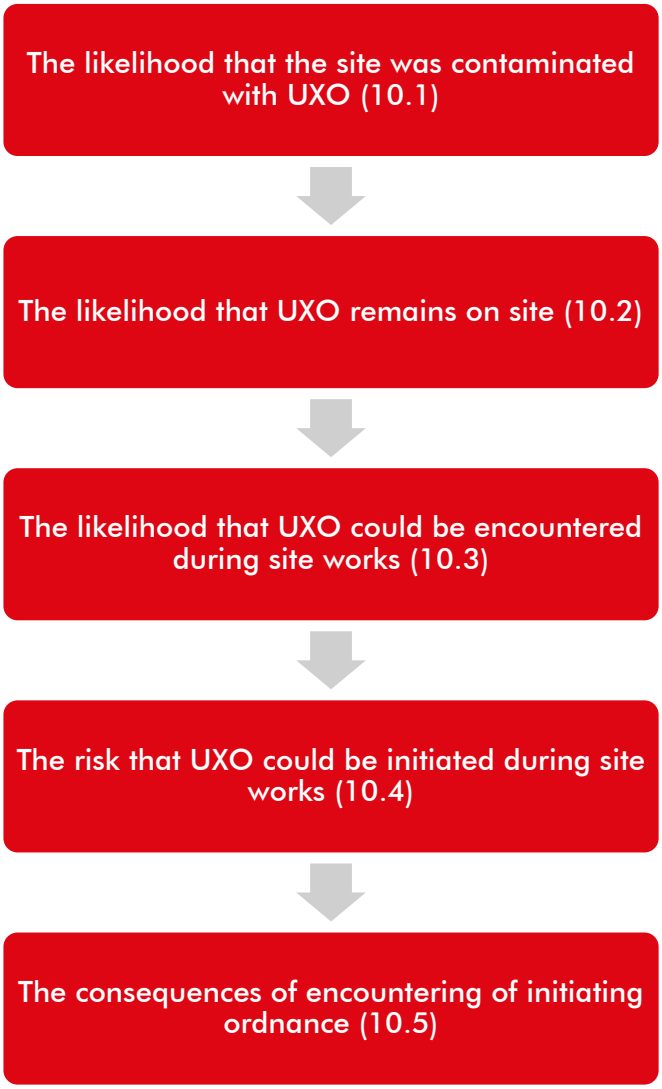
The smaller 40mm projectiles are similar in appearance and effect to small arms ammunition and, although still dangerous, present a lower risk. Details of the most commonly deployed WWII AAA projectiles are shown below:

Gun type	Calibre	Shell Dimensions	Shell Weight	HE Fill Weight
3.7 Inch	94mm	94mm x 438mm	12.7kg	1.1kg
4.5 Inch	114mm	114mm x 578mm	24.7kg	1.7kg
40mm	40mm	40mm x 311mm	0.84kg	70g

Examples of the most commonly used British / Allied Anti-Aircraft Ammunition types are presented in the *Ordnance Specifications and Information* appendices, at the end of this document.

10 The Overall Unexploded Ordnance Risk Assessment Methodology

Taking into account the quality of the historical evidence, the assessment of the overall risk to any intrusive works from UXO must evaluate the following factors:



Each of these steps will be evaluated in the following sections in order to conclude the total risk from UXO to the proposed works to be undertaken within the project site.

10.1 The Likelihood that the Site was Contaminated with Unexploded Ordnance

10.1.1 General

The below is a generalised table of factors used to determine the likelihood that the site was contaminated with unexploded ordnance. Note that additional site-specific information can adjust UXO risk beyond these criteria:

Low Likelihood	Medium Likelihood	High Likelihood
German Air-Delivered Ordnance / Allied Anti-Aircraft Shells		
No evidence of bombing / bomb damage on site coupled with low local bombing density.	Moderate to High local bombing density or evidence of bombing / bomb damage on or close to the site.	High local bombing density or evidence of bombing /bomb damage on or adjacent to the site. Confirmed finds of WWII UXB.
Ground conditions that would prevent UXB penetration or lead to easily identifiable entry holes.	Ground conditions that allow for bomb penetration.	Ground conditions that would have immediately and completely obscured the existence of UXB.
Site was occupied and accessed fully throughout the bombing campaign.	Site located in an area that was infrequently observed or accessed, with a low likelihood that a UXB strike would have been noticed.	Site may be completely obscured from view or subject to very infrequent access.
British / Allied Ordnance		
No evidence of Allied military activity on or near the site. Or Military sites which have been cleared / redeveloped since their use Or Military-owned sites which have not been used for training with live munitions.	Clear evidence of military training activity on site involving live ammunition / munitions. Military sites which have not undergone clearance operations or redevelopment since use. Evidence of weapons storage on site.	Evidence of weapons testing or disposal on or adjacent to the site.
Developed areas that are unlikely to have been used for military exercises.	Open or unmaintained ground that may have been used for disposal or caching of munitions.	Evidence of UXO finds on or in the vicinity of the site.

The following sections assess the likelihood of contamination from German UXO and British / Allied UXO, based on the evidence discussed in the previous sections.

10.1.2 Likelihood of Contamination from German UXO

The following table discusses the overall likelihood of contamination from German UXO, based on the evidence discussed in Section 8.

Overview of the Potential Sources of German Air-Delivered UXO	
Bombing density	• Situated in an area of high bombing density • 1 x HE bomb within the immediate vicinity of the site. • 1 x Incendiary bomb within proximity to the site • 5 abandoned bombs were discovered to the north of the site
Bomb Damage	• Possible ground disturbances located on and to the south of the study area. • There is no clear evidence of bomb damage on the site.
Ground Conditions	• Soft vegetation across the whole site. • Irrigation ditches present across the site.
Frequency of Access	• The site was mainly agricultural, it is unclear how often it was accessed during WWII. • The western site boundary was adjacent to railway sidings.
J-Curve Effect	• Had any UXB landed within the soft ground and vegetation on site, it could have come to rest beneath the study area.
Other considerations	n/a
Overall Likelihood of Contamination	**Medium**

10.1.3 Likelihood of Contamination from British / Allied UXO

The following table discusses the overall likelihood of contamination from British / Allied UXO, based on the evidence discussed in Section 9.

Overview of the Potential Sources of British / Allied UXO	
Land Service Ammunition / Small Arms Ammunition	• Evidence suggests that the HG were very active in the area surrounding the port and Sandwich Road. • No evidence has been found to suggest that the site formerly had any British / Allied military occupation or usage that could have led to contamination with items of UXO.
Anti-Aircraft Projectiles	• 4 HAA batteries were located within 5km of the site. • The nearest HAA battery was approximately 1.45km south-east to the site, located on the open ground near Richborough Port. • Several LAA batteries may have been established in open fields within the site's proximity during WWII. • Had an exploded shell landed onto the soft vegetation on site, it is conceivable it could have remained undetected.
Overall Likelihood of Contamination	**Medium**

10.2 The Likelihood that Unexploded Ordnance Remains on Site

10.2.1 General

The extent to which any ordnance clearance activities have taken place on site or extensive ground works have occurred is relevant since they may indicate previous ordnance contamination but also may have reduced the risk that ordnance remains undiscovered.

10.2.2 EOD Bomb Disposal and Clearance Tasks

SafeLane Global holds a number of official records of explosive ordnance disposal operations during and following WWII, obtained from the Explosive Ordnance Disposal (EOD) Archive Information Office at 33 Engineer Regiment (EOD), British Army.

Potential Source	Details
Records of Army EOD tasks having taken place on site or in the vicinity	None
Local ordnance finds	None
Local tasks undertaken by SafeLane Global	None

10.2.3 Post War Redevelopment

The nature of post-WWII ground works, redevelopment and construction has been considered. Significant structural redevelopment on site can, in some cases, provide a level of mitigation, particularly from shallow buried items. However, if a site has not undergone any extent of redevelopment, the likelihood of UXO remaining within its boundaries can remain.

The site has been redeveloped post-WWII	✘
Further Details	Historical OS mapping has highlighted that land-use on site has remained consistent since WWII, the site has remained agricultural.

10.2.4 Site-Specific Analysis

The following table discusses the likelihood that UXO could remain on site, following any post-WWII activity.

Mitigating factors during post-WWII period	The site has remained undeveloped since the end of WWII.
Further comments	Within the footprints of the post-war redevelopment / ground works, the risk of shallow buried UXO (especially German 1kg incendiaries) remaining will have been partially mitigated since any such items could have been encountered and removed during soil stripping and levelling. As no such works appear to have taken place post-WWII, this is considered unlikely. Only within the volume of any post-war basement level bulk excavations and at the precise locations of any post-war pile foundations / boreholes, will the risk from deeper buried German HE UXBs have been completely mitigated. As no bulk excavations have been carried out onsite, the risk from deep buried UXO remains unmitigated to the maximum bomb penetration depth

10.3 The Likelihood that Ordnance may be Encountered during the Works

The following table discusses the likelihood that UXO could be encountered on site during the proposed works.

At-Risk Scenarios	The most likely scenarios under which a UXO could be encountered during construction works is during piling, drilling operations or bulk excavations for basement levels. The overall risk will depend on the extent of the works, such as the numbers of boreholes/piles (if required) and the volume of the excavations. Since an air-dropped bomb may come to rest at any depth between just below ground level and its approximate penetration depth there is also a chance that such an item could be encountered during shallow excavations (for services or site investigations) into the original WWII ground level. If the proposed works are due to be undertaken within post war fill material / made ground, the risk of encountering WWII UXBs is low. However, if works are to be undertaken below WWII ground level this risk is significantly higher.
Likelihood of UXO being encountered during the proposed works	The proposed works are expected to consist of site investigation works, comprising boreholes and trial pits etc

10.4 The Risk that Ordnance may be Initiated

Items of ordnance do not become inert or lose their effectiveness with age. Time can indeed cause items to become more sensitive and less stable. This applies equally to items submerged in water or embedded in silts, clays or similar materials. The greatest risk occurs when an item of ordnance is struck or interfered with. This is likely to occur when mechanical equipment is used or when unqualified personnel pick up munitions.

10.4.1 Initiation of Unexploded Bombs

In the case of unexploded German bombs discovered within the construction site environment, there are a number of potential initiation mechanisms:

Direct Impact onto the main body of the bomb	Unless the fuze or fuze pocket is struck, there needs to be a significant impact to initiate a buried iron bomb.
Re-starting the clock timer in the fuze	Only a small proportion of German WWII bombs employed clockwork fuzes. It is probable that significant corrosion has taken place within the fuze since the end of WWII that would prevent clockwork mechanisms from functioning, nevertheless it was reported that the fuze in a UXB dealt with by 33 EOD Regiment in Surrey in 2002 did recommence.
Induction of a static charge, causing a current in an electric fuze	The majority of German WWII bombs employed electric fuzes. It is probable that significant corrosion has taken place within the fuze mechanism since the end of WWII such that the fuze circuit could not be activated.
Friction impact initiating the (shock-sensitive) fuze explosive	This is the most likely scenario resulting in the bomb detonating.

10.4.2 Activities that may Result in the Initiation of Unexploded Ordnance

Unexploded bombs do not spontaneously explode. All high explosive requires significant energy to create the conditions for detonation to occur. The risk that UXO could be initiated if encountered will depend on its condition, how it is found and the energy with which it is struck. However certain activities pose a greater risk than others.

Percussive piling or deep mechanical excavations	The most violent activity on most construction sites is percussive piling or deep mechanical excavations. If an item is struck with a significant enough impact, be it direct or through friction/vibration, it risks detonation.
Shallow excavation	Soil levelling and shallow excavation such as trial pits can pose a similar risk to deeper excavations, since UXO can be found at any depth between ground level and the maximum bomb penetration depth. In addition to risk of initiation by violent impact or vibration, detonation can also occur if discovered items are mishandled by unqualified personnel. This is particularly common when onsite personnel are not trained in the recognition of ordnance.
Non-intrusive works	In the case of non-intrusive planned works, little risk is posed by items of UXO that are buried beneath the ground. However, risk can arise from unburied munitions,

	particularly items of ordnance discarded in periphery areas of military sites. These items are frequently discovered by onsite personnel and remain live and liable to activate if mishandled.

10.5 The Consequences of Encountering or Initiating Ordnance

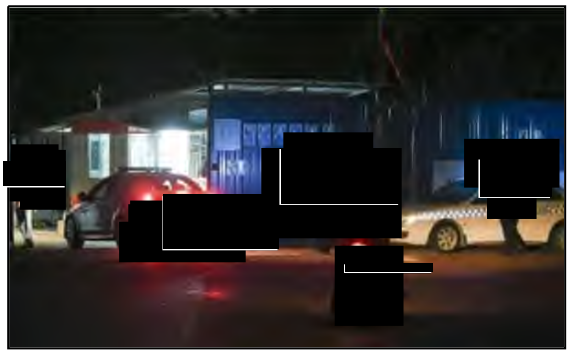
Clearly the consequences of an inadvertent detonation of UXO during construction operations would be catastrophic with a serious risk to life, damage to plant and a total site shutdown during follow-up investigations.

Since the risk of initiating ordnance is significantly reduced if appropriate mitigation measures are undertaken, the most important consequence of the discovery of ordnance will be economic. This would be particularly so in the case of high-profile locations and could involve the evacuation of the public.

The unexpected discovery of ordnance may require the closing of the site for any time between a few hours and a week with a potentially significant cost in lost time. Note also that the suspected find of ordnance, if handled solely through the authorities, may also involve loss of production since the first action of the Police in most cases will be to isolate the locale whilst awaiting military assistance, even if this turns out to have been unnecessary.

The following tables review a number of finds over recent years both in the UK and overseas that have seen large-scale disruptions, damage and injury/death:

UXB Incidents where intrusive works have caused detonation, resulting in death, injury and damage to plant	
 RESCUE workers search for survivors after a Second World War bomb exploded at a building site in Berlin, killing three people and injuring at least eight others. A fire brigade spokesman said he feared the final death toll could be higher. One worker was still missing, believed to be trapped under a machine. "We've found human remains 100 metres away but we can't tell if they belong to the dead already found," the spokesman said. The blast, set off by drilling work on Frankfurter Allee, one of east Berlin's busiest avenues, trapped workers under building machinery and sent huge chunks of concrete tumbling through the air. A large office block was being built on the site of the explosion which sent shoppers scrambling for shelter and paralysed dense afternoon traffic. One eyewitness said: "There was a bang, then silence, and then it started raining stones and dirt." Dozens of cars within a 250-metre radius were wrecked and the top two floors of a nearby apartment block caved in. Radio reports claimed that the total number of injured stood at 14. **Blown up by history**	A WWII bomb killed 3 and injured 8 in Berlin - 1994
	WWII bomb killed 3 in Goettingen, Germany – 2010.
	Excavator operator killed by WWII bomb in Euskirchen, Germany – 2014. A WWII bomb exploded at a construction site near a west German town, killing a man and injuring 8 others. The explosion occurred with a digger accidently struck the device during excavation works.

UXB Incidents where intrusive works have caused detonation, resulting in death, injury and damage to plant	
	A highway construction worker in Germany accidentally struck a WWII bomb, killing himself and wrecking several passing cars – 2006.
	Destroyed piling rig and dump truck after detonation of WWII UXB in Austria – 2006.
	WWII bomb injures 17 at construction site in Hattingen, Germany – 2008.
	A buried WWII-era bomb exploded during construction works in Bandar Malaysia, Kuala Lumpur – 2017.

UXB Incidents in the UK, resulting in delays, site shutdowns, evacuations, and disruptions	
	London City Airport shut: Flights cancelled after WWII bomb found in River Thames dock. London City Airport was closed after the discovery of a 250kg WWII German bomb, affecting tens of thousands of passengers. All flights into and out of the airport were stopped after the device was found by SafeLane Global in the nearby King George V dock. A 700ft exclusion zone was put in place and people living nearby were evacuated.
	Unexploded WWII 1000kg HE bomb found in Exeter, causing a construction site and the surrounding area to be evacuated. The subsequent detonation caused substantial damage to nearby buildings.
	A WWII UXB was found near to the Aston Expressway, leading to the evacuation of around 200 residents and a 500m cordon. Following the discovery, the weapon was safely detonated by the Army. However, although the M6 was reopened after the blast, the key Aston Expressway stayed shut until 6pm, extending traffic disruption. All nearby rail services and other roads were also disrupted.
	Up to 1000 homes were evacuated and a 300m exclusion zone was put in place following the discovery of a WWII UXB in Lansdown Road, Bath. The 500lb bomb was found just a meter beneath a playground at the former Royal High Junior School.

11 SafeLane Global's Risk Assessment

The Risk Assessment made by SafeLane Global for the site is based upon the likelihood that the site was contaminated, the risk of the contaminant item remaining, and the likelihood of, and potential consequences, should the item be struck during the proposed works. The following section discusses the risk that each ordnance type presents to the scope of works for the project site.

11.1 Conclusions

Taking into consideration the findings of this study, SafeLane Global considers the UXO risk at the site to be **Medium.**

Type of Ordnance	Likelihood of Contamination	Likelihood of UXO remaining	Likelihood of encounter	Potential Consequence	Overall Risk level
German High Explosive Bombs	Medium	Medium	Medium	Severe	**Medium**
German 1kg Incendiary Bombs	Low	Low	Low	Severe	**Low**
Allied Anti-Aircraft Shells	Medium	Medium	Medium	Minor	**Medium**
British / Allied Small Arms	Low	Low	Low	Not Significant	**Low**
Land Service Ammunition	Low	Low	Low	Moderate	**Low**

12 Proposed Risk Mitigation Strategy

SafeLane Global recommends the following minimum risk mitigation measures be deployed to support the proposed ground works at the site.

12.1 Summary

Based on the findings of the report, the following mitigation measures have been recommended for the proposed works on the site. Further detail on each method is presented in **Section 12.2**.

Risk Level	Planned Site Activity	Recommendations
Medium	Shallow Intrusive Works eg. excavations	• UXO Safety & Awareness Briefing (Toolbox Brief, TBB) • Site Specific Safety Instructions (SSSIs) Training Course • Explosive Ordnance Disposal (EOD) Engineer to support Site Investigation (SI) • Non-Intrusive (NI) Magnetometer Survey (Greenfield areas only) • Target Investigation (Required as a follow-on from NI magnetometer survey)
	Deep intrusive works (eg. piling)	• UXO Safety & Awareness Briefing (Toolbox Brief, TBB) • Site Specific Safety Instructions (SSSIs) Training Course • Intrusive Magnetometer Survey of pile/borehole positions

12.2 Additional Notes

Risk Mitigation Measures – Further Detail	
Site Specific Explosive Ordnance Safety and Awareness Briefings (UXO Toolbox Briefing) to all personnel conducting intrusive works	These briefings are intended to make site operatives aware of the nature of explosive ordnance that may be encountered on their project site. • Delivered by a specialist Explosive Ordnance Disposal Engineer. • Provides information on the site-specific explosive ordnance risk • Basic ordnance identification. • What to do in the event of an encounter with a suspicious object. Provide UXO response procedures.
Site Specific Safety Instruction (SSSI)	For longer term projects that require Explosive Ordnance Safety and Awareness Briefings as part of the Explosive Ordnance Risk Mitigation measures for the project, SSSIs can be provided to allow nominated site representatives to deliver these briefings after initial training. • 2/3-hour presentation and training course. • Delivered by a fully qualified senior EOD Engineer. • Suitable for Project Site Manager HSE representative and supervisors. • Includes briefing pack. This provides a cost-effective solution to ensure that the Explosive Ordnance Safety and Awareness Briefings can be delivered effectively and efficiently to the required standard.
Explosive Ordnance Disposal (EOD) Engineer On-Site Support	In areas where the risk posed by the potential presence of explosive ordnance is low or where the conditions are not suitable for pro-active survey, EOD On-Site Support can provide a reactive response to any suspicious object that may be encountered during open excavation works. The presence of the EOD Engineer (sometimes referred to as 'high risk dig wardens') on-site in support of shallow intrusive work allows for a direct monitoring of works using visual recognition and instrumentation and provides an immediate response to reports of suspicious objects or suspected items of ordnance that have been recovered by ground workers. SafeLane Global EOD personnel on-site also have the additional benefit of providing Explosive Ordnance Safety and Awareness briefings (UXO TBB) to any staff that have not received them earlier and can advise staff of the need to modify working practices to take account of the ordnance threat. The EOD Engineer will also aid potential incident management which would involve liaison with the local authorities and police should ordnance that presents an explosive hazard be identified. • Specialist Explosive Ordnance Disposal Engineer. • Maintains a watching brief over all excavations. • Provides safety and awareness briefings to construction personnel as required.

	• Provides immediate identification of any suspicious item that is encountered. • Identifies whether any UXO item is live or inert. • Provides liaison assistance with the relevant authorities when dealing with any live UXO. Avoids on site delays which can be caused by the incorrect identification of a suspect item being potential UXO.
Explosive Ordnance Disposal (EOD) Engineer to support site investigation works	For cost effective Explosive Ordnance Risk Mitigation for site investigation work, the EOD Engineer can survey ahead of trial pits, monitor excavations when the ground conditions are not suitable for a pro-active survey and conduct intrusive surveys for borehole and window sample locations working in conjunction with the site investigation team. The On-Site Support will also provide a reactive response to any suspicious object that may be encountered during open excavation works. SafeLane Global EOD personnel on-site also have the additional benefit of providing Explosive Ordnance Safety and Awareness briefings to any staff that have not received them earlier and can advise staff of the need to modify working practices to take account of the ordnance threat. The EOD Engineer will also aid potential Incident Management which would involve liaison with the local authorities and police should ordnance be identified and present an explosive hazard. • Specialist Explosive Ordnance Disposal Engineer. • Maintains a watching brief over all trial pit excavations. • Provides safety and awareness briefings to construction personnel as required. • Works in conjunction with the drilling team to survey all borehole and window sample locations in real-time using a staged drilling and magnetometer survey procedure. • Provides immediate identification of any suspicious item that is encountered. • Identifies whether any UXO item is live or inert. • Provides liaison assistance with the relevant authorities when dealing with any live UXO. • Avoids on site delays which can be caused by the incorrect identification of a suspect item being potential UXO. *Technical Information* 1. In optimum ground conditions each survey using the borehole technique will have a 1 metre look ahead capability. 2. Any steel casing used for borehole surveys will need to be retracted by 3 metres to allow the magnetometer survey to be conducted. Non-ferrous pipe will be required to support the borehole during the survey minimum diameter 60mm (to be supplied by the client).
Search & Clear	Where a non-intrusive magnetometer survey is not possible (e.g. wooded areas) SafeLane Global can deploy a two-man Explosive Ordnance Disposal Engineer team using handheld magnetometer equipment who will proactively survey either in search lanes or boxes, investigating each reading with the support of

	an operated excavator. The survey is suited to detecting suspicious ferro-magnetic buried objects that may be munitions and/or explosive ordnance related. All SafeLane Global personnel involved with the Search and Clearance Works will be former military personnel who have gained formal NATO Military Explosive Ordnance Disposal Qualifications, having completed training at the Defence Explosive Ordnance Disposal School (DEODS) Chattenden, Kent or similar establishment throughout their military service. The client will be responsible for: • Demarcating the areas to be searched. • Providing services clearance and permit to dig. • Providing operated excavator to access deeper targets if required (SafeLane Global can provide this service at additional cost). • Providing coordinates of positions where debris have been identified (if information required in report). • Providing storage for recovered debris. Output will depend upon terrain and contamination (number of readings to be investigated).
Non-Intrusive Magnetometer Survey and Target Investigation (greenfield land only)	**Non-Intrusive Survey** This survey type is designed for use on magnetically 'clean' land commonly referred to as 'greenfield'. Brownfield land is often described as that which has had previous industrial or commercial use. In this context it specifically encompasses sites with are underlain by 'made ground' which may contain metallic contamination. Non-intrusive magnetometry or electromagnetic equipment which is used in the search for buried UXO relies upon the detection of small changes between clear ground and that containing UXO. The technique operates very successfully in environments where there is minimal ground contamination from other sources such as fired bricks, reinforced concrete, discarded scrap metal and buried services. There are also man-made ambient effects on magnetic and electromagnetic non-intrusive survey systems which include moving plant vehicles, power cables, electric trains etc. Non-Intrusive survey is carried out using either total-field or gradiometer magnetometry, dependent upon site conditions. Data is recorded and then interpreted using advanced AGSPRoc software in order to map magnetic fields and model discrete magnetic anomalies (variations in the Earth's magnetic field caused by ferro-magnetic objects electrical fields or geology). The location of such anomalies is determined, and mathematical modelling used to estimate their mass and depth. The survey will also locate any buried services with a magnetic signature and indicate any areas of gross magnetic "contamination" which may indicate the presence of unknown obstructions. Additionally, the survey can provide information on archaeological features. The system can detect the magnetic field from a 50kg WWII air-dropped bomb at a depth of 4m and smaller items such as Land Service Ammunition to depths of up to 1.5m in ground with a low ambient magnetic field. In the case of soft geology, it should be noted that a 50kg high explosive bomb may be buried greater than 4 metres below ground level and therefore may not be detected by the survey. In this instance intrusive surveys may be required.

	The non-intrusive survey system will be deployed utilising the pedestrian survey frame. The output for the pedestrian frame is estimated at up to 2Ha per day. *Technical information:* • Client to clearly demarcate area to be surveyed prior to start and highlight any known services/underground obstructions. • Ground must be level, free of obstacles / obstructions and clear of undergrowth. Height of any crops should be no more than 400mm and where crops are present SafeLane Global would require written approval from the landowner or client to walk over the site area. • When working adjacent to existing infrastructure the survey may be ineffective due to the ferro magnetic interference caused by passing vehicles and the presence of underground buried services. A site visit may be recommended prior to commencement. • Note: the survey will be ineffective on Brownfield sites due to the magnetic nature of building rubble, which typically masks the weaker magnetic signatures of buried objects. If parts of the site are contaminated, then alternative risk mitigation measures may need to be considered. **Target Investigation** If a buried anomaly is detected that cannot be discounted as a potential UXO / UXB then the object will need to be investigated to positively identify the item. The process will include; • Specialist two-man Explosive Ordnance Disposal Team. • Combination of manual and mechanical excavation techniques. • Excavator shafting, shoring and dewatering equipment can be provided by SafeLane Global if required. • Excavation techniques will be defined and agreed prior to the commence. A factual report with clearance certificate will be issued on completion of the investigation.
Intrusive Magnetometer Survey of all pile locations down to the maximum bomb penetration depth	SafeLane Global can deploy a range of intrusive magnetometry techniques to clear ahead of all the pile locations. The appropriate technique is governed by a number of factors, but most importantly the site's ground conditions. The appropriate survey methodology would be confirmed once the enabling works have been completed. A site meeting would be required between SafeLane Global and the client to determine the methodology suitable for this site. Target investigation or avoidance will be recommended as appropriate.

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The key sources consulted during this assessment are listed below;

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vii. Ramsey, W., *The Blitz Then and Now, Volume 1*, (Battle of Britain Prints International Limited. 1987).

viii. Ramsey, W., *The Blitz Then and Now, Volume 2*, (Battle of Britain Prints International Limited. 1988).

ix. Ramsey, W., *The Blitz Then and Now, Volume 3*, (Battle of Britain Prints International Limited. 1990).

x. Whiting, C., *Britain Under Fire: The Bombing of Britain's* Cities 1940-1945, (Pen & Sword Books Ltd. 1999).





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SAFELANE® GLOBAL

Recent Aerial Photograph

Annex B
9251-4 RA

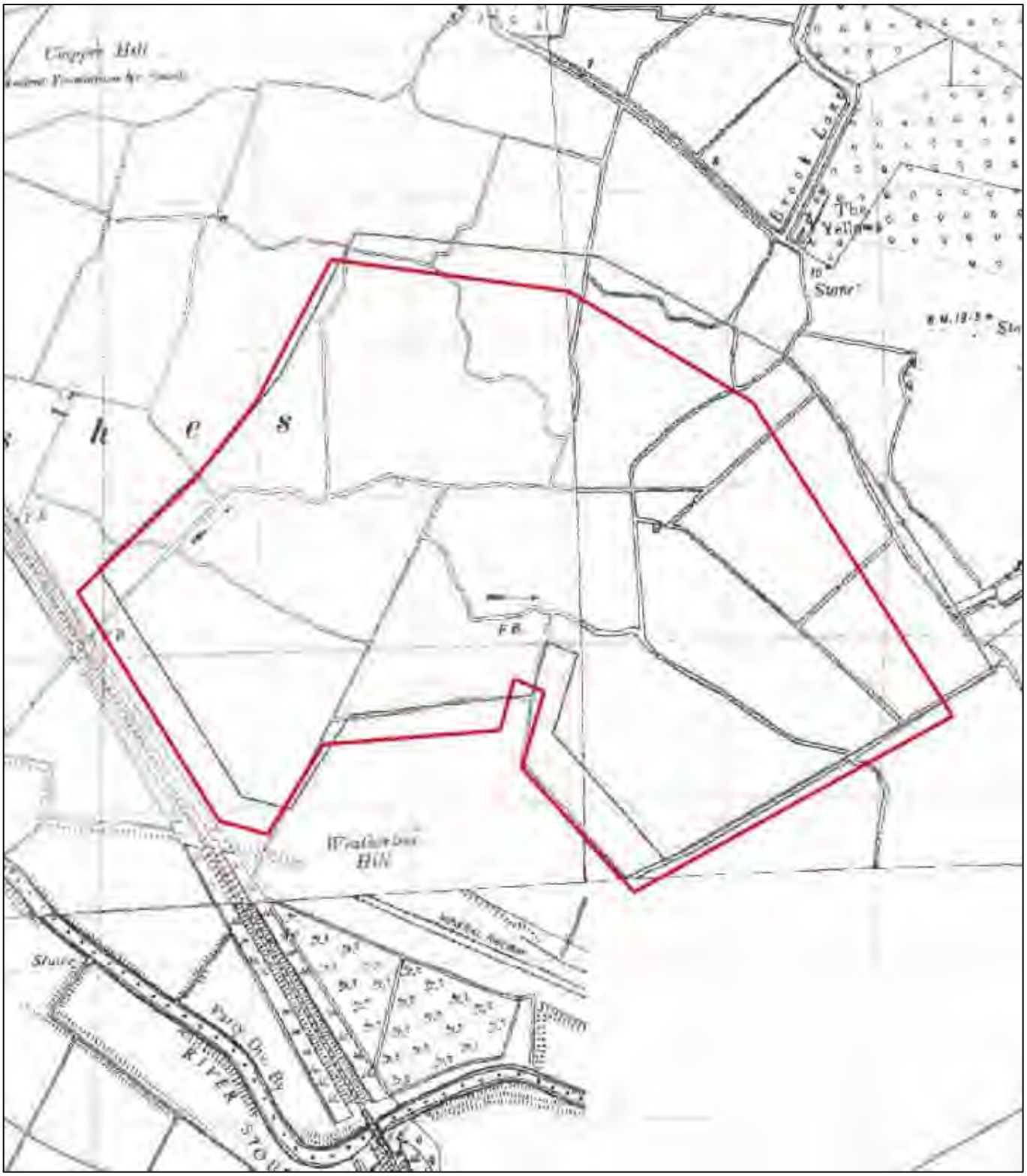
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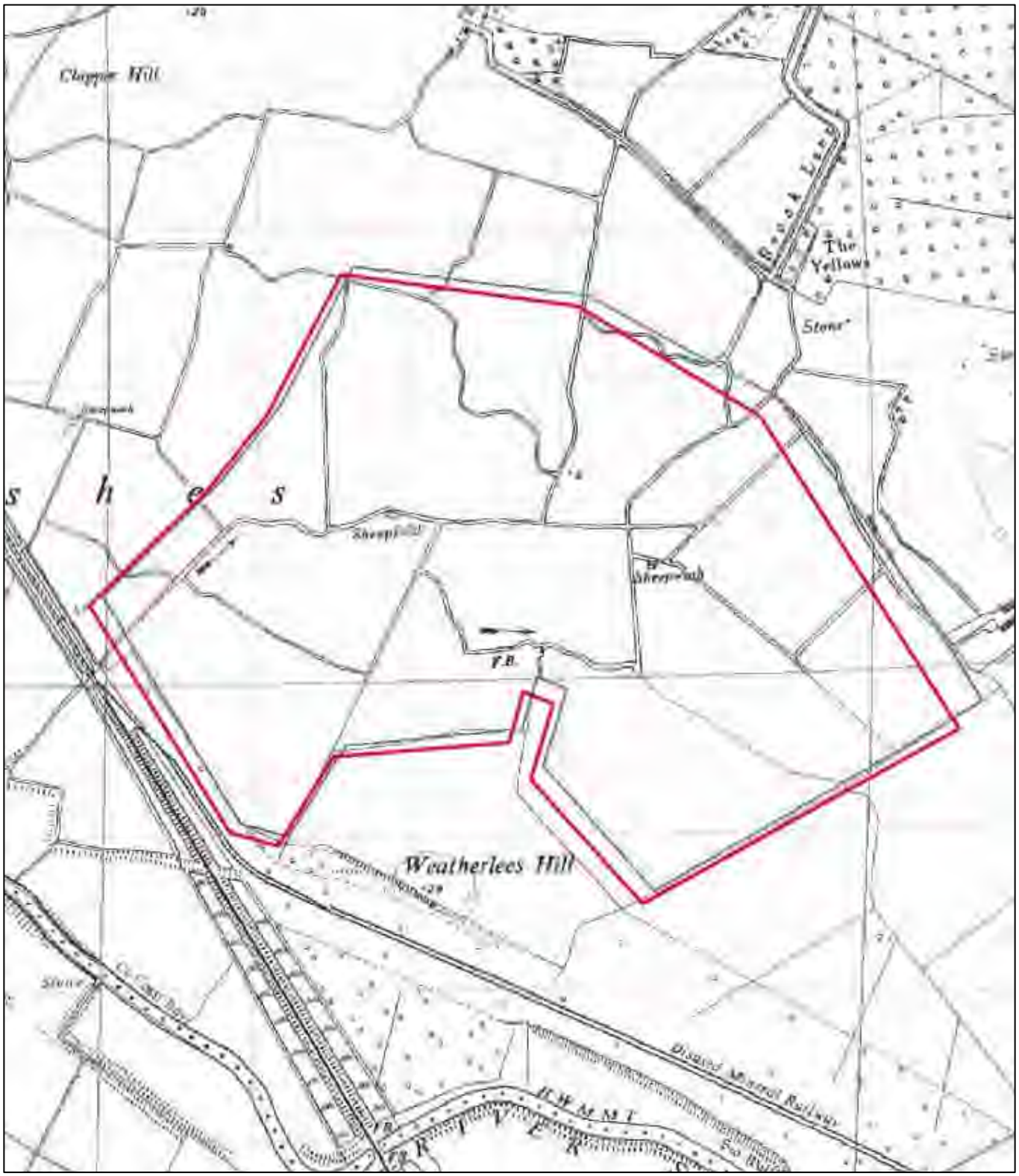
Approximate site boundary

Google Earth™ Mapping Services

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Approximate site boundary

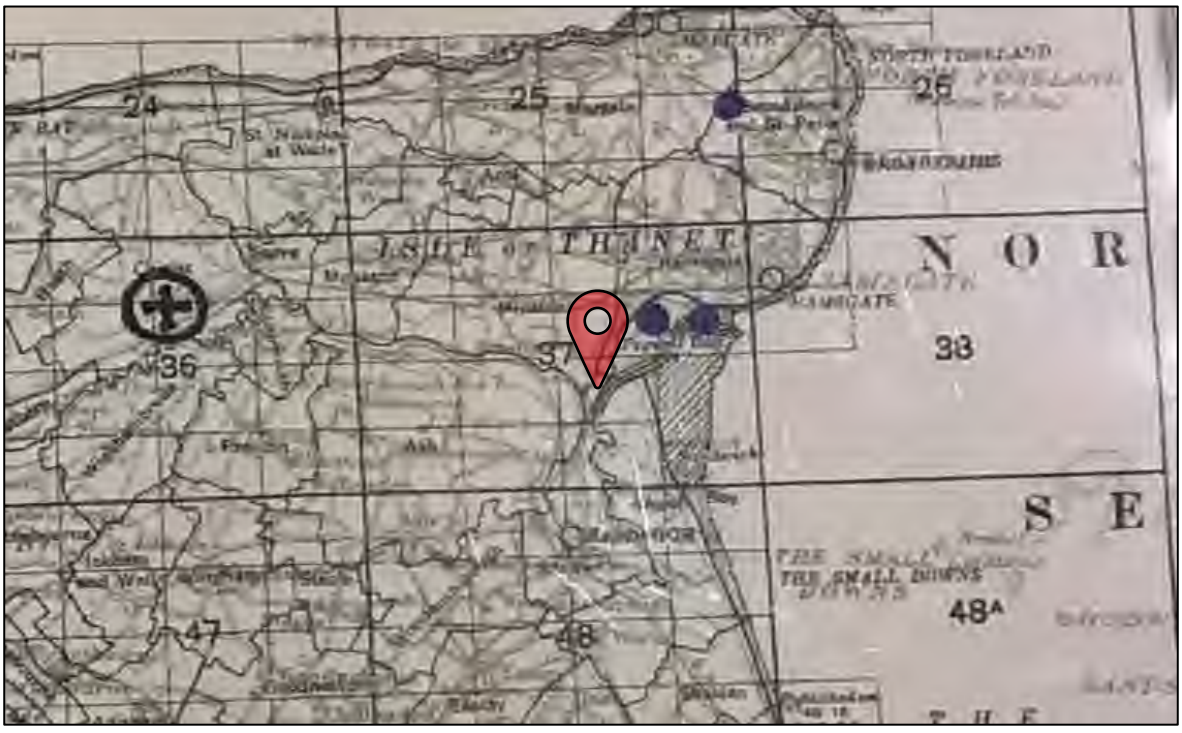


Approximate site boundary

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9th July 1940



27th October 1940

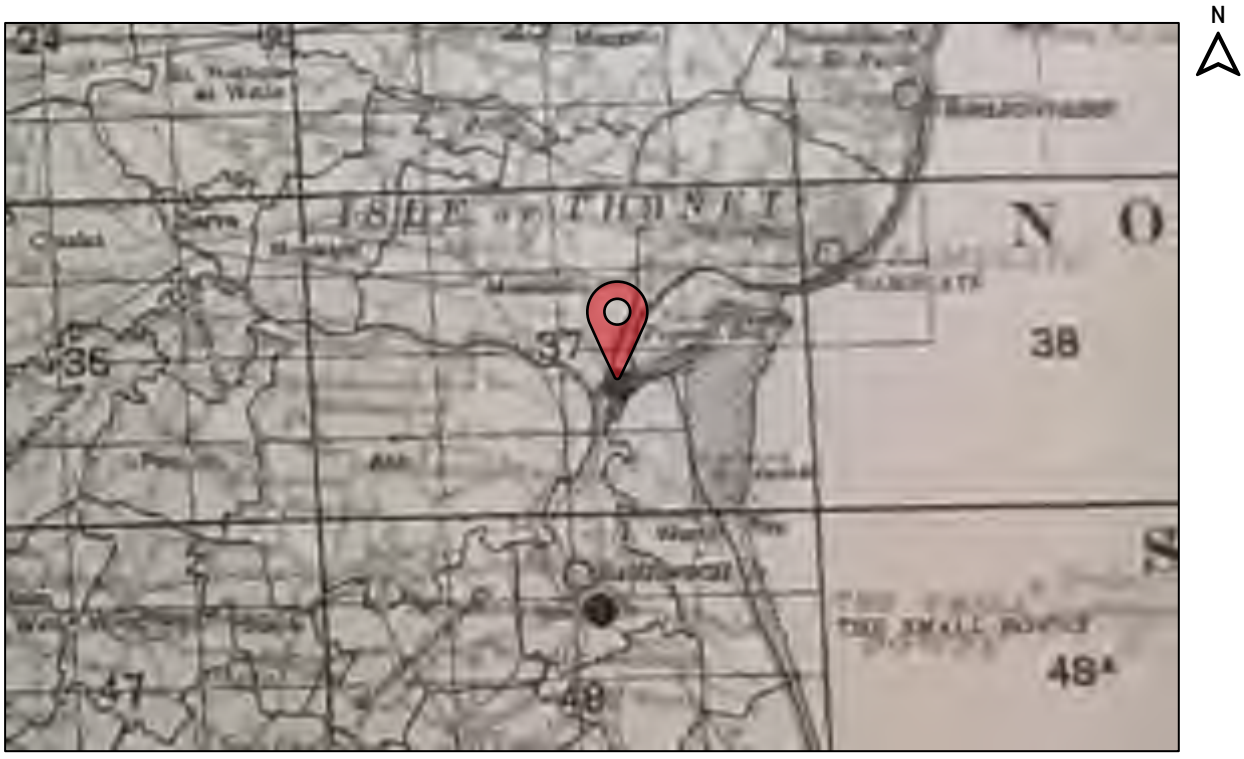
Approximate site location

HE bomb strike

Incendiary shower

HE bomb area

Kent History & Library Centre



29th October 1940



6th December 1940

Approximate site location

HE bomb strike

Incendiary bomb

RAF Fighter

Kent ARP Records Bomb Census Map

N



Approximate site boundary

HE bomb

Unexploded bomb

(Numbers in circles denote quantity of explosive ordnance recorded)

SAFELANE® GLOBAL

WWII-era RAF Aerial Photography - Circa. 1946

Annex F
9251-4 RA

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Approximate site boundary

Possible Ground disturbance

SAFELANE®
GLOBAL
LEADING THE WAY

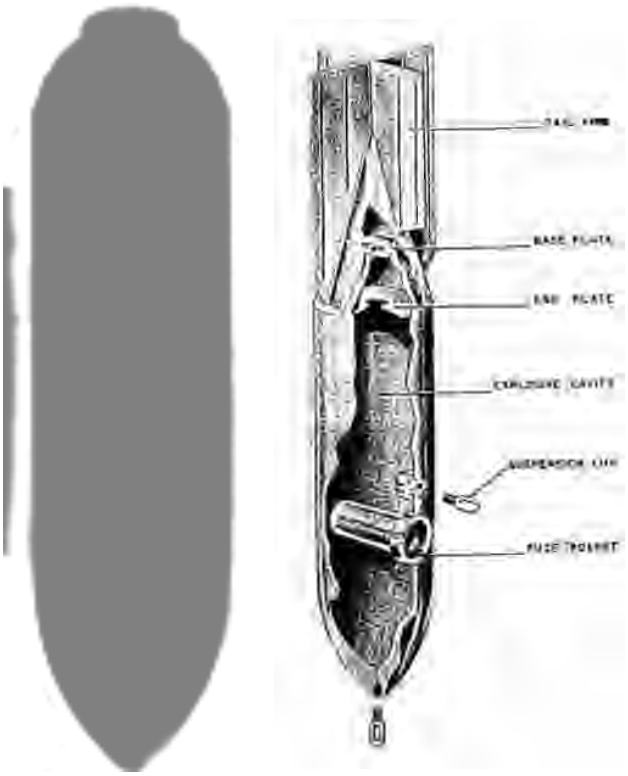


Ordnance Specifications and Information





German Ordnance





Sprengbombe Cylindrisch 50

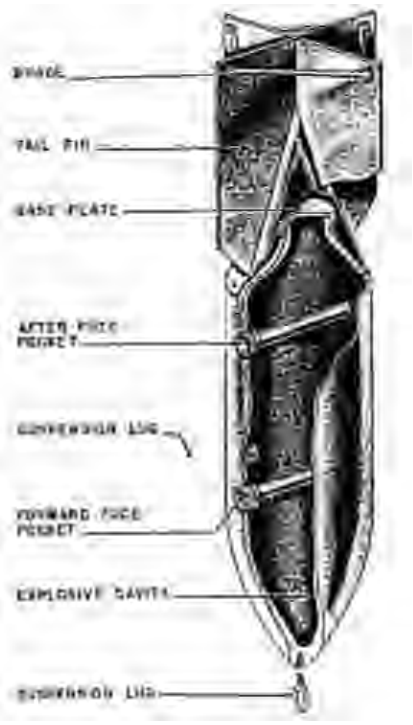
Bomb weight: 40-54kg
Fuze Type: Impact fuze / electro-mechanical time delay fuze
Bomb Dimensions: 1090 x 280mm
Body Diameter: 200mm
Use: Used against lightly damageable materials, hangars, railway rolling stock, ammunition depots, light bridges and buildings up to 3-storeys.
Remarks: The smallest and most common conventional German bomb. Nearly 70% of bombs dropped on the UK were 50kg.

SC50 found on site

In May 2015, an SC50 was found at a building site on Empire Way, Wembley, London. (*Image source: The Guardian*)







Sprengbombe Cylindrisch 250

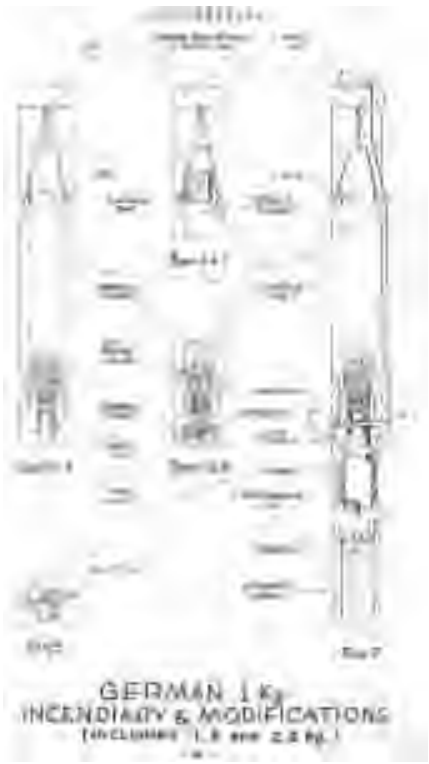
Bomb weight: 245-256k
Explosive Weight: 125-130kg
Fuze Type: Electrical impact / mechanical time delay fuze
Bomb Dimensions: 1640x512mm
Body Diameter: 368mm
Use: Used against railway installations, embankments, flyovers, underpasses, large buildings and below-ground installations.

SC250 found on site

In the year 2000, SafeLane Global discovered an SC250 whilst supervising construction work at Hawkinge, Kent.









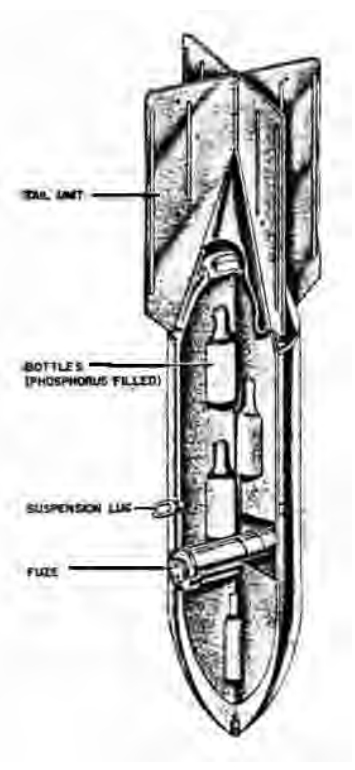
Above: Left – ordinary scaffold pipe, centre - 1kg incendiary bomb, right - incendiary bomb recently found on site in UK

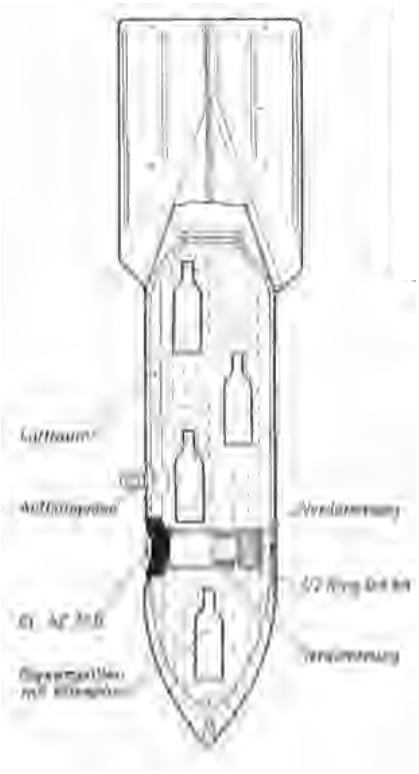
1kg Incendiary Bomb (IB)

Bomb weight: 1.0 & 1.3kg
Filling: 680g Thermite
Fuze Type: Impact fuze
Body Dimensions: 350x50mm
Body Diameter: 50mm
Use: As incendiary – dropped in clusters against towns and industrial complexes
Remarks: Jettisoned from air-dropped containers. Magnesium alloy case. Sometimes filled with high explosive charge.



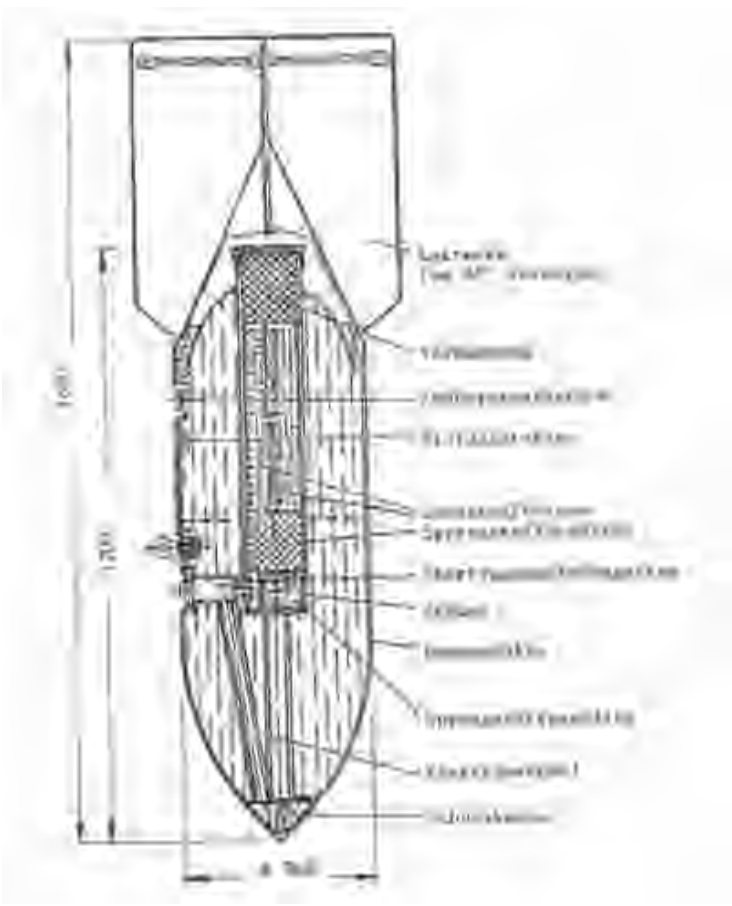






C-50 A Phosphorus Bomb

Bomb Weight: c.41kg
Explosive Weight: 0.03kg
Incendiary Filling: 12kg liquid filling with phosphor igniters in glass phials
Fuze Type: Electrical impact fuze
Bomb Dimensions: 1100x2800mm
Body Diameter: 200mm
Use: Against all targets where an incendiary effect is to be expected
Remarks: Early fill was a phosphorus / carbon disulphide incendiary mixture

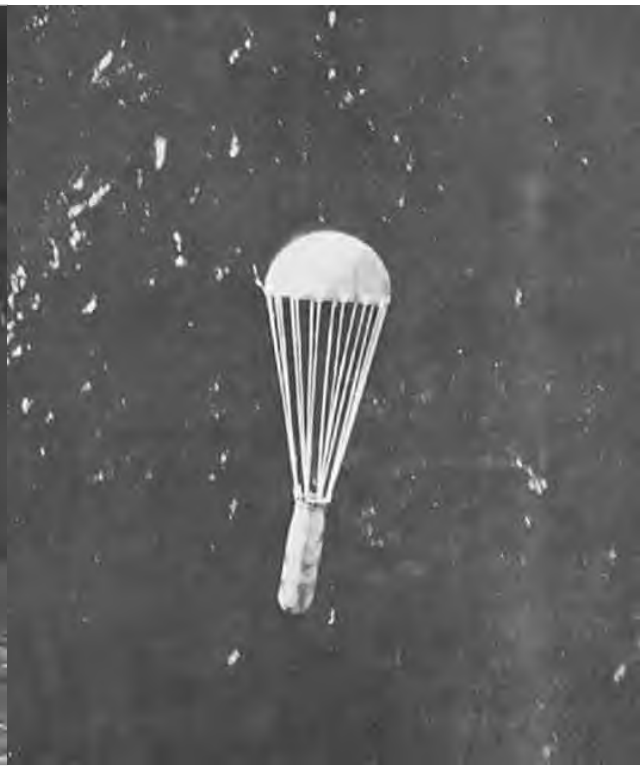




Flam C-250 'Oil Bomb'

Bomb Weight: 125kg
Explosive Weight: 1kg
Flammable Weight: 74kg
Filling: Mixture of 30% petrol and 70% crude oil
Fuze Type: Super-fast electrical impact fuze
Bomb Dimensions: 1650 x 512.2mm
Body Diameter: 368mm
Use: Often used for surprise attacks on living targets, against troop barracks and industrial installations
Remarks: Thin casing – not designed for ground penetration

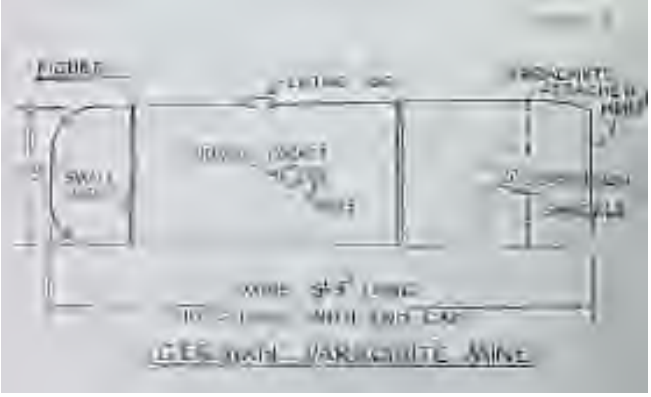


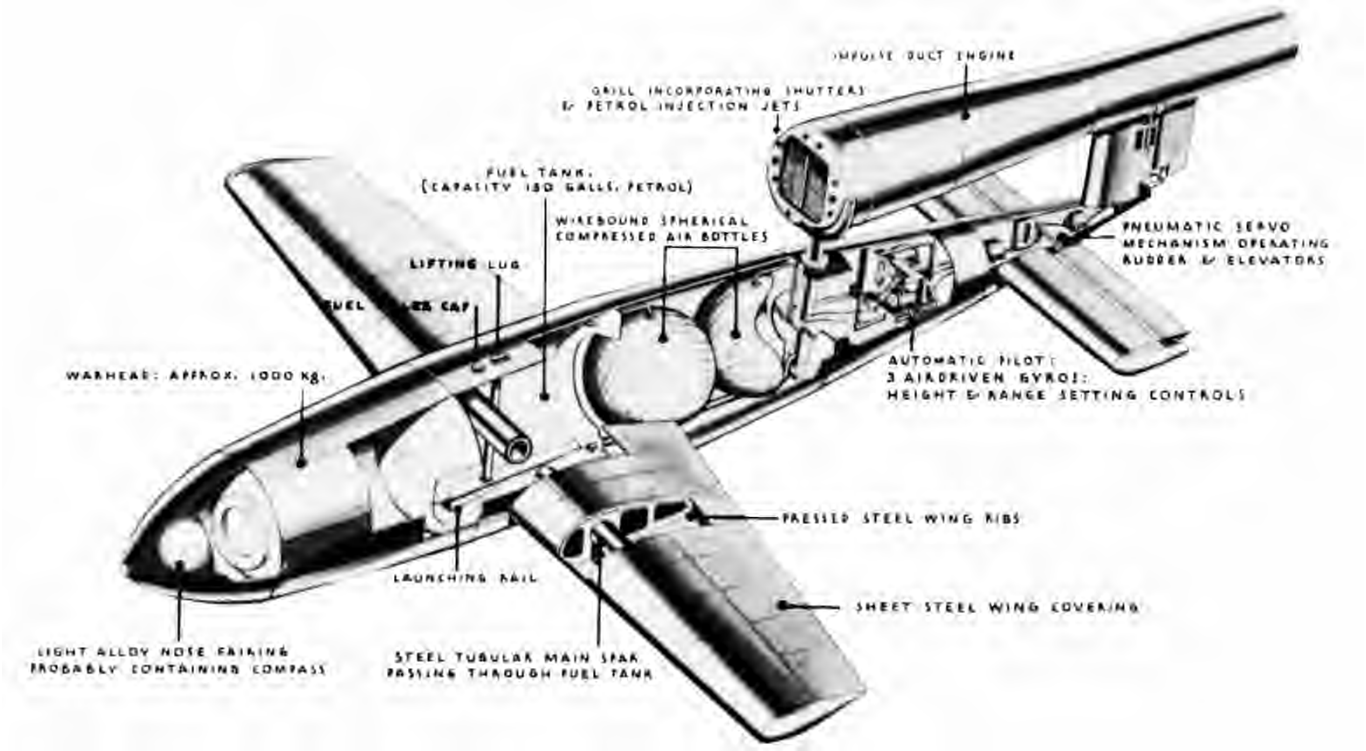


Luftmine A/B 'Parachute Mine'

Bomb Weight: A- 500kg, B – 1000kg
Fuze Type: Mechanical clockwork fuze
Bomb Dimensions: A – 1768mm, B – 2682mm
Use: Capable of creating severe blast damage in built-up areas.
Remarks: Parachute mines were standard German sea mines fitted with a suitable detonator. They were widely used against British cities.





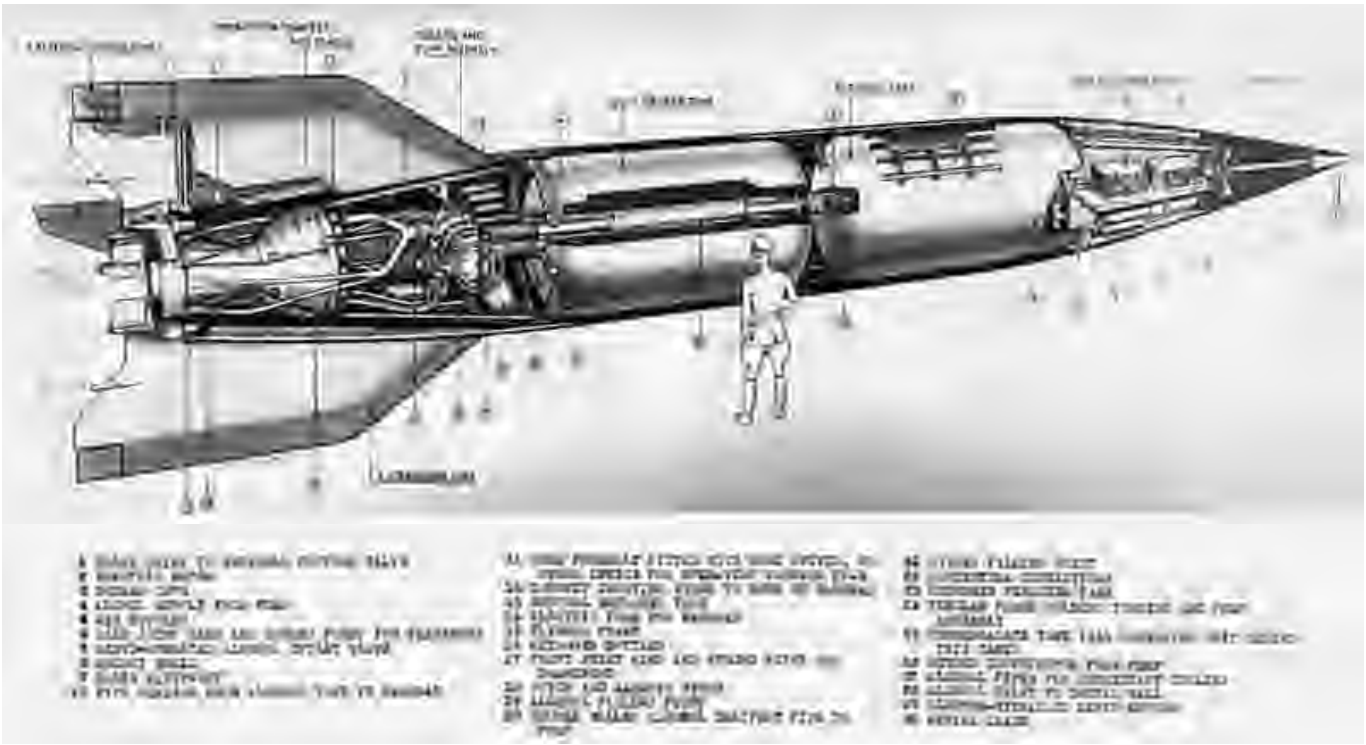


Vergeltungswaffe 1 (V-1) 'Fly' Bomb

Missile Weight: 2,150kg
Fuze Type: Electric Impact Fuze
Missile Length: 8.32m
Width: 5.37m
Range: 250km
Use: Pulsejet-powered guided cruise missile, designed to attack Allied cities.
Remarks: Armed with an 850kg warhead, around 10,000 V-1 flying bombs were fired at England, causing significant damage and killing approximately 6,000 people . There is a negligible risk from unexploded V-1s today, since the remains would have left incontrovertible evidence of the impact.



A V-1 'Fly' Bomb, captured over London seconds before impacting



Vergeltungswaffe 2 (V-2) Rocket

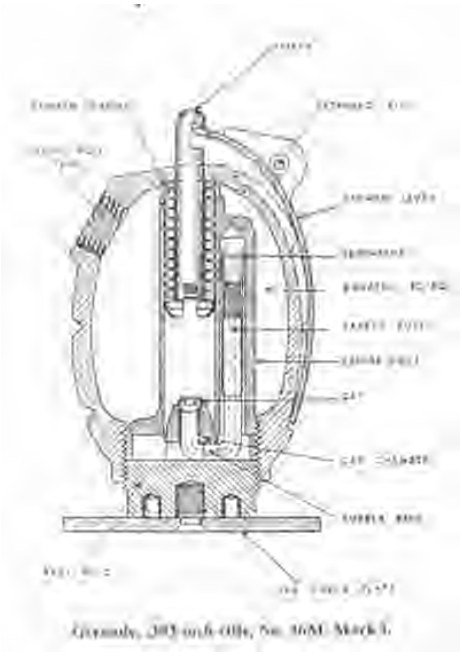
Rocket Weight: 12,500kg
Fuze Type: Electric Impact Fuze
Rocket Length: 14m
Body Diameter: 1.65m
Range: 320km
Use: Long-range ballistic missile, designed to attack Allied cities.
Remarks: Armed with a 975kg warhead and travelling at three times the speed of sound, the V-2 could cause widespread destruction. There is a negligible risk from unexploded V-2s today, since the remains would have left incontrovertible evidence of the impact.





British & Allied Ordnance

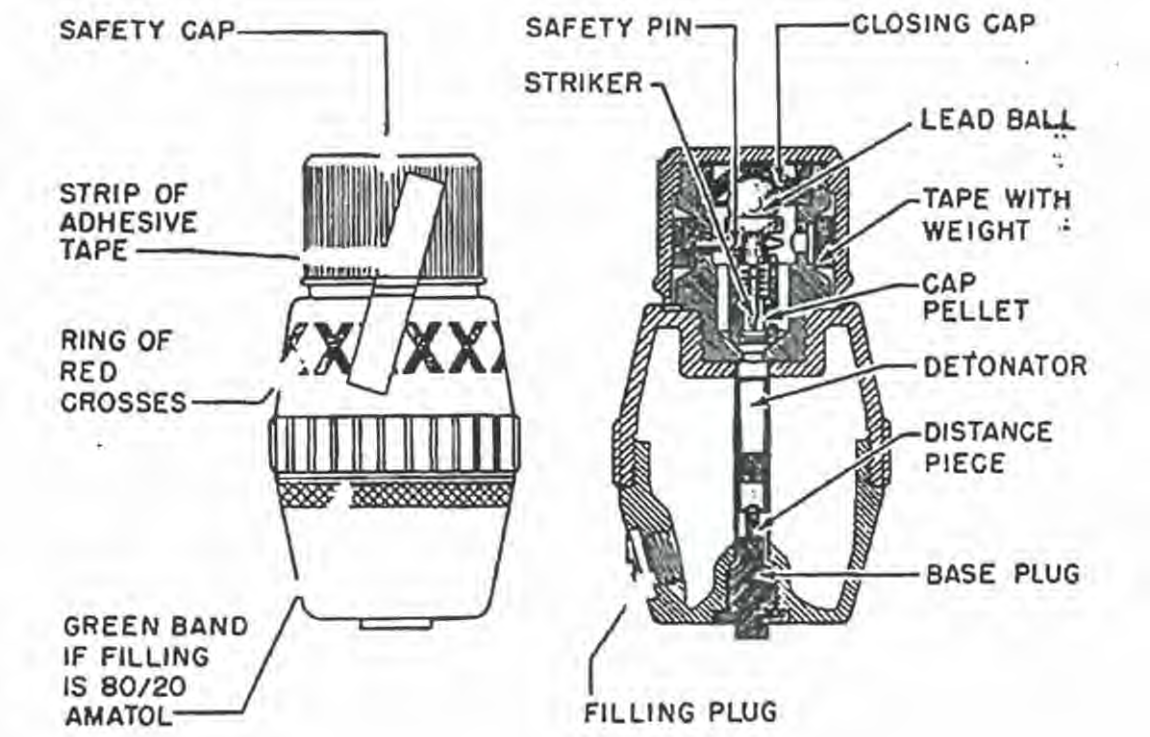




No. 36 “Mills” Grenade

Weight: 0.7kg filled
Type: Hand or discharger, fragmentation
Dimensions: 95 x 61mm
Filling: Alumatol, Amatol 2 or TNT
Remarks: 4 second hand-throwing fuze with approximate range of 30m. First introduced May 1918.



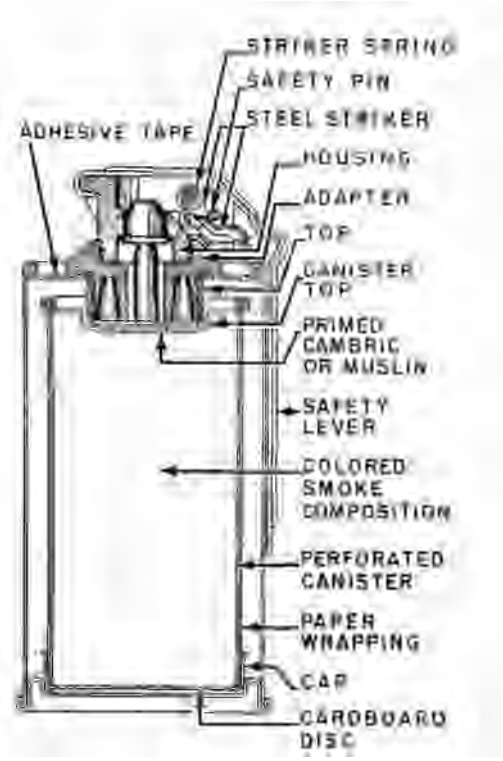


No. 69 Grenade

Weight: 038kg filled
Type: Percussion / Blast
Date Introduced: December 1940
Remarks: Black Bakelite body. Blast rather than fragmentation type. After unscrewing the safety cap, a tape is held when throwing the grenade releasing the safety bolt in the throwing motion. Detection is problematic due to its very low metal content.







Typical Smoke Grenade

Dimensions: Approx. 65 x 115mm
Type: Smoke
Date Introduced: Current MoD issue
Remarks: Smoke grenades are used as ground-to-ground or ground-to-air signalling devices, target or landing zone marking devices, and screening devices for unit movement.





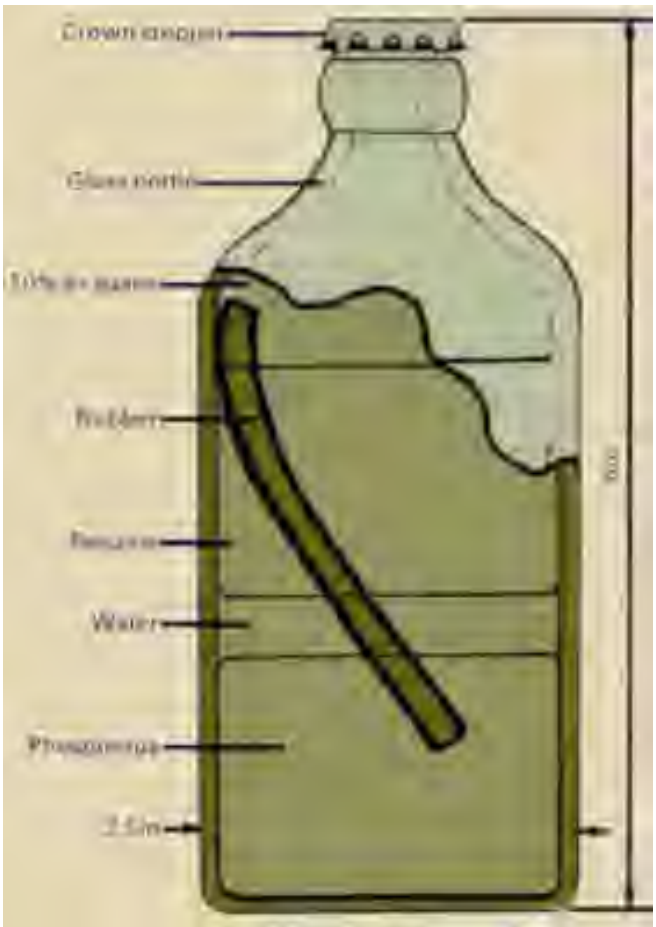


Self-Igniting Phosphorous (SIP) Grenade

Sometimes called the "A&W (Albright & Wilson)" grenade.

The grenade comprised a glass bottle with a total volume of approximately 1 pint. It was filled with white phosphorous, benzene, a piece of rubber and water. Over time, the rubber dissolved to create a sticky fluid which would self-ignite when the bottle broke.

Fired by hand or Northover Projector.

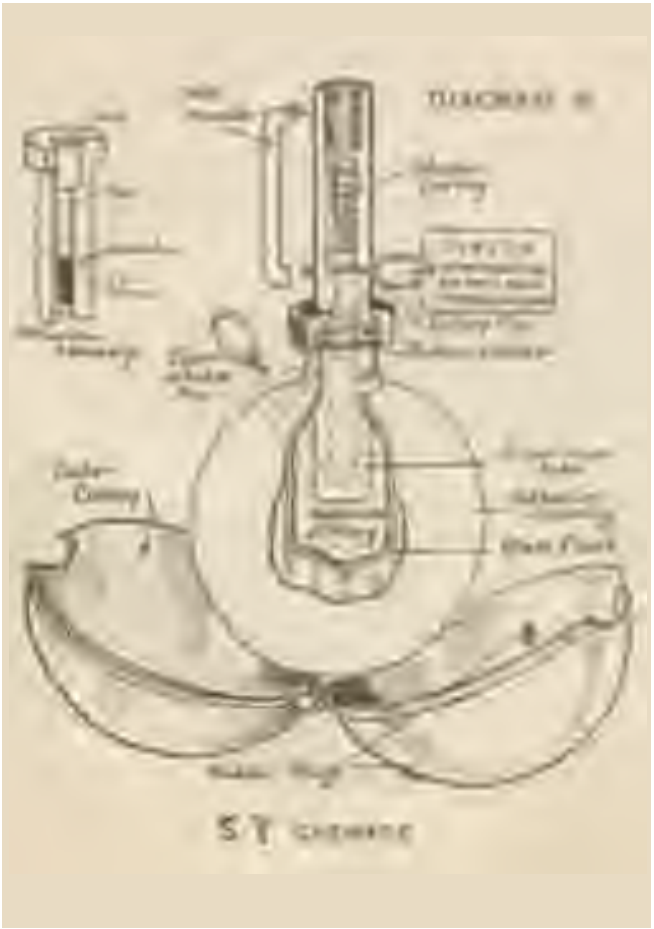






No. 74 Grenade (Sticky Bomb)

Designed as an anti-tank grenade and used by the Home Guard. The grenade consisted of a glass ball on the end of a Bakelite (plastic) handle. Inside the glass ball was an explosive filling whilst on the outside was a very sticky adhesive covering. Until used, this adhesive covering was encased in a metal outer casing.

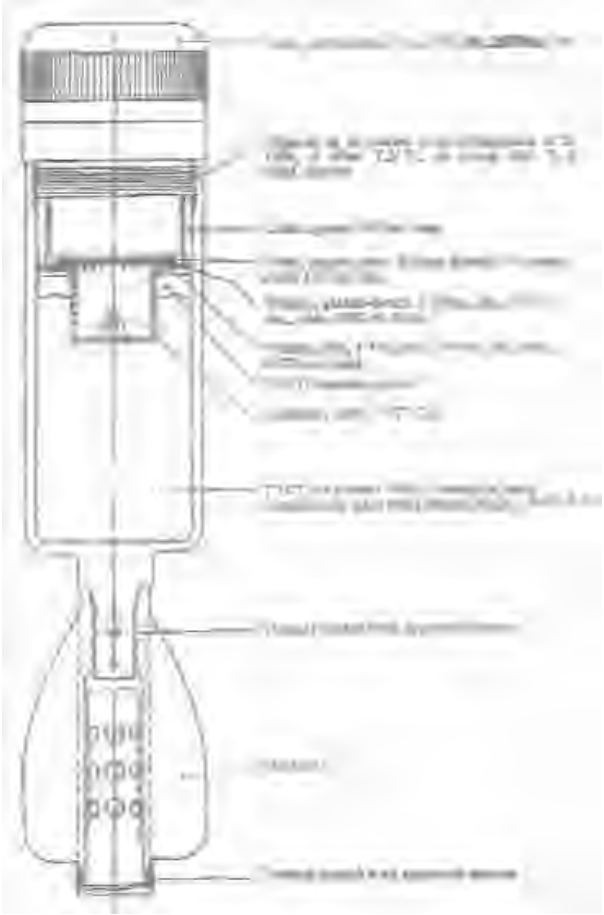






Typical 2" High Explosive Mortar

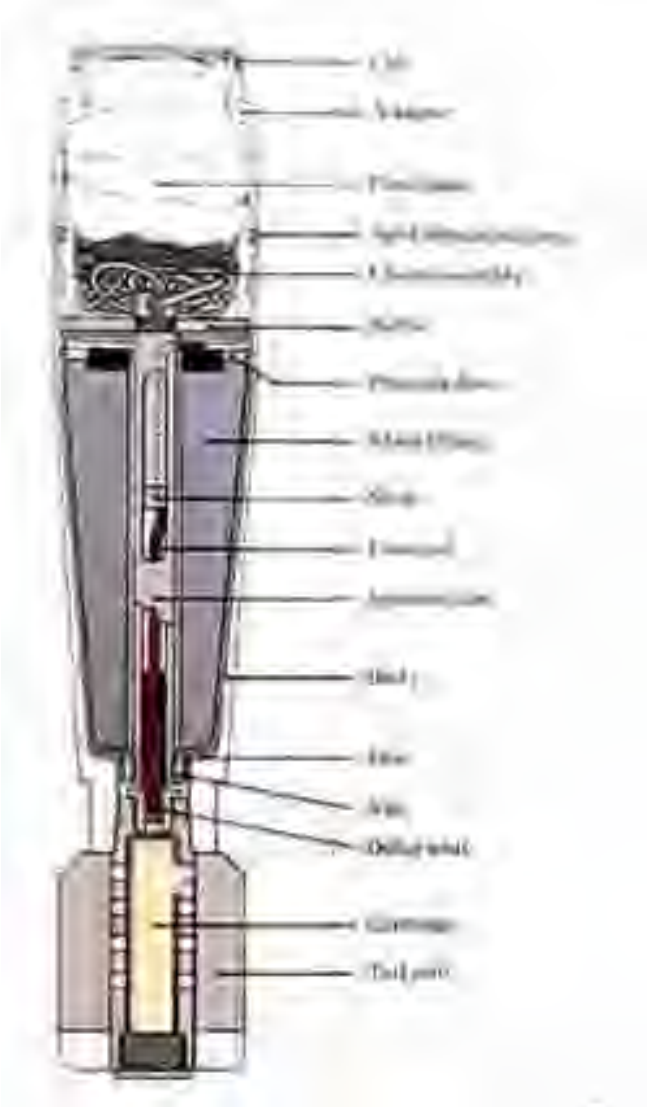
Bomb weight: 1.02kg
Fuze Type: High Explosive
Bomb Dimensions: 51 x 290mm
Filling: 200g RDX/TNT
Remarks: Fitted with an impact fuze which detonates the fuze booster charge (exploder) and, in turn, the high explosive charge. The main charge shatters the mortar bomb body, producing near optimum fragmentation and blast effect at the target.





Typical 2" Illuminating Mortar

Fuze Type: Illuminating
Bomb Dimensions: 51 x 290mm
Filling: Various
Remarks: The expulsion charge ignites and ejects the candle assembly. A spring ejects the parachute from the tail cone. The parachute opens, slowing the descent of the burning candle which illuminates the target.







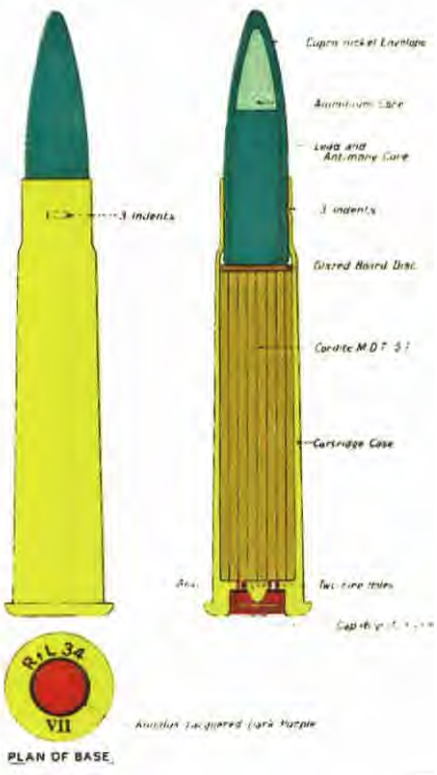


Typical 3" Smoke Mortar

Fuze Type: Smoke
Bomb Dimensions: c.490 x 76mm
Filling: Typically, white phosphorus
Remarks: On impact, the fuze functions and initiates the bursting charge. The bursting charge ruptures the mortar bomb body and disperses the white phosphorous filler. The white phosphorous produces smoke upon exposure to the air.



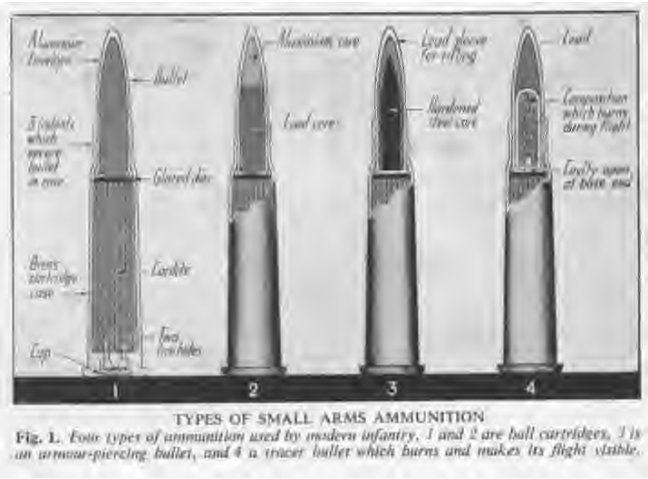




.303" Ammunition

Type: Rifle / machine gun round
Markings: Regular round – none. Tracer round – red primer
Bullet Weight: 150–180g
Dimensions: Total cartridge / projectile length – 182mm
Filling: Regular round – none. Tracer round – small incendiary fill
Threat: Explosive cordite within unspent cartridge
Deployment: Royal Navy, RAF and British Army Light Anti-Aircraft guns, machine guns and rifles. Standard British and Commonwealth military cartridge from 1889 until the end of the 1950s
Remarks: Cartridges are belted or supplied loose in cartons

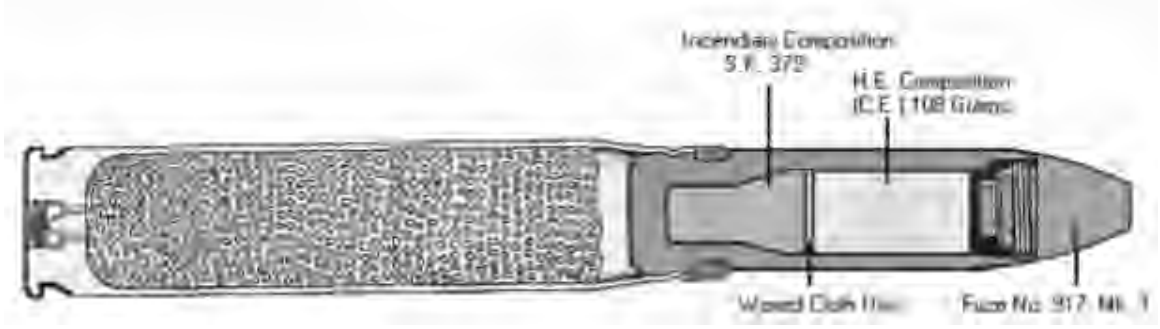




TYPES OF SMALL ARMS AMMUNITION
Fig. 1. Four types of ammunition used by modern infantry. 1 and 2 are ball cartridges, 3 is an armour-piercing bullet, and 4 a tracer bullet which burns and makes its flight visible.

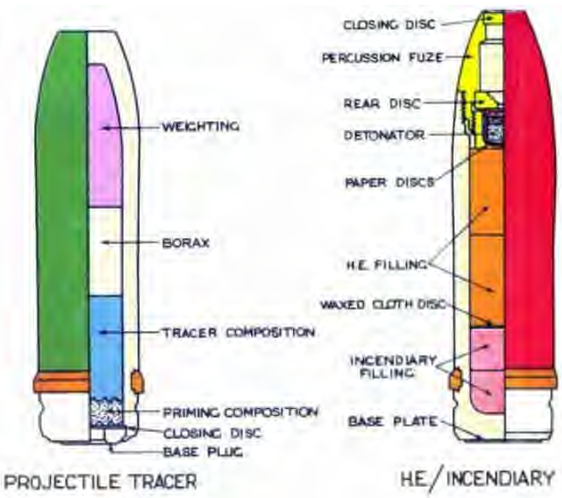






20mm Hispano HEI Ammunition

Type: Live cannon round
Markings: Upper half of projectile painted "buff" colour, lower half is red
Cartridge Weight: 256g
Dimensions: Total cartridge / projectile length – 182mm
Fuze: Contact fuze – No. 253, No. 254 or No. 917
Filling: 108g of contact explosive & 68g of SR. 379 incendiary composition
Threat: Explosives within unspent cartridge as well as the projectile
Deployment: Royal Navy, RAF and British Army Light Anti-Aircraft guns. Also RAF aircraft cannons.
Remarks: Cartridges are belted or supplied loose in cartons.



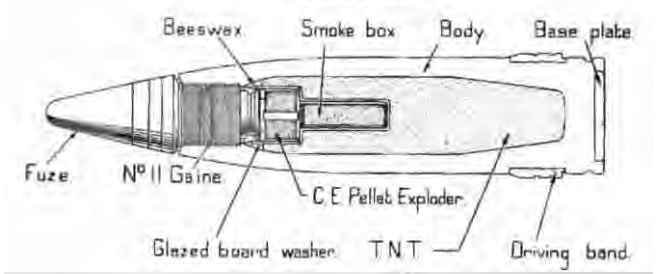
COLOUR IDENTIFICATION		
BRITISH		
NATURE OF SHELL	H.E. FILLING	COLOUR
H.E. TRACER	T.N.T.	
H.E.	T.N.T.	
PROJ. PRACTICE		
PROJ. TRACER		
H.E. INCENDIARY	T.N.T.	
H.E. INCENDIARY TRACER	T.N.T.	



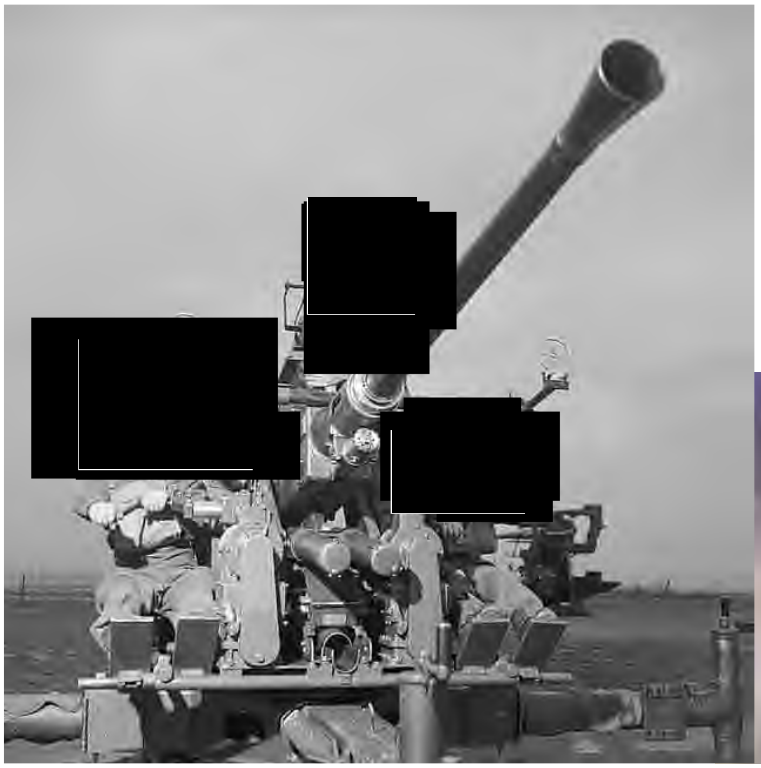
3.7" Anti-Aircraft Projectile

Weight: 12.7kg
Bomb Dimensions: 94 x 360mm
Rate of Fire: 10-20 rounds per minute
Carriage: Typically, white phosphorus
Ceiling: 9,000-18,000m
Muzzle Velocity: 72m/s
Remarks: 4.5" projectiles were also commonly utilized.







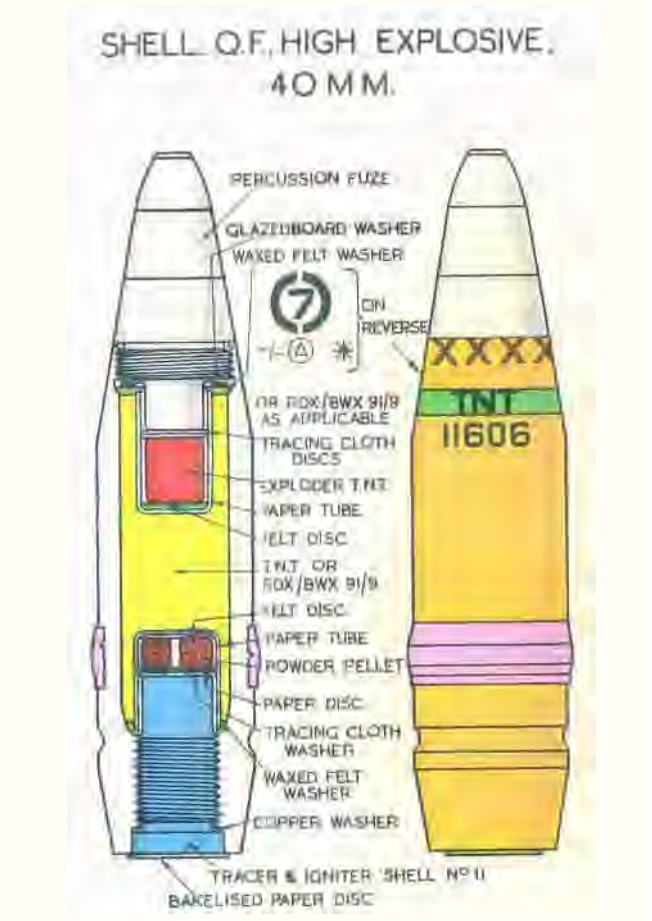




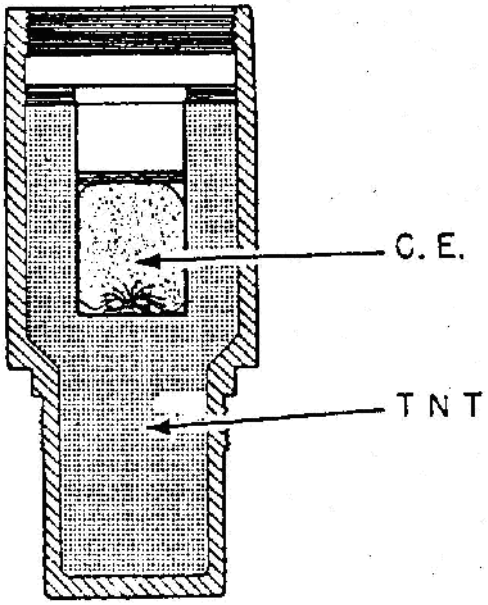


40mm Bofors Gun Projectile

Weight: 0.86kg
Bomb Dimensions: 40mm x 310mm
Rate of Fire: 120 rounds per minute
Ceiling: 7,000m
Muzzle Velocity: 881m/s
Remarks: Mobile batteries – normally few records of where these guns were located.

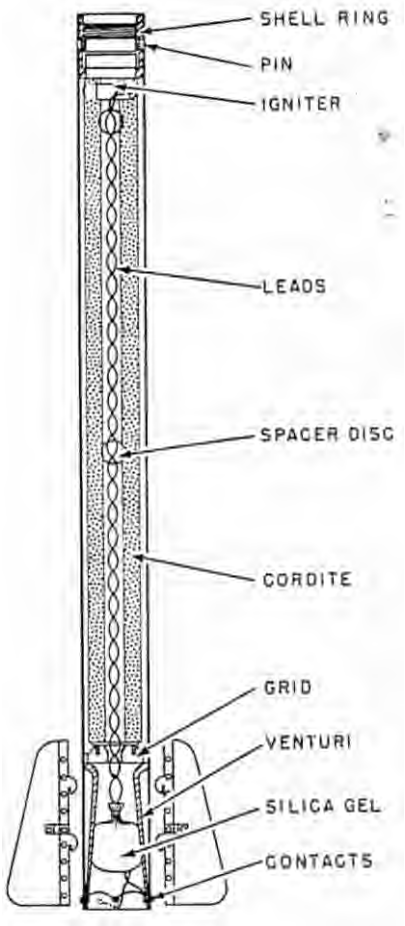






Rockets / Un-rotating Projectiles

Weight: 24.5kg
Bomb Dimensions: 94 x 360mm
Carriage: Typically, white phosphorus
Rate of Fire: 10-20 rounds per minute
Ceiling: 9,000-18,000m
Muzzle Velocity: 72m/s
Remarks: 4.5" projectiles were also commonly utilized.
Top-left image: Home Guard soldiers load an anti-aircraft rocket at a 'Z' Battery



SAFELANE
GLOBAL



Detailed Unexploded Ordnance
Risk Assessment

In Respect Of:
Richborough Alternative Area 4 Cable Route Revision

For:
Mott Macdonald

Report Reference:
9758-3 RA

safelaneglobal.com

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This Report has been produced in compliance with the Construction Industry Research and Information Association guidelines for the preparation of Detailed Unexploded Ordnance Risk Assessments in the management of UXO risks in the construction industry. This report has been compiled using all due diligence and expertise and having made all proper but reasonable enquiries within given time limitations. However, in accepting and implementing the recommendations contained in this report, the client does so strictly at his own risk.

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Executive Summary

The Site	
Address:	Cliffsend, Ramsgate, CT12 5LJ
OS National Grid Reference:	TR 34156 63747
Site Description:	The site is predominantly occupied by the grounds of St. Augustine Golf Links and Stonelees Golf Centre, constituting multiple holes. The golf courses are largely occupied with soft vegetation, with several clusters of trees in the central northern extent and towards the south-western extent. Access to the site is gained by the golf club located to the north-west through multiple paths that encroach onto the site. Sandwich Road encroaches through sites eastern boundary. Extension area: Comprises a section of foreshore, grassy ground, mature trees and hard-surfaced areas.
Proposed Works	
The proposed ground investigation would include machine excavated trial pits to 4m bgl and cable percussion boreholes, maximum 35m bgl. Construction will comprise Horizontal Directional Drilling from offshore to onshore where the cable will be installed in an open cut trench to a max depth of 2m bgl. There will be some shallow earthworks carried out for temporary construction compounds and construction of the permanent substation/ convertor station platform. Piled foundations are also anticipated.	
Risk Assessment	
Risk Assessment Methodology: In accordance with CIRIA guidelines this assessment has carried out research, analysed the evidence and considered the likelihood that the site has been contaminated with unexploded ordnance; that such items remained on site; the risk that they could be encountered during any intrusive works and the consequences that could result. Appropriate risk mitigation measures have been proposed.	
UXO Risk Rating	**HIGH from the following UXO types:** • German Air-Delivered HE bombs • Land Service Ammunition
	MEDIUM from the following UXO types: • Allied Anti-Aircraft Shells • British / Allied Small Arms
The full UXO Risk Assessment and a breakdown of the UXO Risk Level can be found in Section 11.	
Maximum Bomb Penetration Depth	It has been assessed that a 500kg bomb would have had an approximate maximum bomb penetration depth of between 10-12m below WWII ground level. Penetration depth could potentially have been greater if the UXB was larger (though only 4% of German bombs used in WWII over Britain were of

	that size). Note that UXBs may be found at any depth between just below the WWII ground level and the maximum penetration depth.	
Recommended Risk Mitigation		
Risk Level	**Planned Site Activity**	**Recommendations**
High	**Shallow Intrusive Works eg excavations**	• UXO Safety & Awareness Briefing (Toolbox Brief, TBB) • Site Specific Safety Instructions (SSSIs) Training Course • Search & Clear • Explosive Ordnance Disposal (EOD) Engineer Watching Brief (for brownfield areas unsuitable for NI magnetometer survey)
	Deep intrusive works (eg piling)	• UXO Safety & Awareness Briefing (Toolbox Brief, TBB) • Site Specific Safety Instructions (SSSIs) Training Course • Intrusive Magnetometer Survey of pile/borehole positions
	Offshore works	Appropriate risk mitigation measures can be provided for any works taking place in marine (coastal or offshore) parts of the project site if necessary. These can usually include the following: • UXO Safety & Awareness Briefing (Toolbox Brief, TBB) • Client threat briefing • Authorities' engagement where required • Non-Intrusive (NI) High-Resolution Marine Survey – Area specific to each project module • Assessment and production of a Master Target List • Target Investigation (Required as a follow-on from NI Marine Survey) • ROV/Diver Investigation / Survey • Disposal if requested
In making this assessment and recommending these risk mitigation measures, the proposed works outlined in the 'Scope of the Proposed Works' section were considered. Should the planned works be modified, or additional intrusive engineering works be considered, SafeLane Global should be consulted to see if re-assessment of the risk or mitigation recommendations is necessary.		

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Ordnance Specifications and Information

Glossary of Terms

AAA	Anti-Aircraft Artillery
ARP	Air-raid Precautions
BDO	Bomb Disposal Officer
EOD	Explosive Ordnance Disposal (current term for "bomb" disposal)
HE	High Explosive
HG	Home Guard
IB	Incendiary Bomb
Kg	Kilogram
LM	Land Mine
LSA	Land Service Ammunition (includes grenades, mortars, etc.)
Luftwaffe	German Air Force
m bgl	Metres Below Ground Level
MoD	Ministry of Defence
OB	Oil Bomb
PM	Parachute Mine
RAF	Royal Air Force
SI	Site Investigation
SAA	Small Arms Ammunition (small calibre cartridges used in rifles & machine guns)
UXB	Unexploded Bomb
UXO	Unexploded Ordnance
V-1	"Doodlebug" the first cruise type missile, used against London from June 1944. Also known as 'Flying Bomb'
V-2	The first ballistic missile, used against London from September 1944
WWI	First World War (1914 -1918)
WWII	Second World War (1939 – 1945)

Detailed Unexploded Ordnance Risk Assessment

In Respect of

Richborough Alternative Area 4 Cable Route Revision

1 Introduction

Groundsure Limited, on behalf of Mott Macdonald has commissioned SafeLane Global to conduct a Detailed Unexploded Ordnance Risk Assessment of Richborough Alternative Area 4 Cable Route Revision.

Unexploded Ordnance (UXO) presents a significant risk to construction projects in parts of the UK as a result of enemy actions during the two 20th Century World Wars and historic British and Allied military activity.

One of the legacies of this conflict is buried unexploded air-dropped bombs or anti-aircraft projectiles resulting from the failure of a proportion of the weapons to function as designed. It is commonly accepted that the failure rate of these munitions was approximately 10% and, depending on their shape, weight, velocity and ground conditions, many penetrated the ground and came to rest at depth.

In addition, it is estimated that over 20% of the UK landmass has been used by the military at some point and between 2006 and 2009, over 15,000 items of British / Allied ordnance (excluding small arms ammunition) were found on UK construction sites (CIRIA).

Intensive efforts were made during and after the war to locate and render safe all UXO but, unsurprisingly, not all were found and dealt with. This is evidenced by the regular, on-going discoveries of UXO during construction-related intrusive ground works.

As a result of a generally increased risk awareness amongst professionals involved in ground engineering works and proactive health and safety measures, the risk to life and limb from UXO has been minimised. However even the simple discovery of a suspected device during on-going works can cause considerable disruption to production and cause unwanted delays and expense.

Such risks can be more fully addressed by a better understanding of the site-specific risk and the implementation of appropriate risk mitigation measures.

2 Construction Industry Duties and Responsibilities

2.1 The UK Regulatory Environment

There is no legal requirement for the control and mitigation of UXO risk in the construction industry, but guidelines for good practice, information, and solutions with regards to UXO risk are detailed within CIRIA (C681): Unexploded Ordnance (UXO) A Guide for the Construction Industry.

These guidelines provide the construction industry with a set process for the management of risk associated with UXO, from preliminary risk assessment to implementation of site-specific risk mitigation strategies.

Specific legislation does however exist for health and safety, and is addressed under a number of regulatory instruments, as outlined below.

In practice, the regulations impose a responsibility on the construction industry to ensure that they discharge their obligations to protect those engaged in ground-intrusive operations (such as archaeology, site investigation, drilling, piling or excavations) from any reasonably foreseeable UXO risk.

2.2 The Health and Safety at Work Act, 1974

The Act places a duty of care on an employer to put in place safe systems of work to address, as far as is reasonably practicable, all risks (to employees and the general public) that are reasonably foreseeable.

2.3 Construction (Design and Management) Regulations 2015

CDM 2015 ensures that health and safety within the construction industry is continually improved:

- Works are sensibly planned and managed.
- Competent staff are engaged in the works.
- Risks are identified and managed.
- All parties cooperate and coordinate activities.
- Communication flows to those who require it.
- Workers are consulted and engaged about risks and how they are being managed.

In line with CDM 2015 legislation, SafeLane Global are able to assist parties in their discharge of CDM duties as follows:

- Assist Principal Designers with pre-construction information and risk assessments.
- Assist the Designer with the Designer's Risk Assessment.
- Issue UXO risks as have been identified and manage risks accordingly.
- Assist the Principal Contractor with the construction phase information, in particular risk assessments and mitigation strategies.
- Plan, manage and monitor survey and clearance works under SafeLane Global's control.

2.4 Other Legislation

Other relevant legislation includes the "Management of Health and Safety at Work Regulations 1999" and "The Corporate Manslaughter and Corporate Homicide Act 2007".

3 The Role of the Authorities and Commercial Contractors

3.1 The Authorities

The Police have the responsibilities for co-ordinating the emergency services in the case of an ordnance-related incident on a construction site. They will make an initial assessment (i.e. is there a risk that the find is ordnance or not?) and if they judge necessary impose a safety cordon and/or evacuation and call the military authorities (JSEODOC – Joint Services Explosive Ordnance Disposal Operations Centre) to arrange for investigation and/or disposal. In the absence of an EOD specialist on site many Police Officers will use the precautionary principle, impose cordon(s)/evacuation and await advice from the JSEODOC.

The priority given to the request by JSEODOC will depend on their judgement of the nature of the risk (ordnance, location, people and assets at risk) and the availability of resources. They will respond immediately or as resources are freed up. Depending on the on-site risk assessment the item of ordnance may be removed or demolished (by controlled explosion) in situ. In the latter case additional cordons and/or evacuations may be necessary.

Note, that the military authorities will only carry out further investigations or clearances in very high profile or high-risk situations. If there are regular ordnance finds on a site, the JSEODOC may not treat each occurrence as an emergency and will encourage the construction company to put in place alternative procedures (i.e. the appointment of a commercial contractor) to manage the situation and relieve pressure from the JSEOD disposal teams.

3.2 Commercial Contractors

In addition to pre-construction site surveys and follow-on clearance work, a commercial contractor is able to provide a reactive service on construction sites. The presence of a qualified EOD Engineer with ordnance recognition skills will avoid unnecessary call-outs to the authorities and the contractor will be able to arrange for the removal and disposal of low risk ordnance. If high risk ordnance is discovered actions will be co-ordinated with the authorities with the objective of causing the minimum possible disruption to site operations whilst putting immediate, safe and appropriate measures in place.

4 This Report

4.1 Aims and Objectives

The aim of this report is to examine the possibility of encountering any explosive ordnance during any intrusive works at the site. Risk mitigation measures will be recommended in line with the CIRIA C681 guidelines, to reduce the risk of initiating UXO, and the subsequent risk of harm / damage during the envisaged works to as low as reasonably practicable (ALARP).

4.2 Risk Assessment Methodology

The following issues will be addressed in the report:

- The likelihood that the site was contaminated with unexploded ordnance.

- The likelihood that unexploded ordnance remains on site.
- The likelihood that ordnance may be encountered during any intrusive works.
- The risk that ordnance may be initiated.
- The consequences of initiating or encountering ordnance.

Risk mitigation measures, appropriate to the assessed level of risk and site conditions, will be recommended.

4.3 Approach

In preparing this Unexploded Ordnance Risk assessment, SafeLane Global has considered general and, as far as possible, site specific factors including:

- Evidence of German bombing and delivery of UXBs.
- Site history, occupancy and conditions during WWII.
- The legacy of Allied military activity.
- Details of any known EOD clearance activity.
- The extent of any post war redevelopment.
- Scope of the current proposed works.

4.4 Sources of Information

SafeLane Global has carried out detailed historical research for this Unexploded Ordnance Risk Assessment including accessing military records and archived material held in the public domain and in the MoD.

Material from the following sources has been consulted:

- The National Archives.
- Kent History & Library Centre.
- Kent Historic Environment Record.
- National Collection of Aerial Photography (NCAP).
- Groundsure Limited.
- Relevant information supplied by the client.
- Available material from 33 Engineer Regiment (EOD) Archive.
- SafeLane Global's extensive archives built up over many years of research and hands-on Explosive Ordnance Disposal activities in the UK.
- Open sources such as published books, local historical records and the internet.

4.5 Reliability of Historical Records

4.5.1 General Considerations

This report is based upon research of historical evidence. Whilst every effort has been made to locate all relevant material SafeLane Global cannot be held responsible for any changes to the assessed level of risk or risk mitigation measures based on documentation or other information that may come to light at a later date.

The accuracy and comprehensiveness of wartime records is frequently difficult or impossible to verify. As a result, conclusions as to the exact location, quantity and nature of the ordnance risk can never be definitive but must be based on the accumulation and careful analysis of all accessible evidence. SafeLane Global cannot be held responsible for inaccuracies or gaps in the available historical information.

4.5.2 Bombing Records

During WWII, considerable efforts were expended in recording enemy air raids. Air Raid Precautions (ARP) wardens were responsible for making records of bomb strikes either through direct observation or by post-raid surveys. However, their immediate priority was to deal with casualties and limit damage, so it is to be expected that records are often incomplete and sometimes contradictory. Record keeping in the early days of bombing was not comprehensive and details of bombing in the early part of the war were sometimes destroyed in subsequent attacks. Some reports may cover a single attack, others a period of months or the entire war.

Records of raids that took place on sparsely or uninhabited areas were often based upon third party or hearsay information and are not always reliable; records of attacks on military or strategic targets were often maintained separately from the general records and have not always survived.

5 The Site and Scope of Proposed Works

Site Address	Cliffsend, Ramsgate, CT12 5LJ	
OS National Grid Reference	TR 34156 63747	
Site Description	The site is predominantly occupied by the grounds of St. Augustine Golf Links and Stonelees Golf Centre, constituting multiple holes. The golf courses are largely occupied with soft vegetation, with several clusters of trees in the central northern extent and towards the south-western extent. Access to the site is gained by the golf club located to the north-west through multiple paths that encroach onto the site. Sandwich Road encroaches through sites eastern boundary. Extension area: Comprises a section of foreshore, grassy ground, mature trees and hard-surfaced areas.	
Proposed Works	The proposed ground investigation would include machine excavated trial pits to 4m bgl and cable percussion boreholes, maximum 35m bgl. Construction will comprise Horizontal Directional Drilling from offshore to onshore where the cable will be installed in an open cut trench to a max depth of 2m bgl. There will be some shallow earthworks carried out for temporary construction compounds and construction of the permanent substation/ convertor station platform. Piled foundations are also anticipated.	
References	**Site Location Maps**	**Annex A**
	Recent Aerial Photograph	**Annex B**

6 Ground Conditions

Data Source		Description
British Geological Survey Borehole	**Borehole Reference**	None recorded within 500m of the site.
British Geological Survey Mapping	**Superficial Deposits**	Thanet Formation (occupies majority of the site) - None recorded. Thanet formation (occupies the south-eastern and eastern extent) – Tidal Flat Deposits consisting of Clay and Silt.
	Bedrock	Thanet Formation – Sand, Silt, and Clay.
Client Provided Data	**Document Name**	Groundsure Ltd – Superficial geology (50k)
Groundsure Ltd	**Superficial Deposits**	• Beach and Tidal Flat deposits – Sand and Gravel (constitutes the eastern corner). • Tidal Flat Deposits – Clay and Silt (constitutes majority of the site). • Storm Beach Deposits – Sand and Gravel (occupies the eastern-most boundary).

7 Pre and Post-WWII OS Mapping

	Date	Observations	Reference	Source
Pre-WWII	1938	• The site is occupied by a *St. Augustine's* golf course in the northern extent and identified greenfield in the south. • A road encroaches onto the site's eastern boundary. • The site and surrounding area is rural/coastal in nature. • Extension area: Extends into the foreshore, comprising *Saltings, Sand and Mud*.	Annex C-1	Groundsure Ltd
Post-WWII	1948	• The site and surrounding area appear consistent with conditions present in pre-war OS mapping. • There appears to be no evidence of clearance, redevelopment, or ruins within the vicinity of the site. • These features can be the indicators of bomb damage on historical OS mapping. However, due to the lack of development within the area, it is unlikely that these indicators would be present. • Extension area: No changes are noted within its boundary.	Annex C-2	Groundsure Ltd

8 The Threat from Aerial Bombing

8.1 General Bombing History of Kent

8.1.1 First World War

During WWI, Kent suffered extensive aerial bombardment from zeppelin airships and fixed-wing aircraft. The first attack by the German Air Force was launched against Dover on the 21st December 1914 using naval seaplanes.

Bombing continued in Kent throughout the war; areas such as Ashford, Canterbury, Dover, Folkestone, Gravesend, Margate, Maidstone and Sheerness suffered particularly severe raids. The last raid on the county was on the night of the 19th May 1918 when a total of 14.55 tonnes of bombs were dropped on London, Faversham and Dover. Ramsgate is situated approximately 3km north-east of the site and gained the reputation as the most bombed seaside town in WWI. The town suffered from both aerial bombing and naval bombardment during WWI, with Zeppelin's scattering a number of bombs in all districts in the area.

WWI bombs were generally smaller than those used in WWII and were dropped from a lower altitude, resulting in limited UXB penetration depths. Aerial bombing was often such a novelty at the time that it attracted public interest and even spectators to watch the raids in progress. For these reasons, there is a limited risk that UXBs passed undiscovered. When combined with the relative infrequency of

attacks and an overall low bombing density the risk from WWI UXBs is considered low and will not be further addressed in this report.

8.1.2 Second World War

At the start of WWII, the Luftwaffe planned to destroy key military installations, including RAF airfields and Royal Navy bases, during a series of daylight bombing raids. After the Battle of Britain these tactics were modified to include both economic and industrial sites. Targets included dock facilities, railway infrastructure, power stations, weapon manufacturing plants and gas works. As a result of aircraft losses, daylight raids were reduced in favour of attacking targets under the cover of darkness.

Kent played a key role in the defence of Britain in WWII. It was at the frontline during the Battle of Britain during which the Luftwaffe attempted to destroy the RAF and its airfields in order to gain air superiority over the south-east of England ahead of the planned German invasion. Bombing raids began in July 1940 from German-occupied France and in the following months many of the towns and cities in Kent were subjected to bombing attacks.

Within Kent, Manston airfield was a key target for the Luftwaffe especially during the Battle of Britain, where RAF Manston sustained serious bomb damage. Most of the staff dispersed into the surrounding houses due to the destruction. The site is located just 1.6km south-east of the airfield.

By May 1941, concentrated attacks were reduced as the Luftwaffe was diverted east to prepare for 'Operation Barbarossa', the invasion of Russia. Note however that Canterbury was heavily bombed in mid-1942 as part of the Baedeker Blitz.

During 1942 and 1943, there were a number of minor raids carried out by small formations of fighter bombers and then between January and May 1944 the Luftwaffe returned to London en masse, for Operation Steinbock. These raids were executed by inexperienced Luftwaffe crews and were less frequent when compared to the original Blitz of 1940/41. Poor navigation and improved defences resulted in unsustainable Luftwaffe losses and many raids were unsuccessful.

Cliffsend was situated within 'Hellfire Corner'; an area of Kent where aerial 'dog fights' and 'tip and run' bombing incidents were frequent during the Battle of Britain. The region was also under artillery bombardment from the coastal batteries located at Calais and Cap-Gris-Nez in occupied France. These batteries, including the *Lindemann* and *Todt Batteries*, bombarded the south coast until they were captured after the Allied D-Day Landings in 1944. The batteries covered an arc stretching from Ramsgate to Hythe and fired shells weighing approximately 1 ton each.

From mid-1944 the "V-weapon" (for Vengeance) campaign, using unmanned cruise missiles and rockets, represented Hitler's final attempt to reverse Germany's imminent defeat. The V1 (Flying Bomb or Doodlebug) and the V2 (Long Range Rocket) were launched from bases in Germany and occupied Europe. Totals of 2,419 V1s and 517 V2s were recorded in the London Civil Defence region.

Although these weapons caused considerable destruction, their relatively low numbers allowed accurate records of strikes to be maintained and these records have mostly survived. There is a negligible risk from unexploded V-weapons on land today since, even if an unexploded 1,000kg warhead had survived impact, the remains of the munition's body would have left incontrovertible evidence of the strike and would have been dealt with at the time.

8.2 Generic Types of WWII German Air-delivered Ordnance

The nature and characteristics of the ordnance used by the Luftwaffe allows an informed assessment of the hazards posed by any unexploded items that may remain today.

- HE Bombs: In terms of weight of ordnance dropped, HE bombs were the most frequent weapon deployed. Most bombs were 50kg, 250kg or 500kg (overall weight, about half of which was the high explosive) though large bombs of up to 2,000kg were also used. HE bombs had the weight, velocity and shape to easily penetrate the ground intact if they failed to explode. Post-raid surveys would not always have spotted the entry hole or other indications that a bomb penetrated the ground and failed to explode, and contemporary ARP documents describe the danger of assuming that damage, actually caused by a large UXB, was due to an exploded 50kg bomb. Unexploded HE bombs therefore present the greatest risk to present–day intrusive works.
- Blast Bombs/Parachute Mines: Blast bombs generally had a slow rate of descent and were extremely unlikely to have penetrated the ground. Non-retarded mines would have shattered on most ground types, if they had failed to explode. There have been extreme cases when these items have been found unexploded, but this was where the ground was either very soft or where standing water had reduced the impact. SafeLane Global does not consider there to be a significant risk from this type of munition on land.
- Large incendiary bombs: This type of bomb ranged in size from 36kg to 255kg and had a number of inflammable fill materials (including oil and white phosphorus), and a small explosive charge. They were designed to explode and burn close to the surface, but their shape and weight meant that they did have penetration capability. If they penetrated the ground, complete combustion did not always occur, and, in such cases, they remain a risk to intrusive works.
- 1kg Incendiary Bombs (IB): These bombs, which were jettisoned from air-dropped containers, were just over 30cm in size and therefore highly likely to go unnoticed. They had the potential to penetrate soft ground and left a very small entry hole. Furthermore, if bombs did not initiate and fell in water or dense vegetation or became mixed with rubble in bomb damaged areas, they could have remained hidden to this day. Some variants had explosive heads, and these present a risk of detonation during intrusive works, particularly due to their shape, which leads them to often be misidentified.
- Anti-personnel (AP) Bomblets: AP bombs had little ground penetration ability and should have been located by the post-raid survey unless they fell into water, dense vegetation or bomb rubble.
- Specialist Bombs (smoke, flare, etc): These types do not contain high explosive and therefore a detonation consequence is unlikely. They were not designed to penetrate the ground.

Examples of the most commonly deployed German bombs are presented in the *Ordnance Specifications and Information* appendices at the end of this document.

8.3 Second World War Bombing Statistics

The following table summarises the quantity of German bombs (excluding 1kg incendiaries and anti-personnel bombs) falling on the Municipal Borough of Ramsgate between 1940 and 1945.

Record of German Ordnance Dropped on the Municipal Borough of Ramsgate	
Area Acreage	3,624
High Explosive Bombs (all types)	771
Parachute Mines	5
Oil Bombs	3
Phosphorus Bombs	-
Fire Pots	-
Pilotless Missile (V1)	-
Long Range Rocket (V2)	-
Total	774
Items Per 1,000 Acres	**213.6**

Source: Home Office Statistics

Detailed records of the quantity and locations of the 1kg incendiary and anti-personnel bombs were not routinely maintained by the authorities as they were frequently too numerous to record.

Although the incendiaries are not particularly significant in the risk they pose, they nevertheless are items of ordnance that were designed to cause damage and inflict injury and should not be overlooked in assessing the general risk to personnel and equipment. The anti-personnel bombs were used in much smaller quantities and are rarely found today but are potentially more dangerous. This table does not include UXO found during or after WWII.

8.4 Site Specific WWII Bombing Records

8.4.1 Kent Bomb Census Maps

A review was conducted of the Kent Bomb Census Maps, obtained from the National Archives. Those showing incidents on or close to the site are listed below. Note, the maps are small in scale and lack any clear geographical indicators, therefore the site and distance(s) listed below can be considered an approximate.

Date	Weapon	Details
09/07/1940	Incendiary bombs HE bombs	On or adjacent to the site.
27/10/1940	3 x HE bombs	1 x HE bomb immediately to the west of the site.
29/10/1940	2 x HE bombs	Approximately 1.1km south-west of the site.
05/12/1940	1 x Incendiary bomb	800m north-east.
Reference		**Annex D**

8.4.2 Original ARP Bombing Incident Records

Throughout WWII, records of bombing incidents were kept by the ARP and Civil Defence Office. These records were kept in the form of typed or hand-written notes and/or presented on bomb plot maps. Some other organisations, such as port authorities and railways, maintained separate records. Sections of these ARP records (with map references) have been plotted in **Annex E**.

Written ARP records were reviewed for	Sandwich		
Source	Kent History & Library Centre		
Records of bombing on / near the site were found			✓
Date	**Weapon**	**Map Reference**	**Details**
19/09/1940	2 x HE bombs	n/a	"2 small HEs on Golf Course." – Sandwich Proximity to site potentially on or adjacent.
06/10/1940	"Salvo" of HE bombs	n/a	"Dropped in Sea off Pegwell Bay". Approximately within 700m of the site.
24/08/1942	HE Bomb	n/a	"Just West of Ramsgate – Sandwich Road." Proximity to site potentially on or adjacent.

Written ARP records were reviewed for	Ramsgate		
Source	Kent History & Library Centre		
Records of bombing on / near the site were found			✓
Date	**Weapon**	**Map Reference**	**Details**
13/09/1940	2 x HE bombs	n/a	Foads Hill, Cliffsend. Approximately 800m north of the site.
18/09/1940	1 x UXB	n/a	St Augustine's Golf Links about 30 yards from Ramsgate-Sandwich Road. Bomb believed to have resulted from enemy action on 17/09/1940. Approximately 200m north-west of the site.
	1 x UX HE 2 x Hes	780820	St Augustine's Golf Course. 320m north.
14/10/1940	1 x Mine	n/a	Mine stranded by the tide 200 yards from shore. Pegwell Bay, Ramsgate. Precise location not known.
27/10/1940	4 x HE bombs	n/a	An enemy aircraft dropped 2 x HE bombs at Pegwell and 2 x HE bombs at Cliffsend. Precise location not known.
08/12/1940	2 x Incendiary bombs	795821	In open field at Cliffsend. Approximately 1.2km north-east.
05/02/1941	4 x HE bombs	n/a	Fell in open ground at Cliffsend, Ramsgate. Eight bungalows slightly damaged. Precise location not known.
06/02/1941	10 x 50 kg HE bombs	788839 to 789819	10 x 50kg HE's were dropped in a line from map reference 788/839 to 789/819. Approximately 600m north-east of the site.
04/05/1941	1 x HE bomb	n/a	Lavender Road, Golf Link Road. Approximately within 300m of the site.
	1 x HE bomb	776819	Cottington Hill, Minister.

			Approximately 350m north-west of the site.
	1 x HE bomb	775817	South of Cottington Hill, Minister. Approximately 400m west of the site.
13/08/1941	Unspecified UXBs	796828	Search on open ground Approximately 1.4km north-east of the site.
19/05/1943	1 x HE	n/a	In Pegwell Bay (in sea). Precise location not known.

9.1.1 Home Office Intelligence Reports

The Home Office Intelligence reports document enemy action on British domestic soil and were prepared twice a day for the Home Security War Room. The summaries were prepared by intelligence staff, who compiled reports received from the twelve civil defence regions.

However, available records only document time and general location of attack and numbers of casualties. The intelligence officials generally only recorded locations on municipal level (town, village, or city), rarely providing specific addresses.

Date	Location	Details
05/07/1940	Ramsgate	0 casualties
08-09/07/1940	Ramsgate	0 casualties
12/08/1940	Manston, Ramsgate	12 casualties
14/08/1940	Manston, Ramsgate	0 casualties
16-17/08/1940	Manston, Ramsgate	0 casualties
22-23/08/1940	Manston, Ramsgate	0 casualties
24/08/1940	Ramsgate	65 casualties
	Manston, Ramsgate	0 casualties
28/08/1940	Ramsgate	1 casualty
13/09/1940	Ramsgate	0 casualties
16/09/1940	Ramsgate	0 casualties
28/09/1940	Ramsgate	Unspecified
07/10/1940	Ramsgate	0 casualties

08/10/1940	Ramsgate	0 casualties
11/10/1940	Ramsgate	4 casualties
20/10/1940	Ramsgate	0 casualties
27/10/1940	Ramsgate	1 casualty
02/11/1940	Ramsgate	29 casualties
10/11/1940	Ramsgate	4 casualties
11/11/1940	Ramsgate	9 casualties
12/11/1940	Ramsgate	2 casualties
13/11/1940	Ramsgate	1 casualty
18/11/1940	Ramsgate	4 casualties
29/11/1940	Ramsgate	0 casualties
05/12/1940	Ramsgate	0 casualties
29/12/1940	Ramsgate	0 casualties
03-04/01/1941	Ramsgate	17 casualties
11/01/1941	Ramsgate	2 casualties
15/01/1941	Ramsgate	1 casualty
17-18/01/1941	Ramsgate	0 casualties
03/02/1941	Ramsgate	4 casualties
12/02/1941	Ramsgate	0 casualties
22/02/1941	Ramsgate	0 casualties
03/03/1941	Ramsgate	4 casualties
13-14/03/1941	Ramsgate	0 casualties
18/03/1941	Ramsgate	2 casualties
20/03/1941	Ramsgate	12 casualties

09-10/04/1941	Ramsgate	2 casualties
04-05/05/1941	Ramsgate	0 casualties
07/05/1941	Ramsgate	0 casualties
10-11/05/1941	Ramsgate	0 casualties
13-14/06/1941	Ramsgate	16 casualties
06-07/08/1941	Ramsgate	1 casualty
16-17/08/1941	Ramsgate	0 casualties
30-31/08/1941	Ramsgate	3 casualties
07-08/09/1941	Ramsgate	26 casualties
09-10/11/1941	Ramsgate	6 casualties
27/11/1941	Ramsgate	1 casualty
29-30/05/1942	Ramsgate	0 casualties
04/09/1942	Ramsgate	0 casualties
31/10/1942	Ramsgate	0 casualties
26/01/1943	Ramsgate	6 casualties
09/02/1943	Ramsgate	0 casualties
02/03/1943	Ramsgate	0 casualties
03-04/03/1943	Ramsgate	0 casualties
18-19/05/1943	Ramsgate	0 casualties
19-20/05/1943	Ramsgate	0 casualties
28-29/05/1943	Ramsgate	3 casualties
12-13/06/1943	Ramsgate	0 casualties
15-16/06/1943	Ramsgate	5 casualties
16-17/08/1943	Ramsgate	5 casualties

17/08/1943	Ramsgate	5 casualties
22-23/08/1943	Ramsgate	0 casualties
03-04/10/1943	Ramsgate	12 casualties
04-05/11/1943	Ramsgate	0 casualties
19-20/01/1944	Ramsgate	0 casualties
21-22/01/1944	Ramsgate	0 casualties
	Ramsgate	0 casualties
24-25/01/1944	Ramsgate	0 casualties
29/06/1944	Ramsgate	0 casualties
31/08/1944 – 01/09/1944	Ramsgate	20 casualties

9.1.2 Secondary Source / Anecdotal Evidence

Anecdotal evidence of local bombing incidents was sought from publications and web resources. The following references to incidents on site or in the surrounding area were found.

Date	Weapon	Details
24/08/1940	HE and Incendiary bombs.	Ramsgate town centre was hit by over 250 bombs.[1] Approximately 3.2km north-west of the site.
31/08/1940	Aircraft crash	A fighter-plane crash landed in Sandwich Flats in Pegwell Bay. Incident possibly on or adjacent to the site.
17/09/1940	Unidentified UXB	"One unexploded bomb at St Augustine's golf course." Incident possible on or adjacent to the site.
02/03/1943	4 x Shells	Pegwell Bay. [2] No further details provided.
1940-1945	HE Bombs	A news article dating from 18th December 1945 (not annexed) details how farmland in the surrounding area of Cliffsend, particularly Bethlehem Farm (~ 600m north-east of the site) sustained bombing in WWII. At least 22 bombs fell in fields and nine RAF planes either crashed or made forced landings.

[1] Ogley, Bob, *Kent at War,* (Kent, Froglets Publications Ltd, 1994)
[2] https://www.britishnewspaperarchive.co.uk/viewer/bl/0001699/19450622/056/0003

9.1.3 WWII-era RAF Aerial Photography

The following WWII-era aerial photography was reviewed for the site:

Date	3rd March 1942
Source	National Collection of Aerial Photography (NCAP)
Image Type	Aerial
Image quality	High resolution, small scale
Observations	• The site remains accurate to historical OS mapping, the golf course is largely covered in soft vegetation. • There seems to be irregularity on the ground approximately 40m to the north of the site, however, it is unclear whether this is a bunker or a crater from a bomb. • The low resolution makes it difficult to see in great detail, therefore any smaller bomb entry points or craters cannot be identified. • WWII bomb craters have been identified in additional aerial photography (not annexed) from 1944, it measured 10.5m by 8.4m.[3] • Extension area: The image confirms the extension area comprised an area of the foreshore. No evidence of bomb damage is apparent within its boundary.
Reference	**Annex F**

9.1.4 Abandoned Bombs

A post-air raid survey of buildings, facilities and installations would have included a search for evidence of bomb entry holes. If evidence was encountered, Bomb Disposal Officer teams would normally have been requested to attempt to locate, render safe and dispose of the bomb. Occasionally evidence of UXBs was discovered but due to a relatively benign position, access problems or a shortage of resources the UXB could not be exposed and rendered safe. Such an incident may have been recorded and noted as an Abandoned Bomb.

Given the inaccuracy of WWII records and the fact that these bombs were 'abandoned', their locations cannot be considered definitive, nor the lists exhaustive. The MoD states that 'action to make the devices safe would be taken only if it was thought they were unstable'. It should be noted that other than the 'officially' abandoned bombs, there will inevitably be UXBs that were never recorded.

SafeLane Global holds records of officially registered abandoned bombs at or near the site	✓
Additional Comments	An abandoned 50kg HE bomb is recorded on the golf course within the site boundary.

[3] https://webapps.kent.gov.uk/KCC.ExploringKentsPast.Web.Sites.Public/SingleResult.aspx?uid=MWX43187

9.2 UXB Ground Penetration

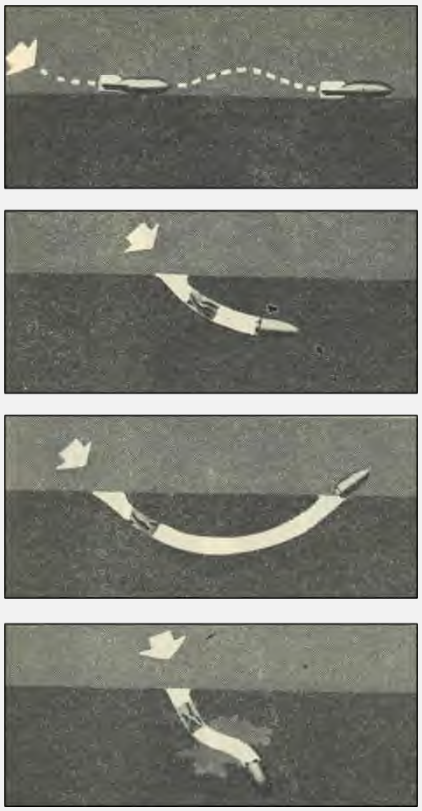
9.2.1 General Considerations

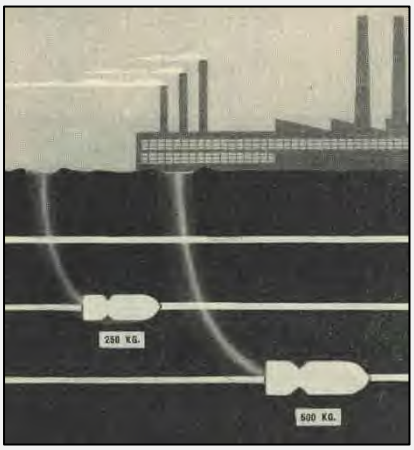
The actual penetration depth of aerial delivered bombs into the ground will have been determined by the mass and shape of the bomb, the velocity and angle of the bomb on impact (dependent on the height of release) and the nature of the ground and ground cover; the softer the ground, the greater the potential penetration. Peat, alluvium and soft clays are easier to penetrate than gravel and sand. Bombs are brought to rest or are commonly deflected by bedrock or large boulders.

9.2.2 The "j" Curve Effect

An air-dropped bomb released from normal bombing altitude (approx. 5,000m) on its curved trajectory can reach a terminal velocity of between 350-400 ms-1. In this case of high-level bombing, the angle of which the bomb enters the earth is approx. 15° from the perpendicular and its exact path is difficult to trace. The bomb is being driven by its kinetic energy can unless deflected, will continue its line of flight and can turn in an upwards curve towards the ground surface as it comes to rest. The upwards curve is caused by the transfer of energy as the bomb travels through the ground. The nose of the bomb travels slower than the rear of the bomb due to the drag/friction of it passing through the ground. The rear of the bomb, having more energy due to less drag/friction is travelling much quicker.

The location of the bomb is thus ''offset'' from the hole of entry. This ''offset'' from vertical is generally understood to be about one third of the penetration depth but can reach up to (and have been found at) 15m/50 ft from point of entry, dependent on ground conditions and the bomb's angle of impact. The figure below depicts the various paths of UXB through homogenous ground, showing how the J-curve effect can lead to a UXB coming to rest beneath undamaged buildings.





A UXB can come to rest beneath undamaged buildings due to the J-Curve effect if it lands in nearby soft ground.

Image source: Field Manual for Unexploded Bombs: Organisation and Operation For Disposal, United States War Department 1943

Left: Path of UXB in soft ground:

1. Ricochet resulting from low level attack: UXB stays perpendicular to ground and rests at surface.
2. Buried UXB with J-Curve: Bomb curves horizontally and rests perpendicular to surface.
3. UXB returning to surface due to J-Curve: Bomb points towards surface but may remain partially or completely below ground level.
4. UXB deflected by buried objects: Results in unpredictable path and unusual shift.

9.2.3 Second World War Bomb Penetration Studies

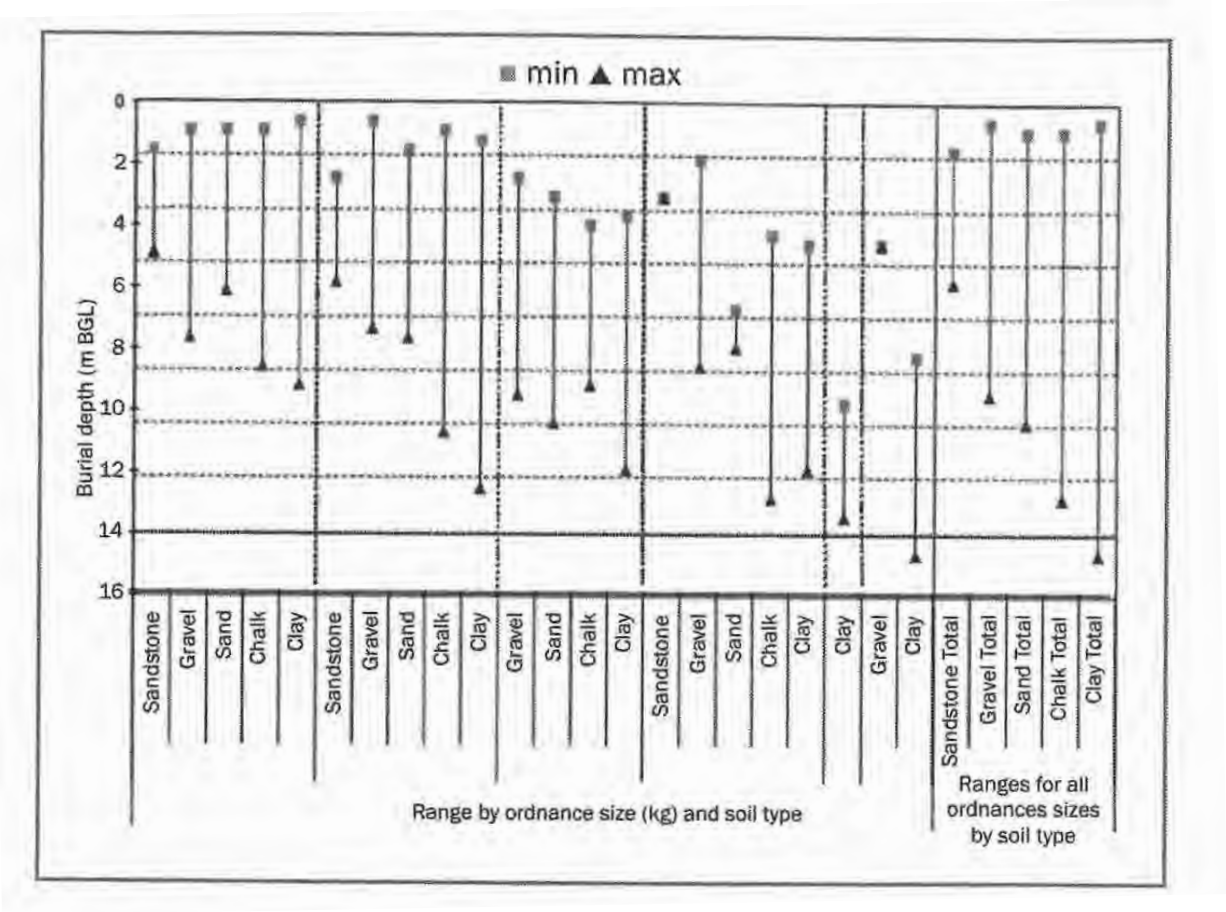
During WWII, the Ministry of Home Security undertook a major study on actual bomb penetration depths, carrying out statistical analysis on the measured depths of 1,328 bombs as reported by Bomb Disposal, mostly in the London area. They then came to conclusions as to the likely average and maximum depths of penetration of different sized bombs in different geological strata.

The median penetration of 430 x 50kg German bombs in London Clay was 4.6m and the maximum penetration observed for the SC50 bomb was 9m.

They concluded that the largest common German bomb, 500kg, had a likely penetration depth of 6m in sand or gravel but 8.7m in clay. The maximum observed depth for a 500kg bomb was 10.2m and for a 1,000kg bomb 12.7m. Theoretical calculations suggested that significantly greater penetration depths were probable.

9.2.4 CIRIA Bomb Penetration Depth Specifications

As stated within C681, the ground conditions at any individual site are likely to be highly variable and this results in a large range of burial depths for each different size bomb. The below chart shows the observed variation in burial depths of various sizes of air-delivered UXO for different ground conditions.



9.2.5 Site Specific Bomb Penetration Considerations

When considering an assessment of the bomb penetration at the site, the following parameters would be used:

- Geology – While no publicly available boreholes are recorded in the area, information provided by the client has shown the superficial deposits are and tidal consist of Clay, Silt, and Sand.
- Impact Angle and Velocity – 80-90° from horizontal and 267 metres per second.
- Bomb Mass and Configuration – The 500kg SC (General Purpose) HE bomb, without retarder units or armour piercing nose. This was the largest of the common bombs used against Britain.

Taking into account the above-mentioned factors it has been assessed that a 500kg bomb would have had an approximate maximum bomb penetration depth of between 10-12m below WWII ground level. Penetration depth could potentially have been greater if the UXB was larger (though only 4% of German bombs used in WWII over Britain were of that size). Note that UXBs may be found at any depth between just below the WWII ground level and the maximum penetration depth.

9.3 Likelihood of Post-raid UXO Detection

Utilising the available historical bombing records as reviewed in Section 8.4, it is possible to make an assessment of the likelihood that evidence of UXO would have been noted on a site during the war and the incident dealt with or recorded at the time. Factors such as bombing density, frequency of access, ground cover, damage and failure rate have been taken into consideration.

9.3.1 Density of Bombing

Bombing density is an important consideration for assessing the possibility that UXBs remain in an area. A very high density of bombs will have increased the likelihood of errors in record keeping at the time, as civil defence personnel and emergency services may have been overwhelmed. A higher density of bombing also increases the number of UXBs actually occurring in a given area.

The type and specific location of recorded bomb strikes is also an important consideration. If a stick of bombs (one individual aircraft's bomb load) is plotted in line with a site or is shown to straddle a site, then this raises the possibility that an unrecorded UXB from the same stick struck that site.

9.3.2 Bomb Damage

In Blitzed cities / towns throughout Britain, bomb sites were often not cleared of rubble until after the war and mid-war repairs to buildings were only carried out on the most vital facilities (power stations, gas works, weapons factories etc.). However, if a building only sustained bomb damage to its upper floors, any subsequent UXB strike to the structure will still have caused obvious damage, at ground floor level, which would have been reported and dealt with at the time.

HE bomb strikes to open ground will have resulted in a large crater and local soil disturbance. Any subsequent UXB strike will not have resulted in an easily identifiable entry hole and as such is likely to have gone unnoticed amongst the disturbed ground.

In London and south-east England, the German V1 Flying Bomb and V2 Long Range Rocket campaigns caused widespread devastation. However, as these weapons began to be utilised after the final significant Luftwaffe air raids had occurred, any serious damage caused by such weapons does not necessarily indicate an increased risk of Luftwaffe freefall UXB contamination. However, it is quite possible that serious damage inflicted during the 1940-1944 campaigns by Luftwaffe freefall bombs could have been erased by a subsequent V Weapon strike.

9.3.3 Frequency of Access

A UXB strike at a site where human access was infrequent would have had a lower chance of being observed, reported and recorded compared to a site which was developed and subject to regular access. UXB strikes during night time raids (when German planes could more easily evade anti-

aircraft defences) are also more likely to have fallen unobserved than ones dropped during a daylight attack.

In frequently bombed cities / towns, ARP Wardens were tasked with carrying out searches for UXBs within recently bombed residential areas and schools. Similarly, many important home front facilities (factories, gas works, power stations, docks etc.) had their own dedicated ARP teams or Fire Watchers tasked with observing local air raids. Fire Watchers were mainly responsible for extinguishing 1kg incendiary bombs as well as reporting any UXB strikes. Anecdotal evidence however indicates that Fire Watchers did not always turn up for their shifts and therefore such UXB mitigating activities should not be assumed in the absence of site-specific evidence. Less important buildings sustaining bomb damage would have been abandoned until after the German bombing campaign in that area had ceased and repairs could be made, greatly decreasing the level of access to that site.

Schools closed due to the evacuation of children were often requisitioned by the Civil Defence authorities to be utilised as night time First Aid posts and reception centres (providing emergency accommodation for bombed out civilians). Therefore, an increased level of access is likely at these locations.

9.3.4 Ground Cover

The entry hole of a 50kg UXB (the most commonly deployed German HE bomb) could have been as little as 20cm in diameter. Wartime records also confirm that small German Incendiary Bombs, weighing just 1kg, were capable of significant penetration into soil, resulting in very small entry holes (5cm) or complete burial.

The quantity and type of ground cover present on a site during WWII would have had a significant effect, at ground level, on the visual evidence of buried UXO.

Evidence of UXO could be obscured in dense vegetation, soft ground, rubble, railway ballast or amongst stockpiled material (such as aggregate, coal or refuse heaps). A UXB strike to waterlogged ground or open water would have been immediately obscured from view beneath the waterline. Had such an incident occurred within a tidal mudflat or river bank, the resulting entry hole will have remained only temporarily, before becoming in-filled by water and sediment. Any HE UXB strike to elevated risk ground cover could potentially have come to rest beneath neighbouring undamaged buildings or hard-standing due to the 'J-Curve' Effect.

UXB strikes to undamaged/superficially damaged buildings and hard-surfaced ground will still have caused substantial damage or an easily identifiable and persistent entry hole. Similarly, it is unlikely that an HE UXB entry hole on well-maintained / manicured lawns (tennis courts, bowling greens, golf course fairways / greens, gardens in affluent areas etc), would have been overlooked. Such incidents would have been reported and the UXB subsequently removed.

9.3.5 German Air-Delivered Ordnance Failure Rate

Based on empirical evidence, it is generally accepted that 10% of the German HE bombs dropped during WWII failed to explode as designed. This estimate is probably based on the statistics of wartime recovered UXBs and therefore will not have taken account of the unknown numbers of UXBs that were not recorded at the time and is probably an underestimate.

The reasons for failures include:

- Fuze or gaine malfunction due to manufacturing fault, sabotage (by forced labour) or faulty installation.
- Clockwork mechanism failure in delayed action bombs.

- Failure of the bomber aircraft to arm the bombs (charge the electrical condensers which supplied the energy to initiate the detonation sequence) due to human error or equipment defect.
- Jettison of the bomb before it was armed or from a very low altitude. Most likely if the bomber was under attack or crashing.

War Office Statistics document that a daily average of 84 bombs which failed to function were dropped on civilian targets in Great Britain between 21st September 1940 and 5th July 1941. 1 in 12 of these (probably mostly fitted with time delay fuzes) exploded sometime after they fell; the remainder were unintentional failures.

From 1940 to 1945 bomb disposal teams dealt with a total of 50,000 explosive items of 50kg and over (i.e. German bombs), 7,000 AAA shells and 300,000 beach mines. These operations resulted in the deaths of 394 officers and men. However, UXO is still regularly encountered across the UK.

Note, due to manufacturing fault or failure of the bomber crew to correctly arm their munitions, whole bomb loads often failed to detonate. Therefore, the presence of reported UXBs increases the likelihood of an additional unrecorded UXB in the vicinity.

9.3.6 Site Specific Analysis

The following table will place the site in context with these factors, in order to assess the likelihood of post-raid UXO detection within the project site.

Likelihood of Post Raid UXO Detection on Site			
Site-Specific Factors			**Additional Comments**
Density of Bombing Assessment	Based on wartime records or secondary source information, what was the bombing density over the site?	High	The site's proximity to an airfield and to a harbour town resulted in a high bombing density over the local area. Ramsgate borough experienced a bombing density of 213.6 items per 1000 acres.
	Was the site ever subjected to one or more large-scale (>100 tons of ordnance) night time Blitz raids?	✓	
	Were any HE bomb strikes recorded on site?	✓	An abandoned 50kg HE bomb is plotted on site.
	What is the distance between the site boundary and the closest recorded large bomb strike?	On site	
	How many HE, Parachute Mine, Oil Incendiary, Phosphorus Incendiary or Fire Pot bombs (large bombs) were recorded within a 300m radius of the site?	~ 4	
	Were any nearby sticks of large bombs recorded in line with the site?	✓	Kent Bomb Census Mapping plotted two HE bombs plotted within

			the vicinity of the site, indicating a possible stick.
	Were any 1kg incendiary bomb showers recorded over the site?	✓	Kent Bomb Census Mapping illustrates an incendiary shower encompassing the site.
Bomb Damage Assessment	A comparison of the historical records confirms that buildings within the site boundary sustained serious bomb damage.	✗	
	Direct or indirect evidence of HE bomb craters in open ground (within the site boundary) have been found.	✗	
	Buildings on site were seriously damaged by a V1 and / or V2 strike.	✗	
	Buildings on site could have been seriously damaged prior to the nearby V1 or V2 strike?	✗	
Frequency of Access Assessment	The site was situated in a densely populated urban area during WWII and therefore would have been accessed at the outbreak of WWII.	✗	
	The site was exclusively or partially developed during WWII.	✓	However, the site was predominantly undeveloped.
	Buildings on site survived WWII intact and therefore likely remained inhabited or in use, suggesting these localities and their immediate environs were accessed throughout the war.	✗	
	The site was crossed by roads / pavements or footpaths which would have been regularly used / subject to daily footfall.	✓	Sandwich Road would have still been used during the war, according to ARP reports it was closed and traffic was stopped when a UXO was found on the golf course.
	The site was occupied by small residential back yards / gardens, likely to have been put to use for cultivation as a result of the government's Dig for Victory Campaign.	✗	
	The site was occupied by a school during WWII.	✗	
	Part of the site is likely to have been subject to post-raid searches for UXO.	✗	

	Buildings on site sustained serious bomb damage and as a result were likely abandoned (along with any associated gardens / open ground) for the remainder of the war.	✖	
	The site was occupied by peripheral open ground / wasteland, with no apparent use, which may have been neglected.	✓	
	The site may have been occupied by recreational land / sports fields which may have only experienced seasonal access.	Possibly	During WWII, the golf course was requisitioned by the military (see Section 9.3) and covered with defensive fortifications, including barbed wire. It is unclear however, when these were constructed and if the site was still being used recreationally during the early part of WWII.
	The site was occupied by a graveyard which would have experienced limited access.	✖	
	The site was occupied by agricultural land, rural countryside or woodland which would not have been accessed in full, either regularly or frequently.	✖	
	The site was occupied by railway sidings which may not have been as regularly checked for buckling as mainline railway tracks.	✖	
	The site was occupied by soft railway embankments which are likely to have been neglected during the war.	✖	
Ground Cover Assessment	The site was partially or entirely abandoned, due to bomb damage, resulting in associated open ground likely becoming overgrown.	✖	
	The site was occupied by dense, inaccessible vegetation during WWII.	✖	
	The site may have been susceptible to waterlogged conditions during WWII.	✓	
	The site was occupied by (possibly) unmaintained grass field during WWII.	✖	
	The site was part occupied by a canal, river, dock basin, lake or reservoir during WWII.	✖	

	The site was occupied by tidal mud or marshland during WWII.	✓	
	The site was occupied by railway tracks crossing soft ground during WWII.	✗	
	The site was occupied by stockpiled material during WWII.	✗	
	The site was occupied by buildings, hard-standing or other manmade structures that did not sustain any degree of bomb damage.	✗	
	A comparison of the historical records confirms that buildings on site sustained inconsequential minor / moderate damage.	✗	
	The site was occupied by well-maintained, manicured lawn during WWII.	✗	It is unlikely the golf course would have been well maintained.
	Undamaged, developed parts of the site would have been vulnerable to the J-Curve Effect.	✓	
Bomb Failure Rate	Evidence has been found which suggests that the bomb failure rate in the vicinity of the site would have been different from the "approximately 10%" figure normally used.	✗	

10 The Threat from Allied Military Ordnance

The following potential historical and modern sources of UXO contamination on site or in the surrounding area have been considered:

Potential Source of Contamination on Site	
Army, Navy and RAF Bases / Installations	✗
Military Training Areas / Weapons Ranges	✓
Ordnance / Explosives Factories and Storage Depots	✗
Sites Requisitioned for Military Use	✓
Sites Used or Occupied by the Home Guard	✓
Military Fortifications and Coastal Defences	✓
Locations of Army Explosive Ordnance Clearance Tasks	✓
WWII Anti-Aircraft Batteries	✓
WWII Pipe Mined Locations and Beach Minefields	✗

The risk of contamination from Allied UXO on site is discussed below.

10.1 Port Richborough

Port Richborough, nicknamed port "Q", was established in 1914 on the banks of the River Stour, the facility was kept a secret and served as a significant military outpost. Throughout WWI, the port was used for manning and arming barges being sent to Dover and subsequently France.[4] The port became militarised during the First World War, with multiple stores for equipment used for supplying the barges erected in and around the banks. Moreover, defensive positions were established around the Port, especially on the flats towards the mouth of the river Stour.

During WWII, the port still served a purpose as a military outpost for the Royal Marines in 1942, named H.M.S Robertson. The Port was considered "a hive of industry" in preparation for D-Day, with many troops stationed in the nearby Richborough Camp, and factory workers working throughout the blackout in the port factory.[5] The port was located approximately 1.2km south-east of the site.

[4] https://blog.railwaymuseum.org.uk/port-of-richborough-and-the-birth-of-the-cross-channel-train-ferry/
[5] http://www.open-sandwich.co.uk/town_history/richborough_port.htm

10.2 Home Guard Activity

The Home Guard (HG) was a defence organisation of the British Army, operational between 1940 and 1944. It comprised 1.5 million local volunteers, otherwise ineligible for military service and acted as a secondary defence force in case of enemy invasion. The HG guarded the coastal areas of Britain and other important facilities such as airfields, factories and explosives stores. They were also active in county towns and cities.

Official records were rarely kept by the HG and therefore any present-day evidence is usually anecdotal. However, it is known that HG personnel often carried out training (including weapons training) in open countryside on the outskirts of cities / towns. Today, items of ordnance related to the HG are occasionally encountered by members of the public and the construction industry in the British countryside. This suggests a culture of ill-discipline regarding live ammunition within HG units.

HG personnel are known to have purposefully buried caches of ammunition and weapons in tactical positions, to be exhumed and used in case of invasion. Records of such caches were not rigorously kept, and some were therefore forgotten about. This is substantiated by several HG UXO finds over recent years. The below table shows just a handful of examples:[6]

Home Guard UXO Finds:	
	Unexploded Spigot Mortar Round, used by the Home Guard in WWII, found and disposed of in Hayle, Cornwall – January 2021
	24 x WWII grenades found buried in a field in Sibton, Suffolk – May 2019

[6] Various News Sources

	A cache of 80 phosphorous grenades buried by the Home Guard found in Eastbourne – September 2015
	Home Guard Phosphorous Grenades found buried beneath a bridge in Herne Bay – July 2015

10.1 Coastal Defences

10.1.1 General

Following the evacuation of troops from Dunkirk in June 1940, Britain was at threat of invasion from occupied France. Several strategies were considered and developed but largely the emphasis was placed upon coastal fortifications. As a result the south-east witnessed the construction of a continuous coastal defence comprising: coast batteries, hardened field defences including weapon emplacements and concrete anti-tank obstacles, anti-tank ditches, anti-tank scaffolding, fire trenches and barbed wire entanglements.

Members of the HG (and probably Army) personnel that would have manned defensive positions along the coast will have been issued with land service and small arms ammunition and therefore there is a slightly increased risk of localised UXO contamination.

The HG deployed a range of both conventional and unconventional weapons throughout the war. These included conventional rifles, machine guns, mortars and grenades and the more unconventional Northover Projector (a grenade launcher), Spigot Mortar, the Smith Gun, SIP grenades and Fougasse bombs.

10.1.2 Defensive Minefields

In addition to an extensive network of coastal defences, key points, such as road junctions, bridges and airfields, were prepared for demolition at short notice. Canadian pipe mines (known as McNaughton Tubes) were also commonly used to create an instant tank obstacle in order to hamper enemy progress.

Furthermore, the mining of the beaches along the south coast was started in great haste following June 1940. These minefields were combined with other previously mentioned obstacles.

The Corps of Royal Engineers Journal states that "the laying of minefields was the first large scale practical experience the British Army had had in this branch of warfare. Lack of experience, and hurried operation, led to many mistakes being made which were to cause much trouble to units and members of the Corps later."

This may also be the reason why the practice of fencing off and accurately recording mine locations was not as universal as desired. Inaccuracies in record keeping, combined with changes caused by the tides, inhibited some of the later clearance efforts.

While the risk from a dislodged mine migrating and being washed up onshore is considered unlikely it cannot be entirely discounted.

10.2 Anti-Aircraft Gun Batteries

At the start of the war two types of AAA guns were deployed: Heavy Anti-Aircraft Artillery (HAA) and Light Anti-Aircraft Artillery (LAA). The LAA batteries were intended to engage fast low flying aircraft and were typically deployed around airfields or strategic installations. These batteries were mobile and could be moved to new positions with relative ease when required. With four guns per battery firing several rounds per minute, AA batteries could expel numerous shells in even the shortest engagements. Numerous unexploded AAA shells were recovered during and following WWII and are still occasionally encountered on sites today.

The maximum ceiling height of fire at that time was around 11,000m however, as the war progressed, improved variants of the 3.7" gun were introduced and, from 1942, large 5.25-inch weapons were brought into service. These had significantly improved ceiling heights of fire reaching over 18,000m.

When the supply of clockwork fuses from Switzerland was cut off, Britain was forced to make its own. After four years of war, the country still lacked the engineering skills to produce a reliable fuse. This resulted in a considerable number of AA projectiles exploding prematurely, killing the gunners or failing to explode at all and falling to the ground as UXBs. In January 1944, more people in London were killed by HAA shells than by German bombs.

10.3 Site-Specific Threat from Allied Military Ordnance

The following table identifies the potential threat to the site of contamination from British / Allied UXO.

Potential Source	Details
Nearest Home Guard Battalion to the site	6th Kent (Thanet) Battalion.
Home Guard Activity on site	• The Thanet battalion primarily operated out of Margate, approximately 7.0km from the site. However, the exact locations of their HQs or training areas were not found.

	• The Kent Historic Environment Record shows a number of WWII defences occupying St Augustine's Golf Course. These include a machine gun post, slit trench and pillbox which are positioned on or in close proximity to the site.[7] • The Thanet Advertiser from 1945 also states that the golf course was also covered with barbed wire and other obstructions.[8] • Further defensive features in close proximity to the extension area included a coast battery observation post and fougasse (anti-tank weapon system) approximately 60m to the north. Pegwell Bay beach was also protected by anti-boat landing obstacles, comprising anti-tank blocks, barbed wire and fencing. • HG personnel are known to have purposefully buried caches of ammunition and weapons in tactical positions, to be exhumed and used in case of invasion. Due to the area being heavily fortified, it is possible that arms were buried on or adjacent to the site. • Marshy land between Minster and Pegwell Bay was used as a mortar training range during WWII, however no details regarding the full extent of the training area could be located. • Furthermore, during May 1943, Spigot Mortars were fired into Pegwell Bay as part of the Thanet Battalions 3rd birthday parade celebrations. [9] Such activity is likely to account for some of the UXO finds in Pegwell Bay, some of which were discovered in close proximity to the extension area, in the post-war period (see Section 10.2.2). • Given the strong military / HG presence in the area and the site comprising undeveloped ground, the possibility the site was used for training purposes cannot be discounted. • Beaches across the Kent coast were mined as an anti-invasion defence measure, for example the shoreline between Deal and Sandwich was mined during WWII. [10] • Furthermore, a newspaper article reported that mines were laid across farmland at Cliffsend when enemy invasion appeared to be imminent. This included Bethlehem Farm 750m north of the site[11]. The full extent of these minefields is unknown. • Pegwell Bay was considered to be a likely landing beach for invading forces and was therefore likely protected with mines. However, no further details could be located.
Number of HAA batteries within 5km of the site	5
Threat to the site from unexploded AA shells	• The nearest HAA battery was approximately 2.0km north-east from the site, situated close to RAF Manston. • However, the Kent Historic Environment Record and historical aerial photography also indicates the presence of an anti-aircraft battery on St Augustine's Golf Course, approximately 200m to the north of the site. [12]

[7] https://webapps.kent.gov.uk/KCC.ExploringKentsPast.Web.Sites.Public/SingleResult.aspx?uid=MWX43191
[8] https://www.britishnewspaperarchive.co.uk/viewer/bl/0001699/19450313/043/0003
[9] https://www.britishnewspaperarchive.co.uk/viewer/bl/0001698/19430518/020/0001
[10] https://issuu.com/cisr-journal/docs/journal21-1/s/103656
[11] Thanet Advisor – 18th December 1945
[12] https://webapps.kent.gov.uk/KCC.ExploringKentsPast.Web.Sites.Public/SingleResult.aspx?uid=MWX43192

	• RAF Manston was targeted and attacked by the Luftwaffe several times during WWII. During such attacks, it is likely that a degree of AA fire would have occurred over the site. • One anecdotal account notes that "the intensity of the anti-aircraft fire put up around Manston and Hawkinge airfields during the raids of 15th August 1940" led to the towns of Ramsgate getting bombed more frequently.[13] • Furthermore, as a consequence of the site's position to Ramsgate harbour, it is possible that many temporary LAA batteries were established on the course and in open fields within close proximity to the site.[14] A Kent County Council source has confirmed. • Had an exploded shell landed onto the soft ground on site, it is conceivable it could have remained undetected.

10.4 Generic Types of WWII British / Allied Unexploded Ordnance

10.4.1 Land Service Ammunition (LSA)

10.4.1.1 General

The term Land Service Ammunition covers all items of ordnance that are propelled, placed or thrown during land warfare. They may be filled or charged with explosives, smoke, incendiary or pyrotechnics. They can be broken into five main groups:

a. Mortars

b. Grenades

c. Projectiles

d. Rockets

e. Landmines

Unexploded or partially unexploded Mortars and Grenades are among the most common items of UXO encountered in the UK. They are commonly encountered in areas used by the military for training and are often found discarded on or near historic military bases.

Examples of the most commonly used British / Allied Land Service Ammunition types are presented in the *Ordnance Specifications and Information* appendices, at the end of this document.

10.4.1.2 Mortars

A mortar bomb is a fin-stabilised munition, normally nose-fuzed and fitted with its own propelling charge (primary cartridge). Range is increased by adding extra propellant (augmenting charges). They are either HE or Carrier and generally identified by their tear-dropped shape (older variants however are parallel sided) and a finned 'spigot tube' screwed or welded to the rear end of the body housing the propellant charge.

A mortar relies on a striker hitting a detonator for explosion to occur. It is possible that the striker may already be in contact with the detonator and that only a slight increase in pressure would be required for initiation. Discarded augmenting charges are often encountered around mortar firing areas/bases.

[13] Hylton, Stuart, Kent and Sussex 1940:Britain's Front Line, (Barnsley, Pen & Sword Books Limited, 2004)
[14] https://webapps.kent.gov.uk/KCC.ExploringKentsPast.Web.Sites.Public/SingleResult.aspx?uid=MWX43191

10.4.1.3 Grenades

A grenade is a short-range weapon which may be thrown by hand, fired from the end of a rifle or projected/propelled from a special purpose grenade launcher. They are divided into two categories; HE and Carrier (generally smoke). As with mortars, a grenade striker may either be in contact with the detonator or still be retained by a spring under tension, and therefore shock may cause it to function. A grenade can have an explosive range of 15-20m. Common older variants have a classic 'pineapple' shape; modern grenades tend to be smooth-sided.

10.4.2 Small Arms Ammunition (SAA)

The most likely type of ordnance to be encountered on site are items of SAA (bullets), especially .303" ammunition which was the standard British and Commonwealth military cartridge from 1889 until the 1950s.

However even if an item such as this functioned, the explosion would not be contained within a barrel and detonation would only result in local overpressure and very minor fragmentation from the cartridge case.

Some LAA guns and RAF fighter cannons in use with British forces during WWII utilised the 20mm round. These bullets had a small fuse and a ~4gram HE or incendiary charge. Although small, this fill quantity still has the potential to cause serious injury.

Examples of the most commonly used British / Allied Small Arms Ammunition types are presented in the *Ordnance Specifications and Information* appendices, at the end of this document.

10.4.3 Anti-Aircraft Shells

At the start of the war two types of AAA guns were deployed: Heavy Anti-Aircraft Artillery (HAA) using large calibre weapons such as the 3.7" QF (Quick Firing) gun and Light Anti-Aircraft Artillery (LAA) using smaller calibre weapons such as 40mm Bofors gun which could fire up to 120 x 40mm HE shells per minute to over 1,800m. During the early war period there was a severe shortage of AAA so older WWI 3" and modified naval 4.5" guns were also deployed.

These shells are frequently mistakenly identified as small German air-delivered bombs but are differentiated by the copper driving band found in front of the base. Although the larger unexploded projectiles could enter the ground, they did not have great penetration ability and are therefore likely to be found close to WWII ground level. With a HE fill and fragmentation hazard these items of UXO also present a significant risk if encountered.

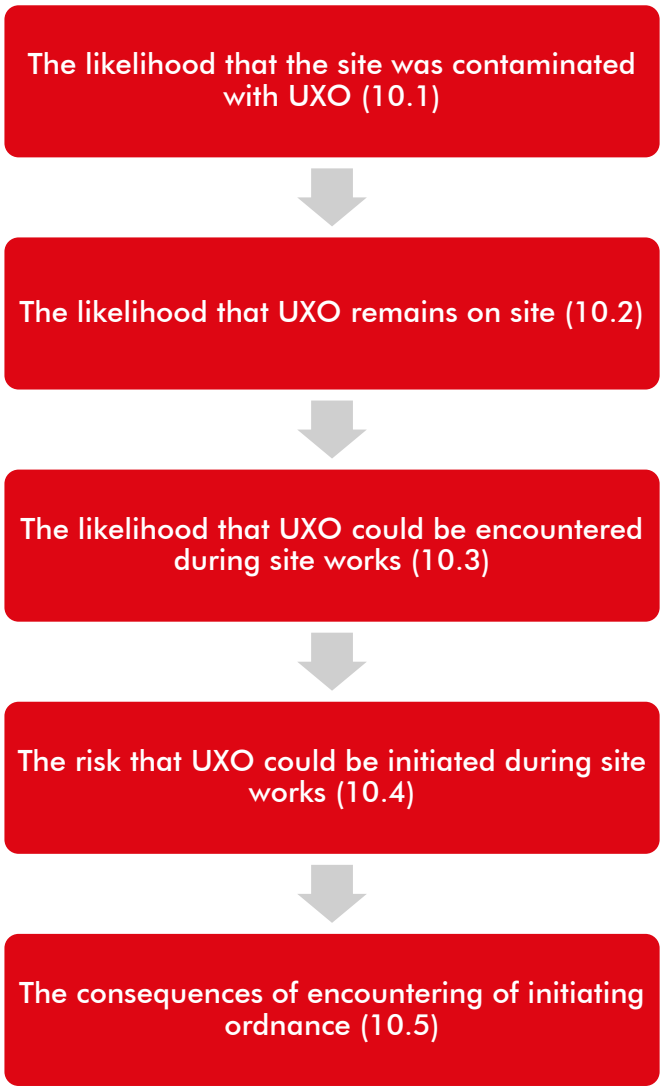
The smaller 40mm projectiles are similar in appearance and effect to small arms ammunition and, although still dangerous, present a lower risk. Details of the most commonly deployed WWII AAA projectiles are shown below:

Gun type	Calibre	Shell Dimensions	Shell Weight	HE Fill Weight
3.7 Inch	94mm	94mm x 438mm	12.7kg	1.1kg
4.5 Inch	114mm	114mm x 578mm	24.7kg	1.7kg
40mm	40mm	40mm x 311mm	0.84kg	70g

Examples of the most commonly used British / Allied Anti-Aircraft Ammunition types are presented in the *Ordnance Specifications and Information* appendices, at the end of this document.

11 The Overall Unexploded Ordnance Risk Assessment Methodology

Taking into account the quality of the historical evidence, the assessment of the overall risk to any intrusive works from UXO must evaluate the following factors:



Each of these steps will be evaluated in the following sections in order to conclude the total risk from UXO to the proposed works to be undertaken within the project site.

11.1 The Likelihood that the Site was Contaminated with Unexploded Ordnance

11.1.1 General

The below is a generalised table of factors used to determine the likelihood that the site was contaminated with unexploded ordnance. Note that additional site-specific information can adjust UXO risk beyond these criteria:

Low Likelihood	Medium Likelihood	High Likelihood
German Air-Delivered Ordnance / Allied Anti-Aircraft Shells		
No evidence of bombing / bomb damage on site coupled with low local bombing density.	Moderate to High local bombing density or evidence of bombing / bomb damage on or close to the site.	High local bombing density or evidence of bombing /bomb damage on or adjacent to the site. Confirmed finds of WWII UXB.
Ground conditions that would prevent UXB penetration or lead to easily identifiable entry holes.	Ground conditions that allow for bomb penetration.	Ground conditions that would have immediately and completely obscured the existence of UXB.
Site was occupied and accessed fully throughout the bombing campaign.	Site located in an area that was infrequently observed or accessed, with a low likelihood that a UXB strike would have been noticed.	Site may be completely obscured from view or subject to very infrequent access.
British / Allied Ordnance		
No evidence of Allied military activity on or near the site. Or Military sites which have been cleared / redeveloped since their use Or Military-owned sites which have not been used for training with live munitions.	Clear evidence of military training activity on site involving live ammunition / munitions. Military sites which have not undergone clearance operations or redevelopment since use. Evidence of weapons storage on site.	Evidence of weapons testing or disposal on or adjacent to the site.
Developed areas that are unlikely to have been used for military exercises.	Open or unmaintained ground that may have been used for disposal or caching of munitions.	Evidence of UXO finds on or in the vicinity of the site.

The following sections assess the likelihood of contamination from German UXO and British / Allied UXO, based on the evidence discussed in the previous sections.

11.1.2 Likelihood of Contamination from German UXO

The following table discusses the overall likelihood of contamination from German UXO, based on the evidence discussed in Section 8.

Overview of the Potential Sources of German Air-Delivered UXO	
Bombing density	• High localised bombing density (213.3 items per 1000 acres). • 1 x abandoned 50kg HE bomb plotted on site. • 1x Incendiary bomb shower plotted adjacent to the site. • 1 x stick of bombs in line with the site.
Bomb Damage	• No evidence of bomb damage on site. • Possible HE bomb crater 40m north.
Ground Conditions	• Soft vegetation across the whole site. • Hard surface in the eastern extent. • Extension area comprised foreshore.
Frequency of Access	• It is unclear whether the site was used recreationally throughout the war. • The site was likely accessed by the military. • Extension area unlikely to have been accessed frequently.
J-Curve Effect	• Had any UXB landed within the soft ground / marshland / mud on / adjacent to the site, it could have come to rest beneath the study area.
Other considerations	n/a
Overall Likelihood of Contamination	**High**

11.1.3 Likelihood of Contamination from British / Allied UXO

The following table discusses the overall likelihood of contamination from British / Allied UXO, based on the evidence discussed in Section 9.

Overview of the Potential Sources of British / Allied UXO	
Land Service Ammunition / Small Arms Ammunition	• St. Augustine's Golf Course was requisitioned by the military. A machine gun post, slit trench and pillbox were positioned on or in close proximity to the site. • A coastal battery observation post and fougasse (anti-tank weapon system) were located 60m to the north of the extension area. • Pegwell Bay beach was also protected by anti-boat landing obstacles, comprising anti-tank blocks, barbed wire and fencing. • HG personnel are known to have purposefully buried caches of ammunition and weapons in tactical positions, to be exhumed and used in case of invasion. Due to the area being heavily fortified, it is possible that arms were buried on or adjacent to the site. • Marshy land between Minster and Pegwell Bay was used as a mortar training range during WWII. Therefore, the possibility of such training taking place on site cannot be discounted. • Spigot Mortars were fired into Pegwell Bay as part of the Thanet Battalions 3rd birthday parade celebrations. Such activity is likely to account for a number of the UXO finds in the area (see Section 10.2.2). • Pegwell Bay was considered to be a likely landing beach for invading forces and was therefore likely protected with mines. However, no further details could be located.
Anti-Aircraft Projectiles	• Five HAA batteries were situated within a 5km radius of the site during WWII, the closest of which was approximately 2.0km north-east. • A smaller AA battery was also located approximately 200m to the north of the site. • Had an exploded shell landed onto the soft ground on site, it is conceivable it could have remained undetected. Therefore, the study area is susceptible to contamination from anti-aircraft ordnance.
Overall Likelihood of Contamination	**High**

11.2 The Likelihood that Unexploded Ordnance Remains on Site

11.2.1 General

The extent to which any ordnance clearance activities have taken place on site or extensive ground works have occurred is relevant since they may indicate previous ordnance contamination but also may have reduced the risk that ordnance remains undiscovered.

11.2.2 EOD Bomb Disposal and Clearance Tasks

SafeLane Global holds a number of official records of explosive ordnance disposal operations during and following WWII, obtained from the Explosive Ordnance Disposal (EOD) Archive Information Office at 33 Engineer Regiment (EOD), British Army.

Potential Source	Details
Records of Army EOD tasks having taken place on site or in the vicinity	None
Local ordnance finds	• November 1960 – An unidentified UXB was discovered on the sand of Pegwell Bay (precise location not known but potentially within the extension area).[15] • December 1960 – A 3-inch mortar was discovered in the mud at Pegwell Bay (precise location not known but potentially within the extension area).[16] • November 1962 – A mortar was dug up at Pegwell Bay. [17] • October 1965 – A smoke bomb was found on the beach at Pegwell Bay (precise location not known but potentially within the extension area). [18] • October 1968 – A bait digger unearthed a mortar on the sands of Pegwell Bay, next to the then construction site of the international hoverport. [19] The former hoverport site is located approximately 420m to the north-east of the site. It is likely the incident occurred on or in close proximity to the extension area. • April 1969 – A 4.5in shell was found in the mud on the Pegwell Bay hovercraft flight path. [20] • January 1970 – A mortar was found by bait diggers in the flight path of the international hoverport, Pegwell Bay. At the same time a bomb disposal team searched for a German 1,000lb bomb in the same area, however no evidence could be found. [21] • March 1970 – A 250lb RAF HE bomb was found on the mud flats of Pegwell Bay, approximately half a mile from the hovercraft flight path. It was believed that the bomb was jettisoned by an RAF plane after it got into difficulties. [22]

[15] https://www.britishnewspaperarchive.co.uk/viewer/bl/0003350/19601130/244/0015
[16] https://www.britishnewspaperarchive.co.uk/viewer/bl/0003350/19601223/054/0003
[17] https://www.britishnewspaperarchive.co.uk/viewer/bl/0003350/19621130/293/0008
[18] https://www.britishnewspaperarchive.co.uk/viewer/bl/0002513/19651012/008/0001
[19] https://www.britishnewspaperarchive.co.uk/viewer/bl/0003350/19681002/420/0013
[20] https://www.britishnewspaperarchive.co.uk/viewer/bl/0003350/19690402/010/0001
[21] https://www.britishnewspaperarchive.co.uk/viewer/bl/0003350/19700123/009/0001
[22] https://www.britishnewspaperarchive.co.uk/viewer/bl/0002513/19700317/014/0001

	• September 1970 – A 3-inch shell was found in the mud on the foreshore at Cliffsend (precise location not known but potentially within the extension area).[23] • September 1976 – A UXB, approximately 16in long, was found on the beach at Pegwell Bay, near the car park of Cliffsend Garage (approximately 1.1km north-east of the site). [24] • July 2017 - A UXB was found in Pegwell Bay Country Park. An Army disposal team carried out a controlled detonation.[25] Pegwell Bay County Park is located approximately 200m south of the site. • An unidentified UXB was discovered in the marshes near Brook Lane, approximately 900m to the west.
Local tasks undertaken by SafeLane Global	During intrusive works within Pegwell Bay (outside of the extension area), SafeLane Global discovered several mortars.

11.2.3 Post War Redevelopment

The nature of post-WWII ground works, redevelopment and construction has been considered. Significant structural redevelopment on site can, in some cases, provide a level of mitigation, particularly from shallow buried items. However, if a site has not undergone any extent of redevelopment, the likelihood of UXO remaining within its boundaries can remain.

The site has been redeveloped post-WWII	✓
Further Details	• It appears that much of the site has remained largely undeveloped in the post-war period. However, the south of the site has seen landscaping works with the construction of Stonelees Golf Centre. • The area of the site still occupied by St Augustine's Golf Links is unlikely to have undergone any bulk excavations. • However, it is likely that the course will have been renovated throughout the years post war. • The extension area has not been subject to significant redevelopment works.

11.2.4 Site-Specific Analysis

The following table discusses the likelihood that UXO could remain on site, following any post-WWII activity.

Mitigating factors during post-WWII period	There is limited evidence that the site has been redeveloped, due to its current state it is likely that the site would have only been subject to shallow excavations.
Further comments	Only within the volume of any post-war basement level bulk excavations and at the precise locations of any post-war pile foundations/boreholes, will the risk from deeper buried German HE UXBs have been completely mitigated. As no known

[23] https://www.britishnewspaperarchive.co.uk/viewer/bl/0002513/19700902/263/0001
[24] https://www.britishnewspaperarchive.co.uk/viewer/bl/0002514/19760914/284/0028
[25] https://theisleofthanetnews.com/the-army-has-carried-out-another-controlled-explosion-of-war-time-bombs-at-cliffsend/

	bulk excavations have been carried out onsite, the risk from deep buried UXO remains unmitigated to the maximum bomb penetration depth.

11.3 The Likelihood that Ordnance may be Encountered during the Works

The following table discusses the likelihood that UXO could be encountered on site during the proposed works.

At-Risk Scenarios	The most likely scenarios under which a UXO could be encountered during construction works is during piling, drilling operations or bulk excavations for basement levels. The overall risk will depend on the extent of the works, such as the numbers of boreholes/piles (if required) and the volume of the excavations. Since an air-dropped bomb may come to rest at any depth between just below ground level and its approximate penetration depth there is also a chance that such an item could be encountered during shallow excavations (for services or site investigations) into the original WWII ground level. If the proposed works are due to be undertaken within post war fill material / made ground, the risk of encountering WWII UXBs is low. However, if works are to be undertaken below WWII ground level this risk is significantly higher.
Likelihood of UXO being encountered during the proposed works	The proposed works are expected to consist of intrusive works. Therefore, the risk of encountering UXO remains elevated.

11.4 The Risk that Ordnance may be Initiated

Items of ordnance do not become inert or lose their effectiveness with age. Time can indeed cause items to become more sensitive and less stable. This applies equally to items submerged in water or embedded in silts, clays or similar materials. The greatest risk occurs when an item of ordnance is struck or interfered with. This is likely to occur when mechanical equipment is used or when unqualified personnel pick up munitions.

11.4.1 Initiation of Unexploded Bombs

In the case of unexploded German bombs discovered within the construction site environment, there are a number of potential initiation mechanisms:

Direct Impact onto the main body of the bomb	Unless the fuze or fuze pocket is struck, there needs to be a significant impact to initiate a buried iron bomb.
Re-starting the clock timer in the fuze	Only a small proportion of German WWII bombs employed clockwork fuzes. It is probable that significant corrosion has taken place within the fuze since the end of WWII that would prevent clockwork mechanisms from functioning, nevertheless it was reported that the fuze in a UXB dealt with by 33 EOD Regiment in Surrey in 2002 did recommence.

Induction of a static charge, causing a current in an electric fuze	The majority of German WWII bombs employed electric fuzes. It is probable that significant corrosion has taken place within the fuze mechanism since the end of WWII such that the fuze circuit could not be activated.
Friction impact initiating the (shock-sensitive) fuze explosive	This is the most likely scenario resulting in the bomb detonating.

11.4.2 Activities that may Result in the Initiation of Unexploded Ordnance

Unexploded bombs do not spontaneously explode. All high explosive requires significant energy to create the conditions for detonation to occur. The risk that UXO could be initiated if encountered will depend on its condition, how it is found and the energy with which it is struck. However certain activities pose a greater risk than others.

Percussive piling or deep mechanical excavations	The most violent activity on most construction sites is percussive piling or deep mechanical excavations. If an item is struck with a significant enough impact, be it direct or through friction/vibration, it risks detonation.
Shallow excavation	Soil levelling and shallow excavation such as trial pits can pose a similar risk to deeper excavations, since UXO can be found at any depth between ground level and the maximum bomb penetration depth. In addition to risk of initiation by violent impact or vibration, detonation can also occur if discovered items are mishandled by unqualified personnel. This is particularly common when onsite personnel are not trained in the recognition of ordnance.
Non-intrusive works	In the case of non-intrusive planned works, little risk is posed by items of UXO that are buried beneath the ground. However, risk can arise from unburied munitions, particularly items of ordnance discarded in periphery areas of military sites. These items are frequently discovered by onsite personnel and remain live and liable to activate if mishandled.

11.5 The Consequences of Encountering or Initiating Ordnance

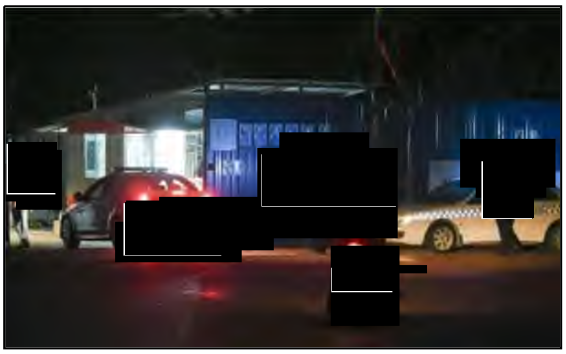
Clearly the consequences of an inadvertent detonation of UXO during construction operations would be catastrophic with a serious risk to life, damage to plant and a total site shutdown during follow-up investigations.

Since the risk of initiating ordnance is significantly reduced if appropriate mitigation measures are undertaken, the most important consequence of the discovery of ordnance will be economic. This would be particularly so in the case of high-profile locations and could involve the evacuation of the public.

The unexpected discovery of ordnance may require the closing of the site for any time between a few hours and a week with a potentially significant cost in lost time. Note also that the suspected find of ordnance, if handled solely through the authorities, may also involve loss of production since the first action of the Police in most cases will be to isolate the locale whilst awaiting military assistance, even if this turns out to have been unnecessary.

The following tables review a number of finds over recent years both in the UK and overseas that have seen large-scale disruptions, damage and injury/death:

UXB Incidents where intrusive works have caused detonation, resulting in death, injury and damage to plant	
 RESCUE workers search for survivors after a Second World War bomb exploded at a building site in Berlin, killing three people and injuring at least eight others. A fire brigade spokesman said he feared the final death toll could be higher. One worker was still missing, believed to be trapped under a machine. "We've **Blown up by history** found human remains 100 metres away but we can't tell if they belong to the dead already found," the spokesman said. The blast, set off by drilling work on Frankfurter Allee, one of east Berlin's busiest avenues, trapped workers under building machinery and sent huge chunks of concrete tumbling through the air. A large office block was being built on the site of the explosion which sent shoppers scrambling for shelter and paralysed dense afternoon traffic. One eyewitness said: "There was a bang, then silence, and then it started raining stones and dirt." Dozens of cars within a 250-metre radius were wrecked and the top two floors of a nearby apartment block caved in. Radio reports claimed that the total number of injured stood at 14.	A WWII bomb killed 3 and injured 8 in Berlin - 1994
	WWII bomb killed 3 in Goettingen, Germany – 2010.
	Excavator operator killed by WWII bomb in Euskirchen, Germany – 2014. A WWII bomb exploded at a construction site near a west German town, killing a man and injuring 8 others. The explosion occurred with a digger accidently struck the device during excavation works.

UXB Incidents where intrusive works have caused detonation, resulting in death, injury and damage to plant	
	A highway construction worker in Germany accidentally struck a WWII bomb, killing himself and wrecking several passing cars – 2006.
	Destroyed piling rig and dump truck after detonation of WWII UXB in Austria – 2006.
	WWII bomb injures 17 at construction site in Hattingen, Germany – 2008.
	A buried WWII-era bomb exploded during construction works in Bandar Malaysia, Kuala Lumpur – 2017.

UXB Incidents in the UK, resulting in delays, site shutdowns, evacuations, and disruptions	
	London City Airport shut: Flights cancelled after WWII bomb found in River Thames dock. London City Airport was closed after the discovery of a 250kg WWII German bomb, affecting tens of thousands of passengers. All flights into and out of the airport were stopped after the device was found by SafeLane Global in the nearby King George V dock. A 700ft exclusion zone was put in place and people living nearby were evacuated.
	Unexploded WWII 1000kg HE bomb found in Exeter, causing a construction site and the surrounding area to be evacuated. The subsequent detonation caused substantial damage to nearby buildings.
	A WWII UXB was found near to the Aston Expressway, leading to the evacuation of around 200 residents and a 500m cordon. Following the discovery, the weapon was safely detonated by the Army. However, although the M6 was reopened after the blast, the key Aston Expressway stayed shut until 6pm, extending traffic disruption. All nearby rail services and other roads were also disrupted.
	Up to 1000 homes were evacuated and a 300m exclusion zone was put in place following the discovery of a WWII UXB in Lansdown Road, Bath. The 500lb bomb was found just a meter beneath a playground at the former Royal High Junior School.

12 SafeLane Global's Risk Assessment

The Risk Assessment made by SafeLane Global for the site is based upon the likelihood that the site was contaminated, the risk of the contaminant item remaining, and the likelihood of, and potential consequences, should the item be struck during the proposed works. The following section discusses the risk that each ordnance type presents to the scope of works for the project site.

12.1 Conclusions

Taking into consideration the findings of this study, SafeLane Global considers the UXO risk at the site to be **High**.

Type of Ordnance	Likelihood of Contamination	Likelihood of UXO remaining	Likelihood of encounter	Potential Consequence	Overall Risk level
German High Explosive Bombs	High	Medium	Medium	Severe	**High**
German 1kg Incendiary Bombs	Medium	Low	Low	Severe	**Low**
Allied Anti-Aircraft Shells	Medium	Medium	Medium	Minor	**Medium**
British / Allied Small Arms	Medium	Medium	Medium	Not Significant	**Medium**
Land Service Ammunition	High	Medium	Medium	Moderate	**High**
Landmines	Medium	Medium	Medium	Severe	**Medium**

13 Proposed Risk Mitigation Strategy

SafeLane Global recommends the following minimum risk mitigation measures be deployed to support the proposed ground works at the site.

13.1 Summary

Based on the findings of the report, the following mitigation measures have been recommended for the proposed works on the site. Further detail on each method is presented in **Section 12.2**.

Risk Level	Planned Site Activity	Recommendations
High	**Shallow Intrusive Works eg. excavations**	• UXO Safety & Awareness Briefing (Toolbox Brief, TBB) • Site Specific Safety Instructions (SSSIs) Training Course • Explosive Ordnance Disposal (EOD) Engineer Watching Brief (for brownfield areas unsuitable for NI magnetometer survey) • Explosive Ordnance Disposal (EOD) Engineer to support Site Investigation (SI)
	Deep intrusive works (eg. piling)	• UXO Safety & Awareness Briefing (Toolbox Brief, TBB) • Site Specific Safety Instructions (SSSIs) Training Course • Intrusive Magnetometer Survey of pile/borehole positions
	Offshore works	Appropriate risk mitigation measures can be provided for any works taking place in marine (coastal or offshore) parts of the project site if necessary. These can usually include the following: • UXO Safety & Awareness Briefing (Toolbox Brief, TBB) • Client threat briefing • Authorities' engagement where required • Non-Intrusive (NI) High-Resolution Marine Survey – Area specific to each project module • Assessment and production of a Master Target List • Target Investigation (Required as a follow-on from NI Marine Survey) • ROV/Diver Investigation / Survey • Disposal if requested

13.2 Additional Notes

Risk Mitigation Measures – Further Detail	
Site Specific Explosive Ordnance Safety and Awareness Briefings (UXO Toolbox Briefing) to all personnel conducting intrusive works	These briefings are intended to make site operatives aware of the nature of explosive ordnance that may be encountered on their project site. • Delivered by a specialist Explosive Ordnance Disposal Engineer. • Provides information on the site-specific explosive ordnance risk • Basic ordnance identification. • What to do in the event of an encounter with a suspicious object. Provide UXO response procedures.
Site Specific Safety Instruction (SSSI)	For longer term projects that require Explosive Ordnance Safety and Awareness Briefings as part of the Explosive Ordnance Risk Mitigation measures for the project, SSSIs can be provided to allow nominated site representatives to deliver these briefings after initial training. • 2/3-hour presentation and training course. • Delivered by a fully qualified senior EOD Engineer. • Suitable for Project Site Manager HSE representative and supervisors. • Includes briefing pack. This provides a cost-effective solution to ensure that the Explosive Ordnance Safety and Awareness Briefings can be delivered effectively and efficiently to the required standard.
Explosive Ordnance Disposal (EOD) Engineer On-Site Support	In areas where the risk posed by the potential presence of explosive ordnance is low or where the conditions are not suitable for pro-active survey, EOD On-Site Support can provide a reactive response to any suspicious object that may be encountered during open excavation works. The presence of the EOD Engineer (sometimes referred to as 'high risk dig wardens') on-site in support of shallow intrusive work allows for a direct monitoring of works using visual recognition and instrumentation and provides an immediate response to reports of suspicious objects or suspected items of ordnance that have been recovered by ground workers. SafeLane Global EOD personnel on-site also have the additional benefit of providing Explosive Ordnance Safety and Awareness briefings (UXO TBB) to any staff that have not received them earlier and can advise staff of the need to modify working practices to take account of the ordnance threat. The EOD Engineer will also aid potential incident management which would involve liaison with the local authorities and police should ordnance that presents an explosive hazard be identified. • Specialist Explosive Ordnance Disposal Engineer. • Maintains a watching brief over all excavations. • Provides safety and awareness briefings to construction personnel as required.

	• Provides immediate identification of any suspicious item that is encountered. • Identifies whether any UXO item is live or inert. • Provides liaison assistance with the relevant authorities when dealing with any live UXO. Avoids on site delays which can be caused by the incorrect identification of a suspect item being potential UXO.
Explosive Ordnance Disposal (EOD) Engineer to support site investigation works	For cost effective Explosive Ordnance Risk Mitigation for site investigation work, the EOD Engineer can survey ahead of trial pits, monitor excavations when the ground conditions are not suitable for a pro-active survey and conduct intrusive surveys for borehole and window sample locations working in conjunction with the site investigation team. The On-Site Support will also provide a reactive response to any suspicious object that may be encountered during open excavation works. SafeLane Global EOD personnel on-site also have the additional benefit of providing Explosive Ordnance Safety and Awareness briefings to any staff that have not received them earlier and can advise staff of the need to modify working practices to take account of the ordnance threat. The EOD Engineer will also aid potential Incident Management which would involve liaison with the local authorities and police should ordnance be identified and present an explosive hazard. • Specialist Explosive Ordnance Disposal Engineer. • Maintains a watching brief over all trial pit excavations. • Provides safety and awareness briefings to construction personnel as required. • Works in conjunction with the drilling team to survey all borehole and window sample locations in real-time using a staged drilling and magnetometer survey procedure. • Provides immediate identification of any suspicious item that is encountered. • Identifies whether any UXO item is live or inert. • Provides liaison assistance with the relevant authorities when dealing with any live UXO. • Avoids on site delays which can be caused by the incorrect identification of a suspect item being potential UXO. *Technical Information* 1. In optimum ground conditions each survey using the borehole technique will have a 1 metre look ahead capability. 2. Any steel casing used for borehole surveys will need to be retracted by 3 metres to allow the magnetometer survey to be conducted. Non-ferrous pipe will be required to support the borehole during the survey minimum diameter 60mm (to be supplied by the client).
Search & Clear	Where a non-intrusive magnetometer survey is not possible (e.g. wooded areas) SafeLane Global can deploy a two-man Explosive Ordnance Disposal Engineer team using handheld magnetometer equipment who will proactively survey either in search lanes or boxes, investigating each reading with the support of

	an operated excavator. The survey is suited to detecting suspicious ferro-magnetic buried objects that may be munitions and/or explosive ordnance related. All SafeLane Global personnel involved with the Search and Clearance Works will be former military personnel who have gained formal NATO Military Explosive Ordnance Disposal Qualifications, having completed training at the Defence Explosive Ordnance Disposal School (DEODS) Chattenden, Kent or similar establishment throughout their military service. The client will be responsible for: • Demarcating the areas to be searched. • Providing services clearance and permit to dig. • Providing operated excavator to access deeper targets if required (SafeLane Global can provide this service at additional cost). • Providing coordinates of positions where debris have been identified (if information required in report). • Providing storage for recovered debris. Output will depend upon terrain and contamination (number of readings to be investigated).
Non-Intrusive Magnetometer Survey and Target Investigation (greenfield land only)	**Non-Intrusive Survey** This survey type is designed for use on magnetically 'clean' land commonly referred to as 'greenfield'. Brownfield land is often described as that which has had previous industrial or commercial use. In this context it specifically encompasses sites with are underlain by 'made ground' which may contain metallic contamination. Non-intrusive magnetometry or electromagnetic equipment which is used in the search for buried UXO relies upon the detection of small changes between clear ground and that containing UXO. The technique operates very successfully in environments where there is minimal ground contamination from other sources such as fired bricks, reinforced concrete, discarded scrap metal and buried services. There are also man-made ambient effects on magnetic and electromagnetic non-intrusive survey systems which include moving plant vehicles, power cables, electric trains etc. Non-Intrusive survey is carried out using either total-field or gradiometer magnetometry, dependent upon site conditions. Data is recorded and then interpreted using advanced AGSPRoc software in order to map magnetic fields and model discrete magnetic anomalies (variations in the Earth's magnetic field caused by ferro-magnetic objects electrical fields or geology). The location of such anomalies is determined, and mathematical modelling used to estimate their mass and depth. The survey will also locate any buried services with a magnetic signature and indicate any areas of gross magnetic "contamination" which may indicate the presence of unknown obstructions. Additionally, the survey can provide information on archaeological features. The system can detect the magnetic field from a 50kg WWII air-dropped bomb at a depth of 4m and smaller items such as Land Service Ammunition to depths of up to 1.5m in ground with a low ambient magnetic field. In the case of soft geology, it should be noted that a 50kg high explosive bomb may be buried greater than 4 metres below ground level and therefore may not be detected by the survey. In this instance intrusive surveys may be required.

	The non-intrusive survey system will be deployed utilising the pedestrian survey frame. The output for the pedestrian frame is estimated at up to 2Ha per day. *Technical information:* • Client to clearly demarcate area to be surveyed prior to start and highlight any known services/underground obstructions. • Ground must be level, free of obstacles / obstructions and clear of undergrowth. Height of any crops should be no more than 400mm and where crops are present SafeLane Global would require written approval from the landowner or client to walk over the site area. • When working adjacent to existing infrastructure the survey may be ineffective due to the ferro magnetic interference caused by passing vehicles and the presence of underground buried services. A site visit may be recommended prior to commencement. • Note: the survey will be ineffective on Brownfield sites due to the magnetic nature of building rubble, which typically masks the weaker magnetic signatures of buried objects. If parts of the site are contaminated, then alternative risk mitigation measures may need to be considered. **Target Investigation** If a buried anomaly is detected that cannot be discounted as a potential UXO / UXB then the object will need to be investigated to positively identify the item. The process will include; • Specialist two-man Explosive Ordnance Disposal Team. • Combination of manual and mechanical excavation techniques. • Excavator shafting, shoring and dewatering equipment can be provided by SafeLane Global if required. • Excavation techniques will be defined and agreed prior to the commence. A factual report with clearance certificate will be issued on completion of the investigation.
Intrusive Magnetometer Survey of all pile locations down to the maximum bomb penetration depth	SafeLane Global can deploy a range of intrusive magnetometry techniques to clear ahead of all the pile locations. The appropriate technique is governed by a number of factors, but most importantly the site's ground conditions. The appropriate survey methodology would be confirmed once the enabling works have been completed. A site meeting would be required between SafeLane Global and the client to determine the methodology suitable for this site. Target investigation or avoidance will be recommended as appropriate.

Bibliography

The key sources consulted during this assessment are listed below;

i. Bates, H, E., *Flying Bombs over England*, (Frogletts Publications Ltd. 1994).

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iii. Fegan, T., *The Baby Killers': German Air raids on Britain in the First World War*, (Leo Cooper Ltd. 2002).

iv. Fleischer, W., *German Air-Dropped Weapons to 1945*, (Midland Publishing. 2004).

v. Jappy, M. J., *Danger UXB: The Remarkable Story of the Disposal of Unexploded Bombs during the Second World War*, (Channel 4 Books, 2001).

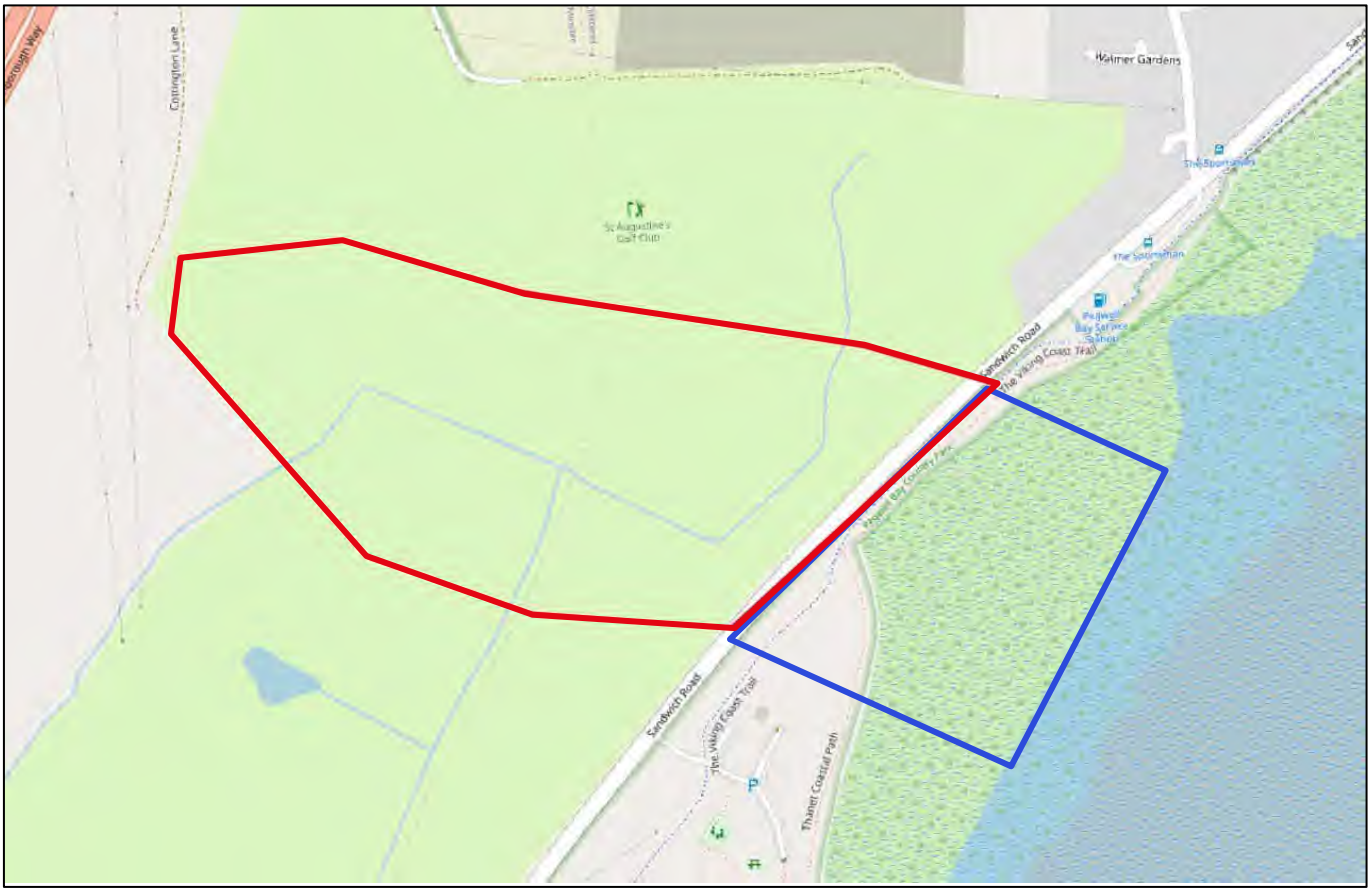
vi. Price, A., *Blitz on Britain, The Bomber Attacks on the United Kingdom 1939 – 1945*, (Purnell Book Services Ltd. 1977).

vii. Ramsey, W., *The Blitz Then and Now, Volume 1*, (Battle of Britain Prints International Limited. 1987).

viii. Ramsey, W., *The Blitz Then and Now, Volume 2*, (Battle of Britain Prints International Limited. 1988).

ix. Ramsey, W., *The Blitz Then and Now, Volume 3*, (Battle of Britain Prints International Limited. 1990).

x. Whiting, C., *Britain Under Fire: The Bombing of Britain's* Cities 1940-1945, (Pen & Sword Books Ltd. 1999).





© OpenStreetMap contributors

Recent Aerial Photograph

N

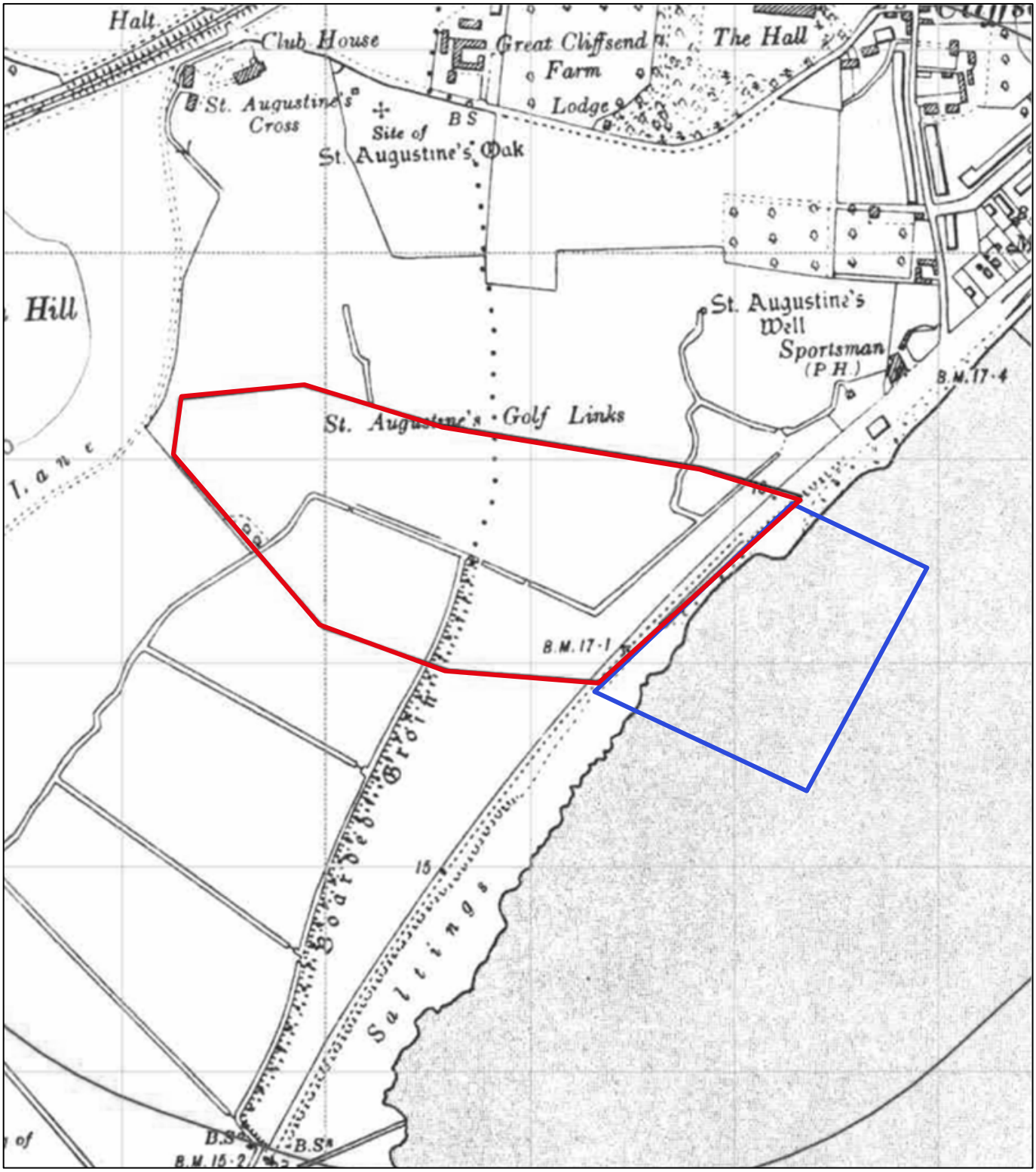


Approximate site boundary

Approximate extension area

Google Earth™ Mapping Services

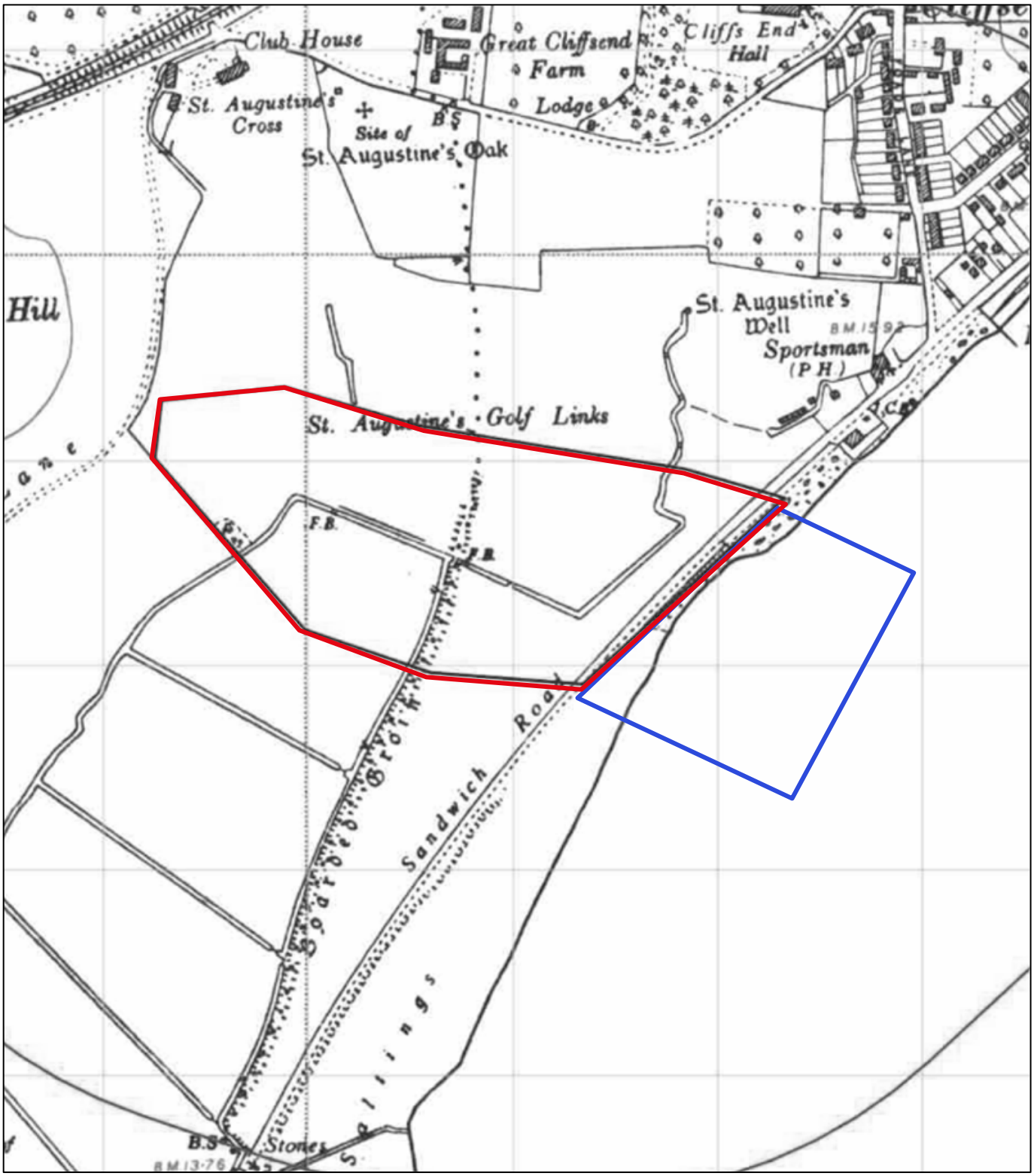
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Approximate site boundary

Approximate extension area

N

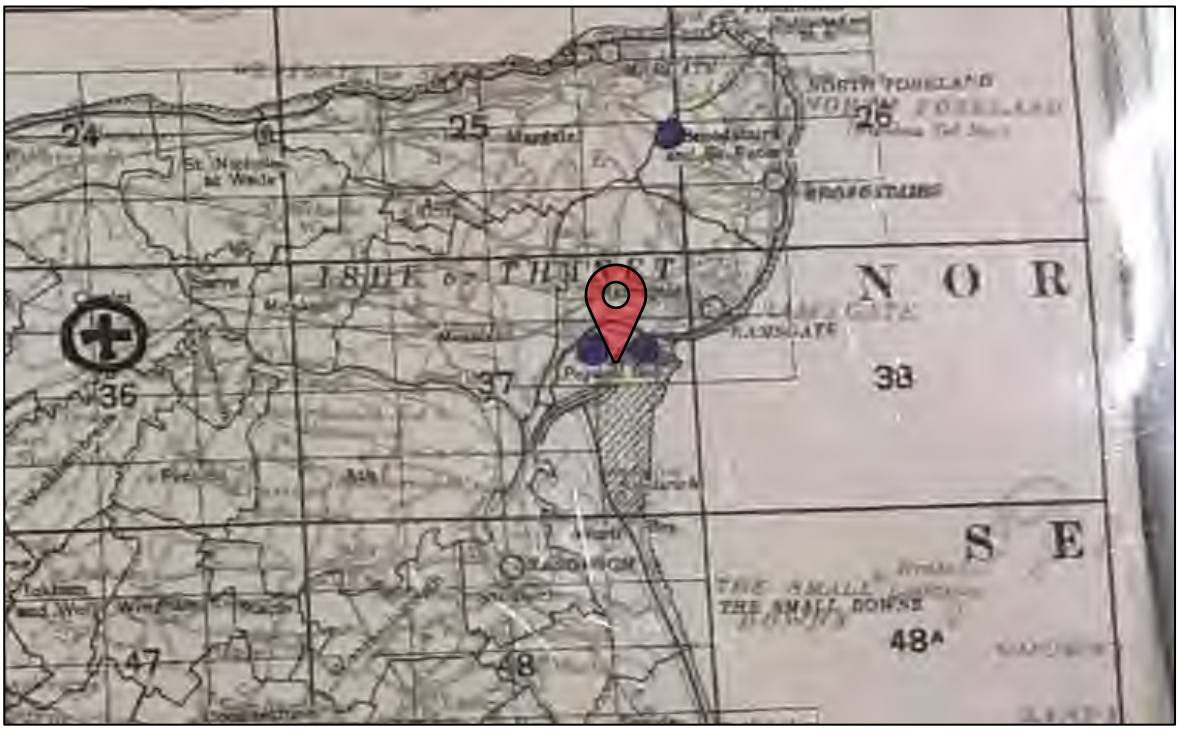


Approximate site boundary

Approximate extension area



9th July 1940



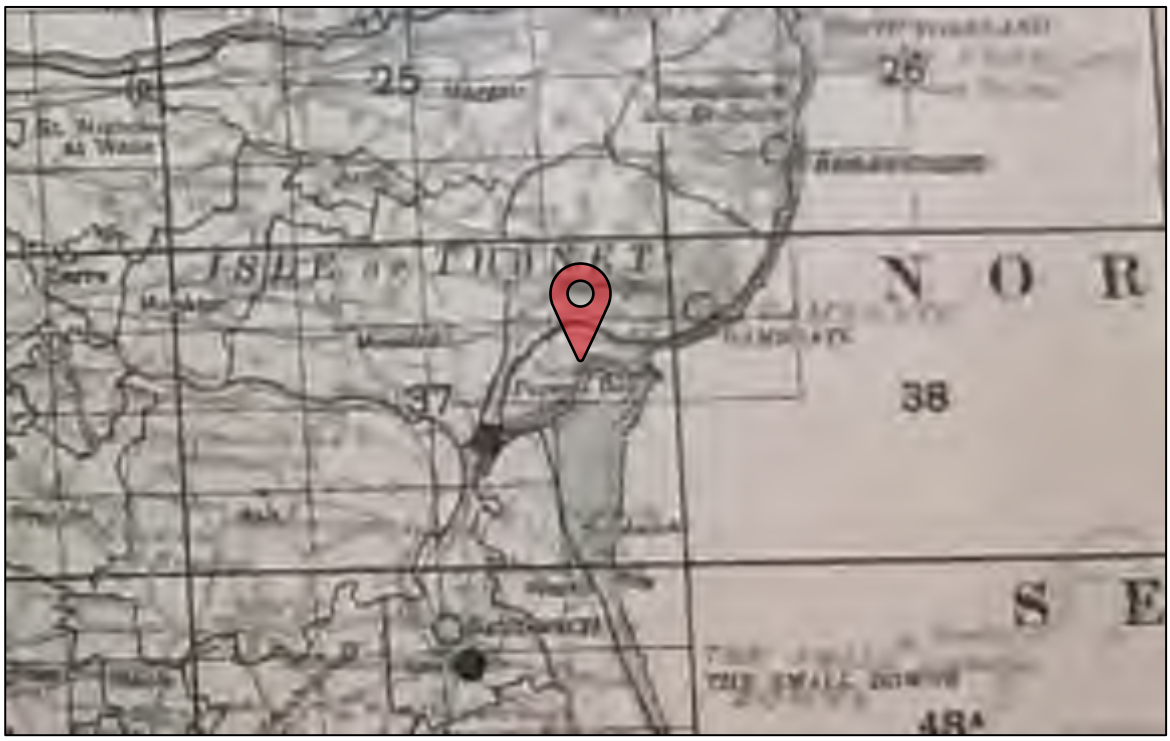
27th October 1940

Approximate site location

HE bomb strike

Incendiary shower

HE bomb area



29th October 1940



5th December 1940

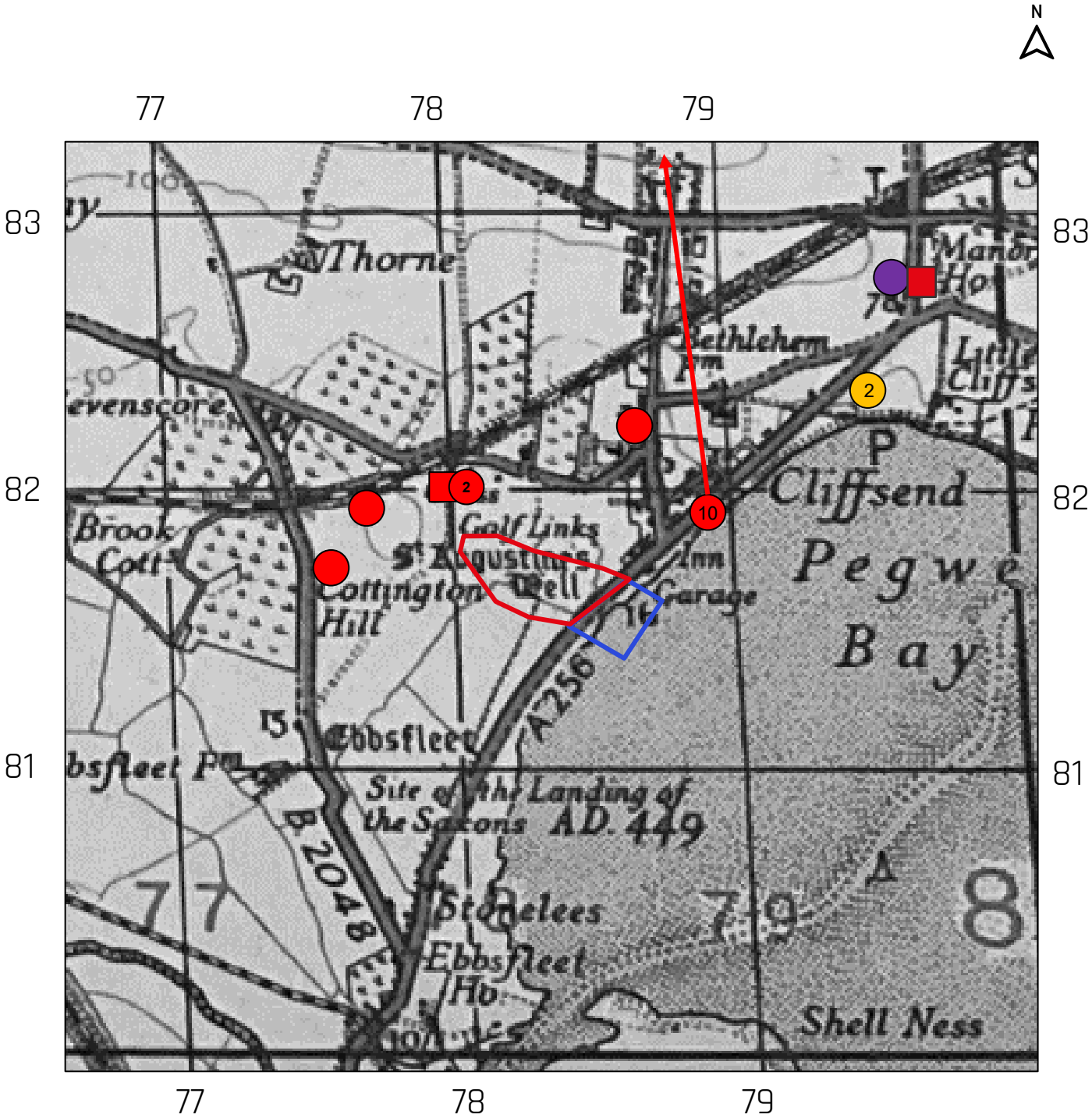
Approximate site location HE bomb strike Incendiary bomb

Kent History & Library Centre

SAFELANE® GLOBAL

Kent ARP Records Bomb Census Map

Annex E
9758-3 RA



Approximate site boundary

HE bomb

Incendiary bomb

Unidentified weapon

Unexploded bomb

(Numbers in circles denote quantity of explosive ordnance recorded)

SAFELANE® GLOBAL

WWII-era RAF Aerial Photography – 3rd March 1942

Annex F
9758-3 RA

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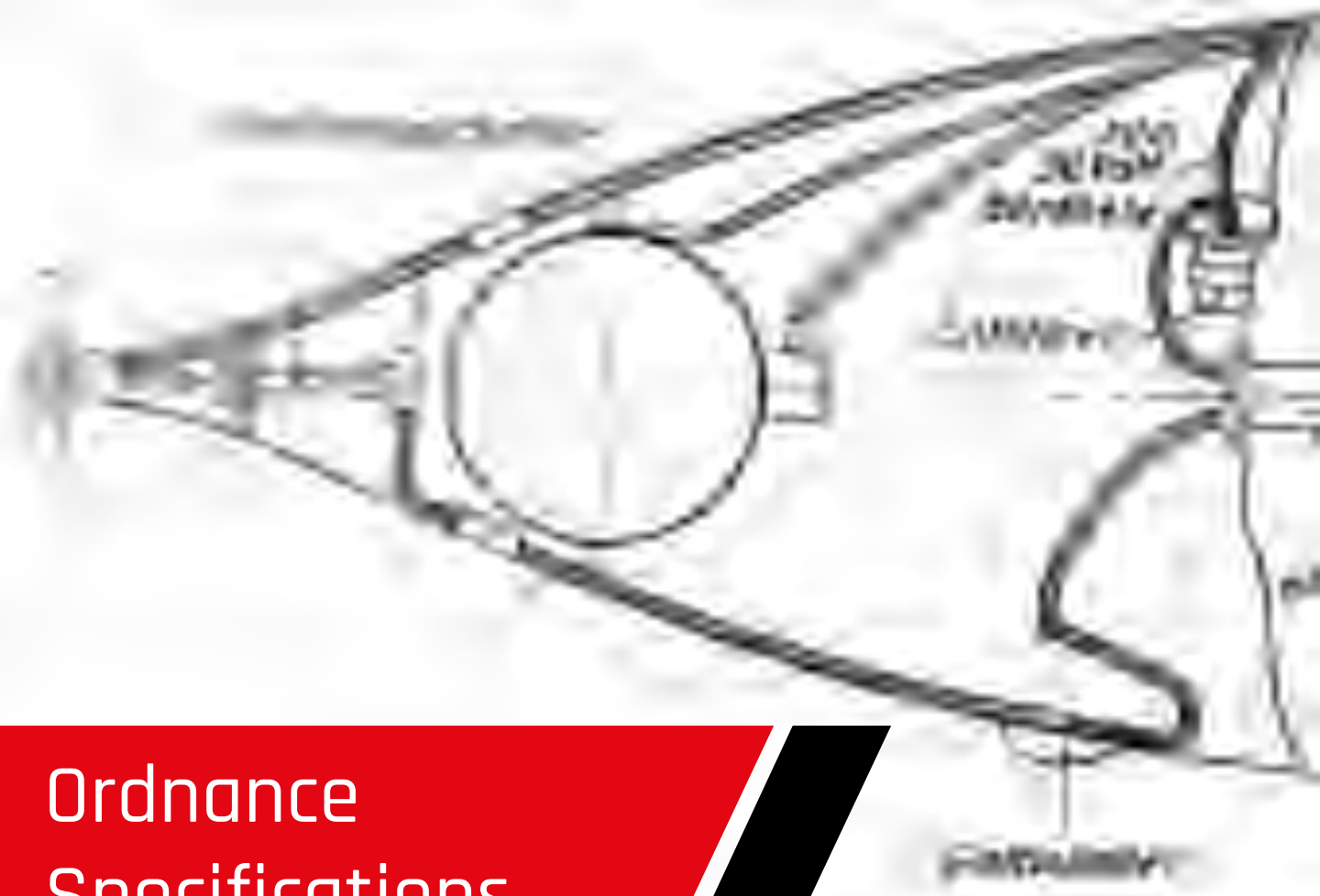
Approximate site boundary

Approximate extension area

Possible ground disturbance

NCAP

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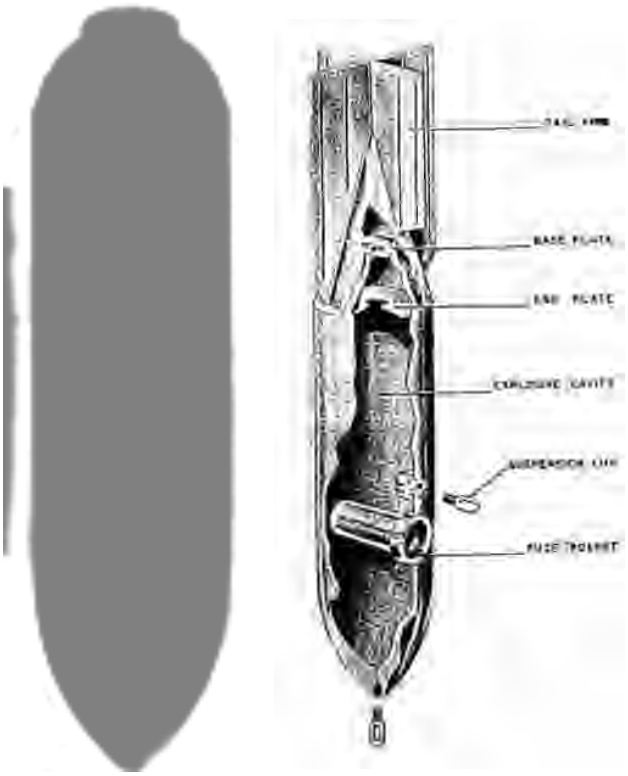


Ordnance Specifications and Information





German Ordnance





Sprengbombe Cylindrisch 50

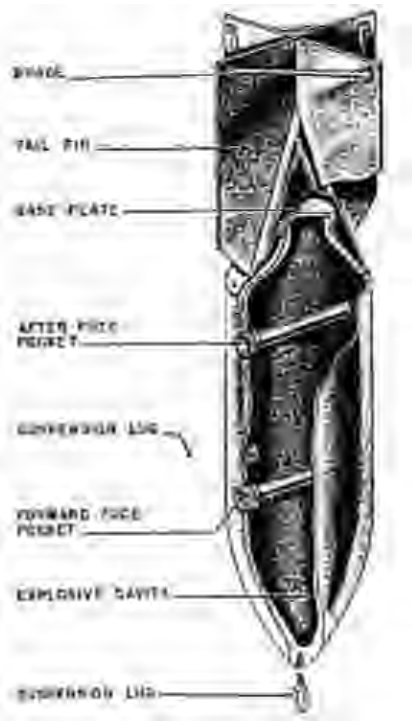
Bomb weight: 40-54kg
Fuze Type: Impact fuze / electro-mechanical time delay fuze
Bomb Dimensions: 1090 x 280mm
Body Diameter: 200mm
Use: Used against lightly damageable materials, hangars, railway rolling stock, ammunition depots, light bridges and buildings up to 3-storeys.
Remarks: The smallest and most common conventional German bomb. Nearly 70% of bombs dropped on the UK were 50kg.

SC50 found on site

In May 2015, an SC50 was found at a building site on Empire Way, Wembley, London. (*Image source: The Guardian*)







Sprengbombe Cylindrisch 250

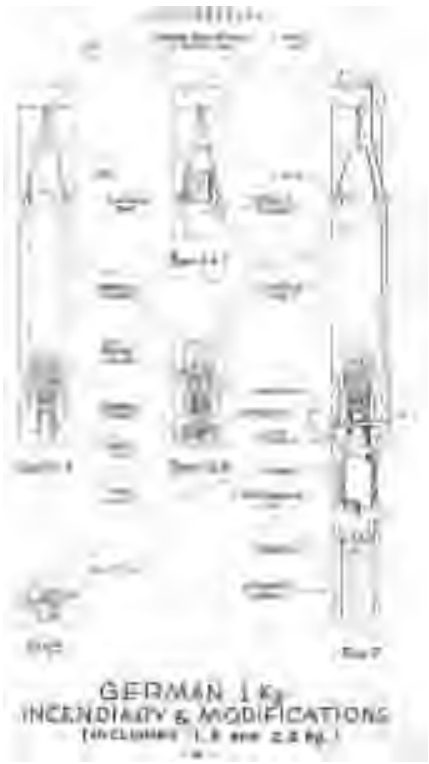
Bomb weight: 245-256k
Explosive Weight: 125-130kg
Fuze Type: Electrical impact / mechanical time delay fuze
Bomb Dimensions: 1640x512mm
Body Diameter: 368mm
Use: Used against railway installations, embankments, flyovers, underpasses, large buildings and below-ground installations.

SC250 found on site

In the year 2000, SafeLane Global discovered an SC250 whilst supervising construction work at Hawkinge, Kent.









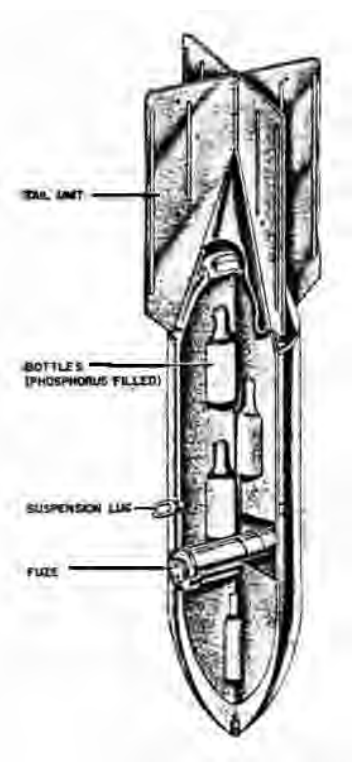
Above: Left – ordinary scaffold pipe, centre - 1kg incendiary bomb, right - incendiary bomb recently found on site in UK

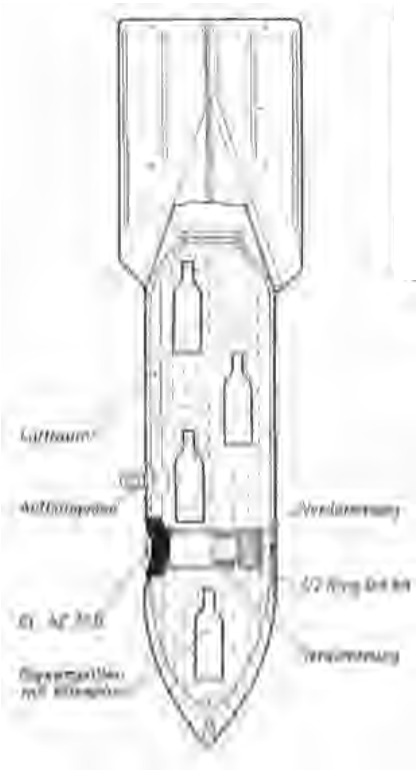
1kg Incendiary Bomb (IB)

Bomb weight: 1.0 & 1.3kg
Filling: 680g Thermite
Fuze Type: Impact fuze
Body Dimensions: 350x50mm
Body Diameter: 50mm
Use: As incendiary – dropped in clusters against towns and industrial complexes
Remarks: Jettisoned from air-dropped containers. Magnesium alloy case. Sometimes filled with high explosive charge.



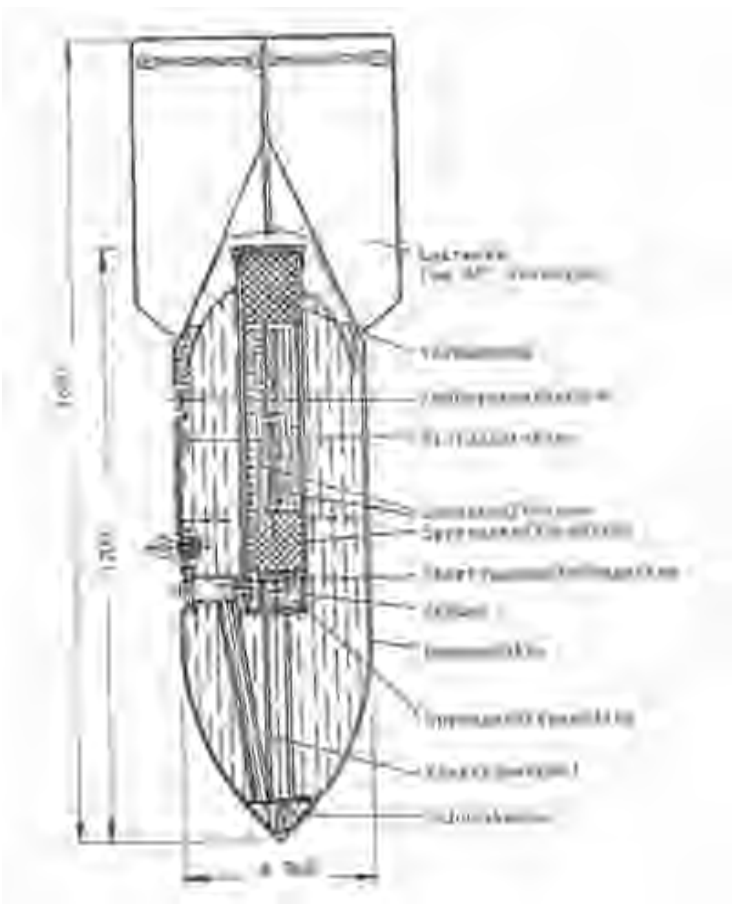






C-50 A Phosphorus Bomb

Bomb Weight: c.41kg
Explosive Weight: 0.03kg
Incendiary Filling: 12kg liquid filling with phosphor igniters in glass phials
Fuze Type: Electrical impact fuze
Bomb Dimensions: 1100x2800mm
Body Diameter: 200mm
Use: Against all targets where an incendiary effect is to be expected
Remarks: Early fill was a phosphorus / carbon disulphide incendiary mixture

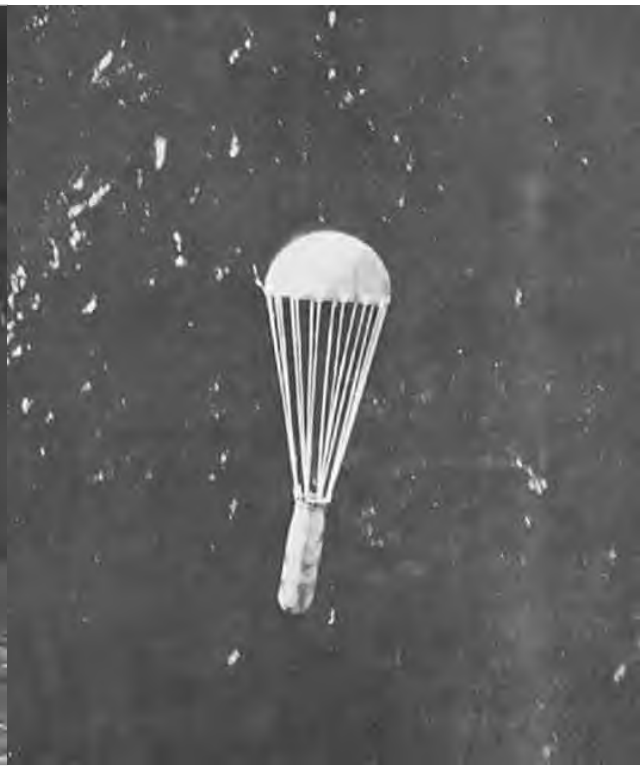




Flam C-250 'Oil Bomb'

Bomb Weight: 125kg
Explosive Weight: 1kg
Flammable Weight: 74kg
Filling: Mixture of 30% petrol and 70% crude oil
Fuze Type: Super-fast electrical impact fuze
Bomb Dimensions: 1650 x 512.2mm
Body Diameter: 368mm
Use: Often used for surprise attacks on living targets, against troop barracks and industrial installations
Remarks: Thin casing – not designed for ground penetration

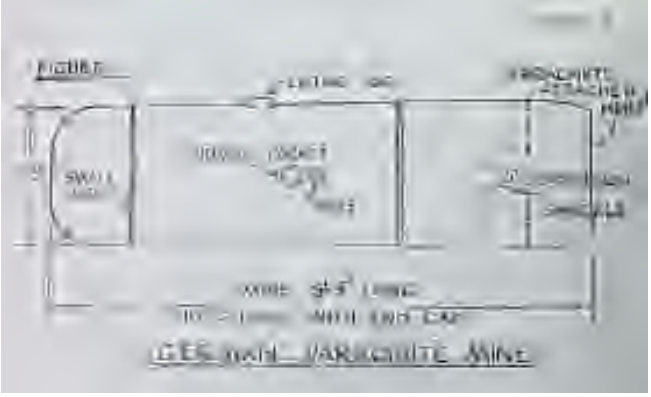


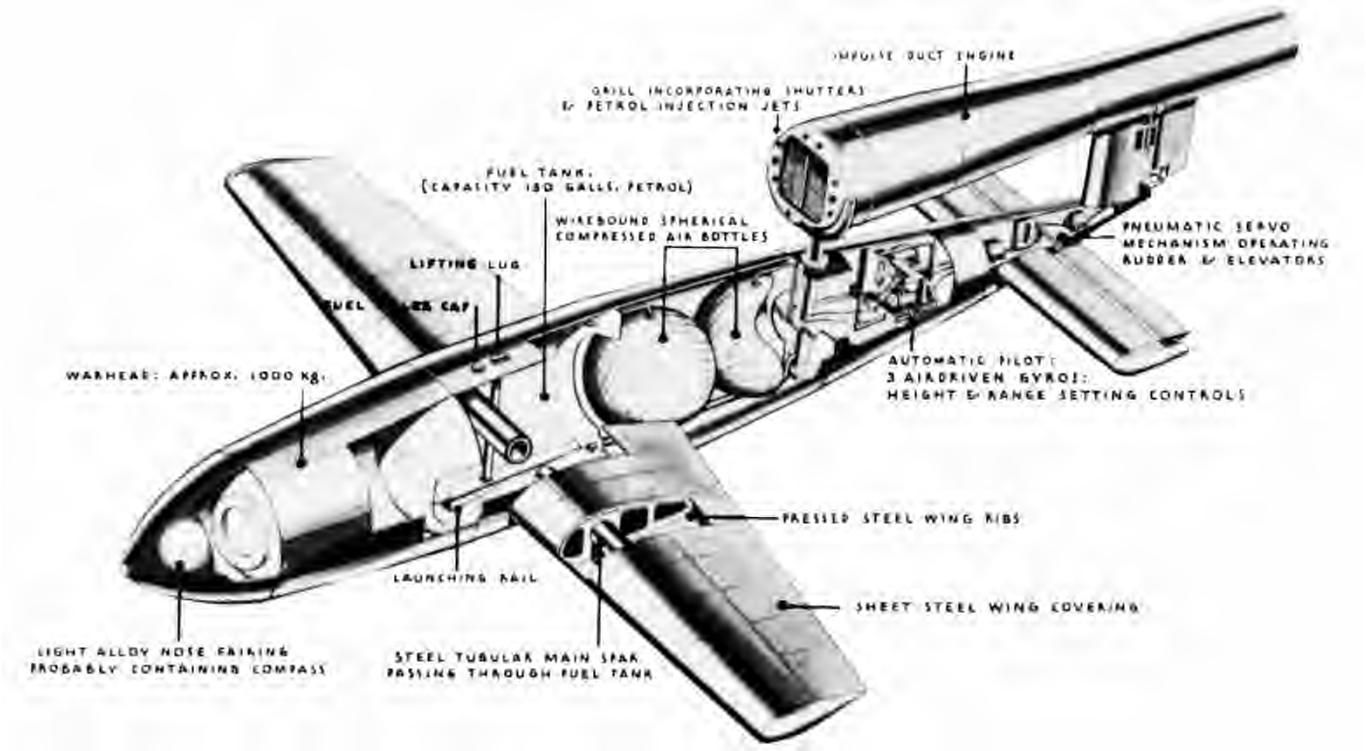


Luftmine A/B 'Parachute Mine'

Bomb Weight: A- 500kg, B – 1000kg
Fuze Type: Mechanical clockwork fuze
Bomb Dimensions: A – 1768mm, B – 2682mm
Use: Capable of creating severe blast damage in built-up areas.
Remarks: Parachute mines were standard German sea mines fitted with a suitable detonator. They were widely used against British cities.





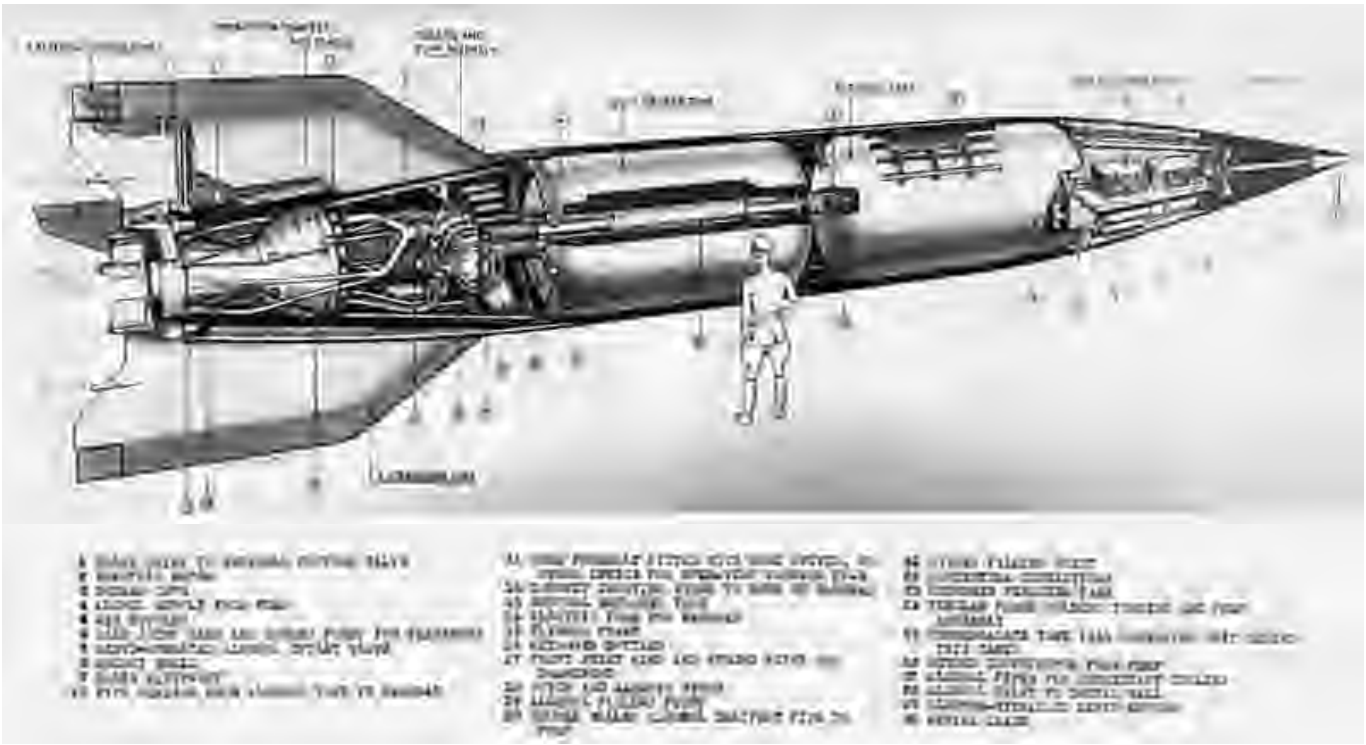


Vergeltungswaffe 1 (V-1) 'Fly' Bomb

Missile Weight: 2,150kg
Fuze Type: Electric Impact Fuze
Missile Length: 8.32m
Width: 5.37m
Range: 250km
Use: Pulsejet-powered guided cruise missile, designed to attack Allied cities.
Remarks: Armed with an 850kg warhead, around 10,000 V-1 flying bombs were fired at England, causing significant damage and killing approximately 6,000 people . There is a negligible risk from unexploded V-1s today, since the remains would have left incontrovertible evidence of the impact.



A V-1 'Fly' Bomb, captured over London seconds before impacting



Vergeltungswaffe 2 (V-2) Rocket

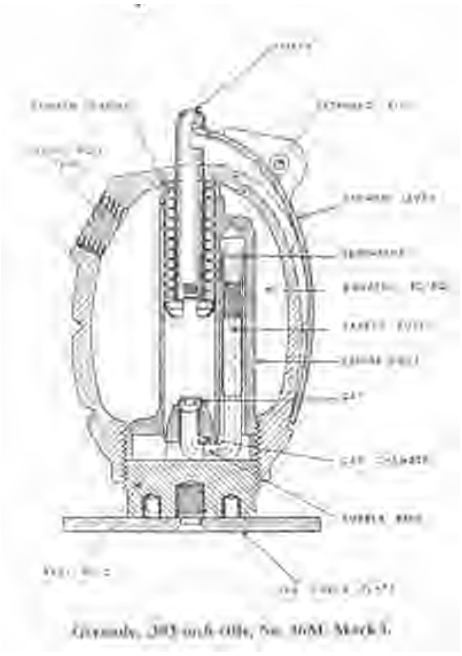
Rocket Weight: 12,500kg
Fuze Type: Electric Impact Fuze
Rocket Length: 14m
Body Diameter: 1.65m
Range: 320km
Use: Long-range ballistic missile, designed to attack Allied cities.
Remarks: Armed with a 975kg warhead and travelling at three times the speed of sound, the V-2 could cause widespread destruction. There is a negligible risk from unexploded V-2s today, since the remains would have left incontrovertible evidence of the impact.





British & Allied Ordnance

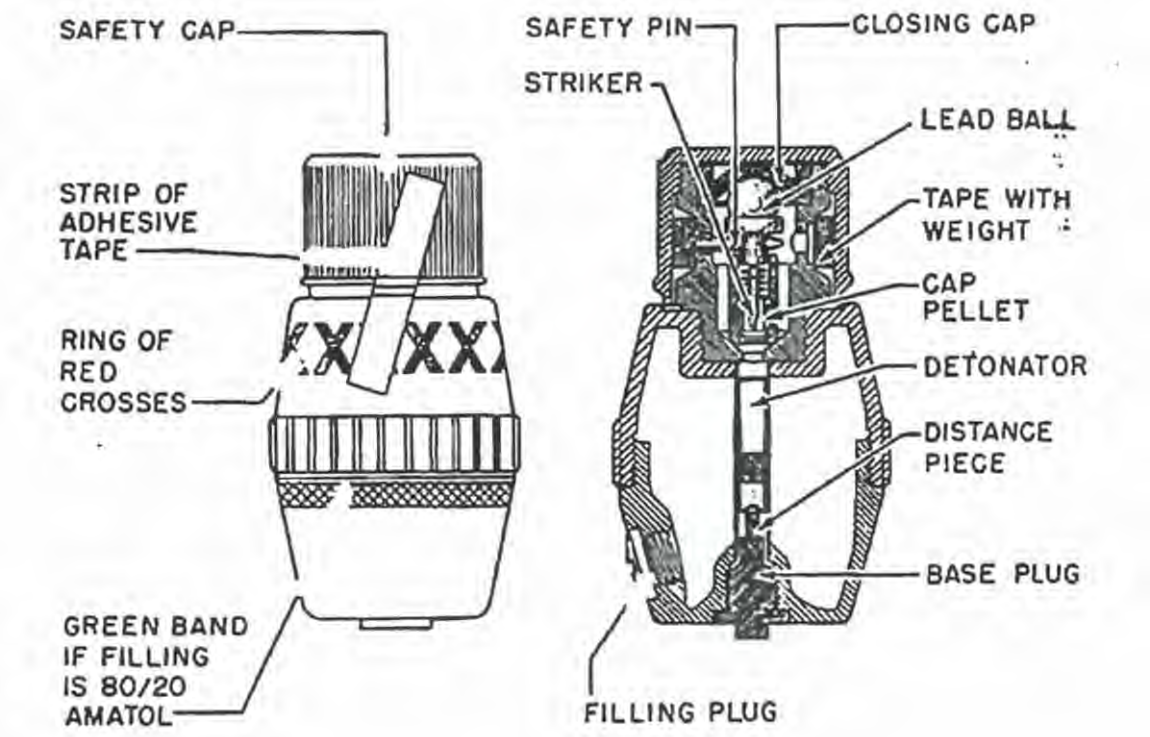




No. 36 “Mills” Grenade

Weight: 0.7kg filled
Type: Hand or discharger, fragmentation
Dimensions: 95 x 61mm
Filling: Alumatol, Amatol 2 or TNT
Remarks: 4 second hand-throwing fuze with approximate range of 30m. First introduced May 1918.



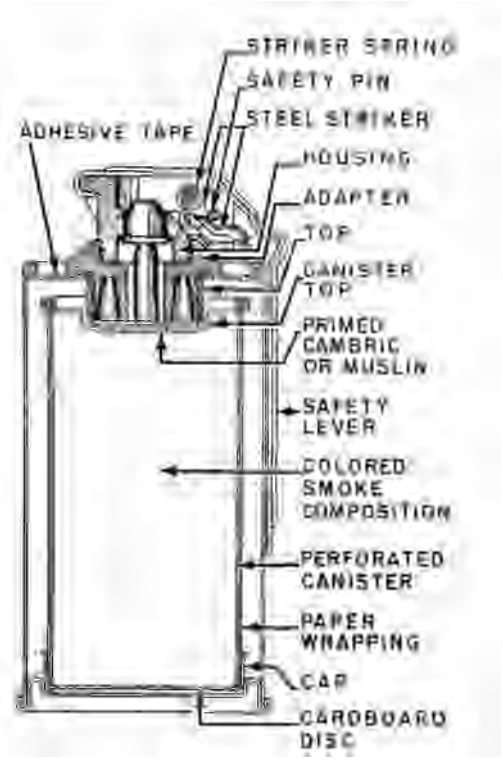


No. 69 Grenade

Weight: 038kg filled
Type: Percussion / Blast
Date Introduced: December 1940
Remarks: Black Bakelite body. Blast rather than fragmentation type. After unscrewing the safety cap, a tape is held when throwing the grenade releasing the safety bolt in the throwing motion. Detection is problematic due to its very low metal content.







Typical Smoke Grenade

Dimensions: Approx. 65 x 115mm
Type: Smoke
Date Introduced: Current MoD issue
Remarks: Smoke grenades are used as ground-to-ground or ground-to-air signalling devices, target or landing zone marking devices, and screening devices for unit movement.





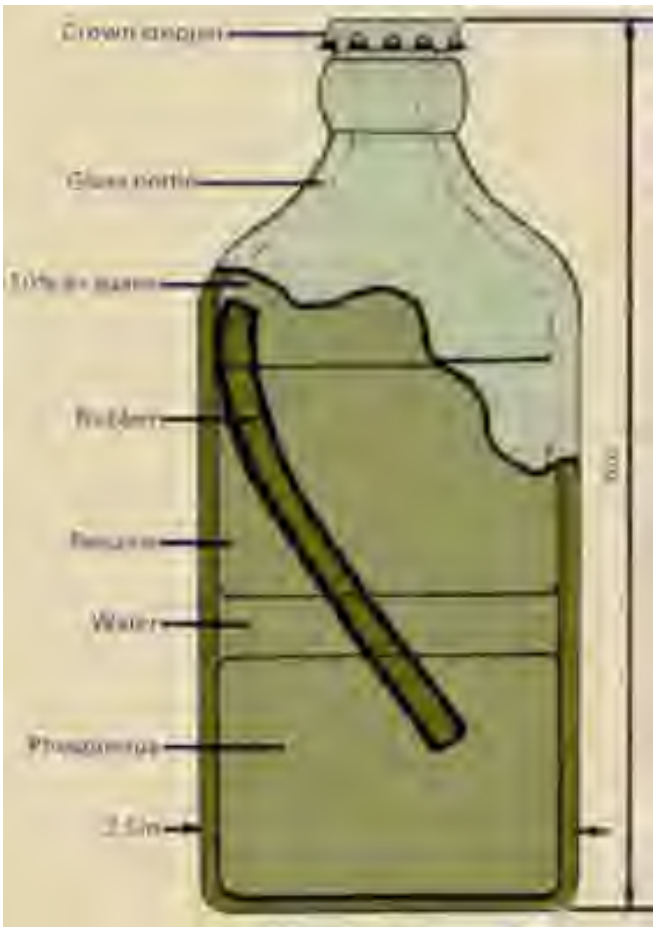


Self-Igniting Phosphorous (SIP) Grenade

Sometimes called the "A&W (Albright & Wilson)" grenade.

The grenade comprised a glass bottle with a total volume of approximately 1 pint. It was filled with white phosphorous, benzene, a piece of rubber and water. Over time, the rubber dissolved to create a sticky fluid which would self-ignite when the bottle broke.

Fired by hand or Northover Projector.

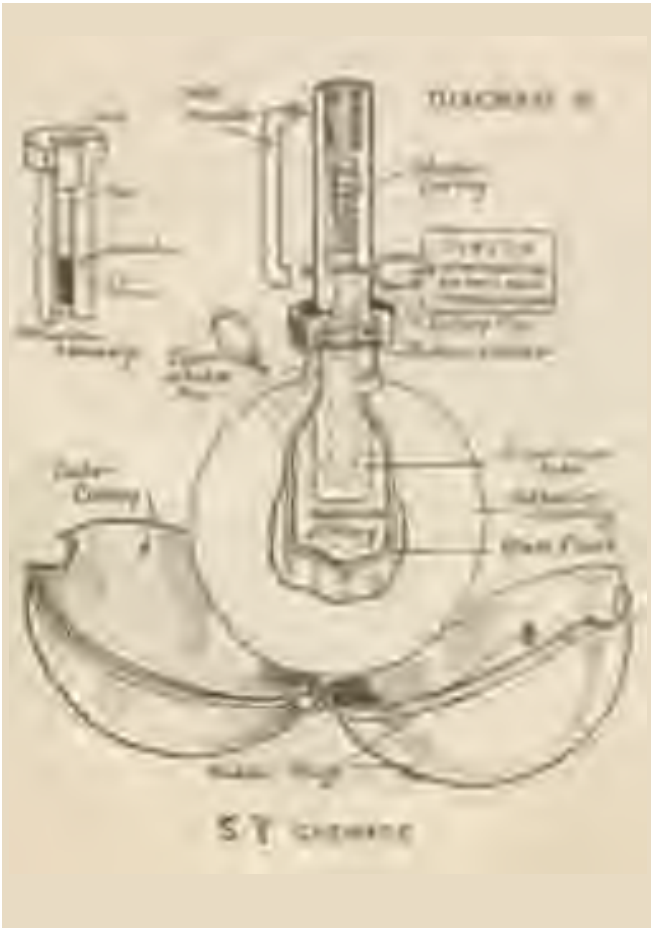






No. 74 Grenade (Sticky Bomb)

Designed as an anti-tank grenade and used by the Home Guard. The grenade consisted of a glass ball on the end of a Bakelite (plastic) handle. Inside the glass ball was an explosive filling whilst on the outside was a very sticky adhesive covering. Until used, this adhesive covering was encased in a metal outer casing.

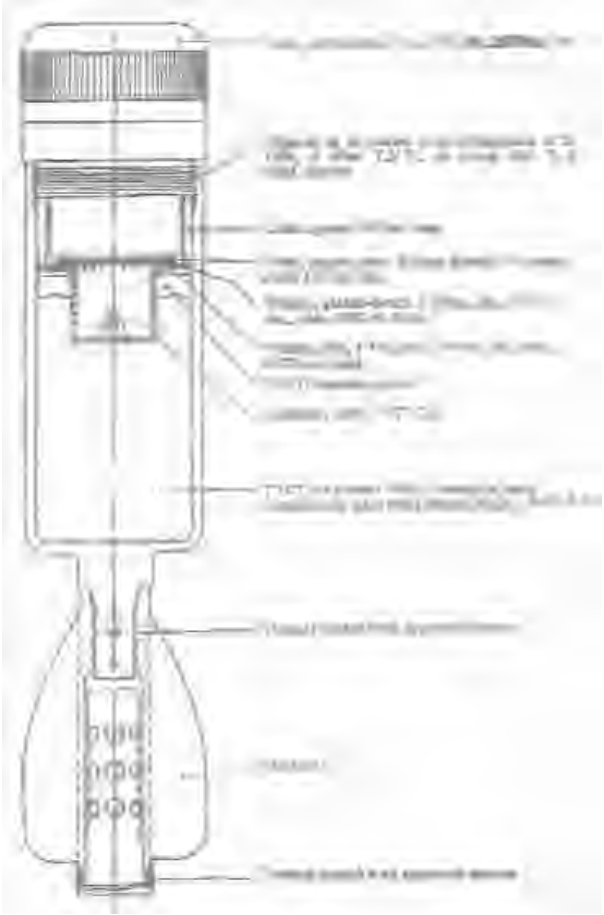






Typical 2" High Explosive Mortar

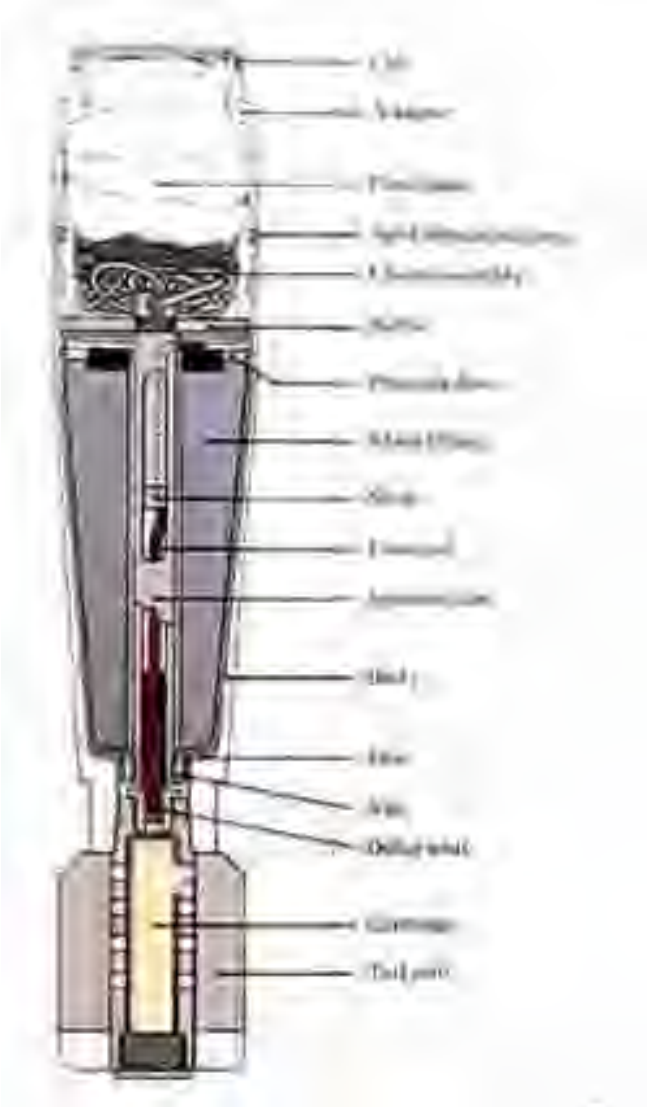
Bomb weight: 1.02kg
Fuze Type: High Explosive
Bomb Dimensions: 51 x 290mm
Filling: 200g RDX/TNT
Remarks: Fitted with an impact fuze which detonates the fuze booster charge (exploder) and, in turn, the high explosive charge. The main charge shatters the mortar bomb body, producing near optimum fragmentation and blast effect at the target.





Typical 2" Illuminating Mortar

Fuze Type: Illuminating
Bomb Dimensions: 51 x 290mm
Filling: Various
Remarks: The expulsion charge ignites and ejects the candle assembly. A spring ejects the parachute from the tail cone. The parachute opens, slowing the descent of the burning candle which illuminates the target.







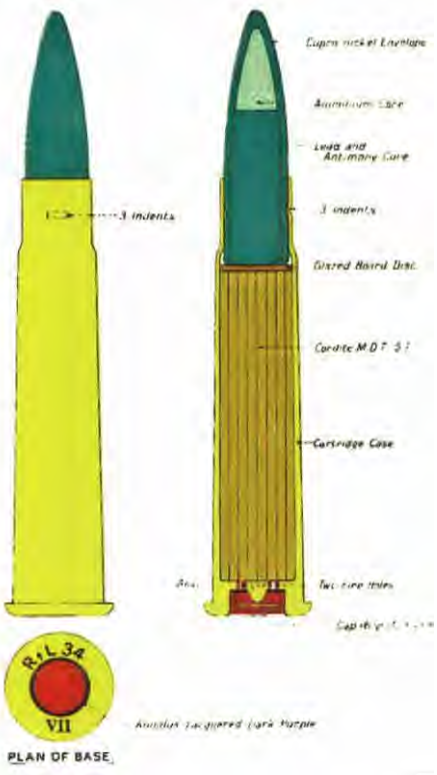


Typical 3" Smoke Mortar

Fuze Type: Smoke
Bomb Dimensions: c.490 x 76mm
Filling: Typically, white phosphorus
Remarks: On impact, the fuze functions and initiates the bursting charge. The bursting charge ruptures the mortar bomb body and disperses the white phosphorous filler. The white phosphorous produces smoke upon exposure to the air.



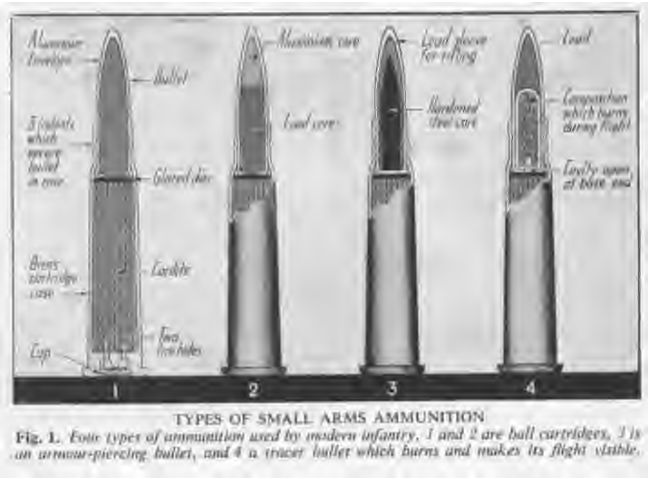




.303" Ammunition

Type: Rifle / machine gun round
Markings: Regular round – none. Tracer round – red primer
Bullet Weight: 150–180g
Dimensions: Total cartridge / projectile length – 182mm
Filling: Regular round – none. Tracer round – small incendiary fill
Threat: Explosive cordite within unspent cartridge
Deployment: Royal Navy, RAF and British Army Light Anti-Aircraft guns, machine guns and rifles. Standard British and Commonwealth military cartridge from 1889 until the end of the 1950s
Remarks: Cartridges are belted or supplied loose in cartons

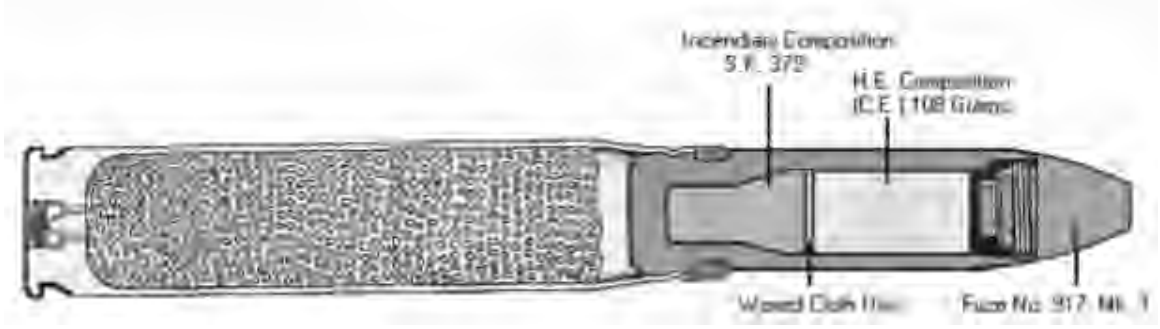




TYPES OF SMALL ARMS AMMUNITION
Fig. 1. Four types of ammunition used by modern infantry. 1 and 2 are ball cartridges, 3 is an armour-piercing bullet, and 4 a tracer bullet which burns and makes its flight visible.

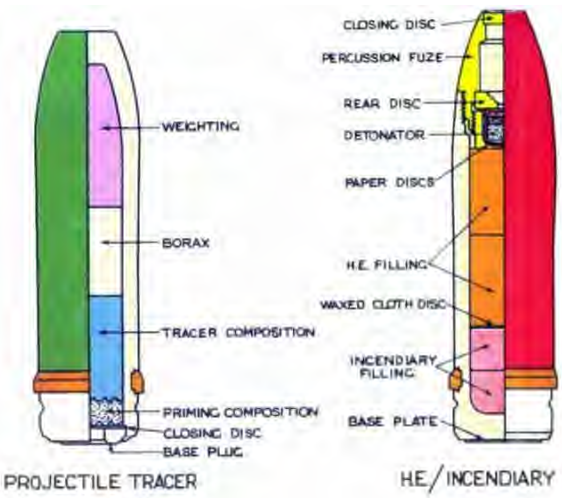






20mm Hispano HEI Ammunition

Type: Live cannon round
Markings: Upper half of projectile painted "buff" colour, lower half is red
Cartridge Weight: 256g
Dimensions: Total cartridge / projectile length – 182mm
Fuze: Contact fuze – No. 253, No. 254 or No. 917
Filling: 108g of contact explosive & 68g of SR. 379 incendiary composition
Threat: Explosives within unspent cartridge as well as the projectile
Deployment: Royal Navy, RAF and British Army Light Anti-Aircraft guns. Also RAF aircraft cannons.
Remarks: Cartridges are belted or supplied loose in cartons.



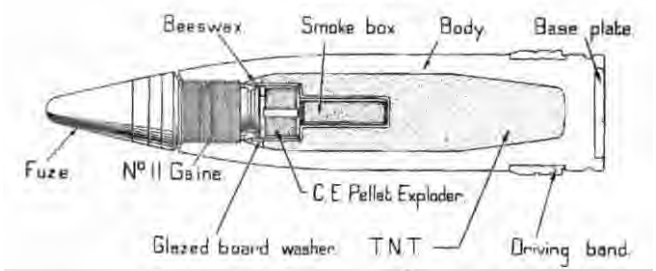
COLOUR IDENTIFICATION		
BRITISH		
NATURE OF SHELL	H.E. FILLING	COLOUR
H.E. TRACER	T.N.T.	
H.E.	T.N.T.	
PROJ. PRACTICE		
PROJ. TRACER		
H.E. INCENDIARY	T.N.T.	
H.E. INCENDIARY TRACER	T.N.T.	



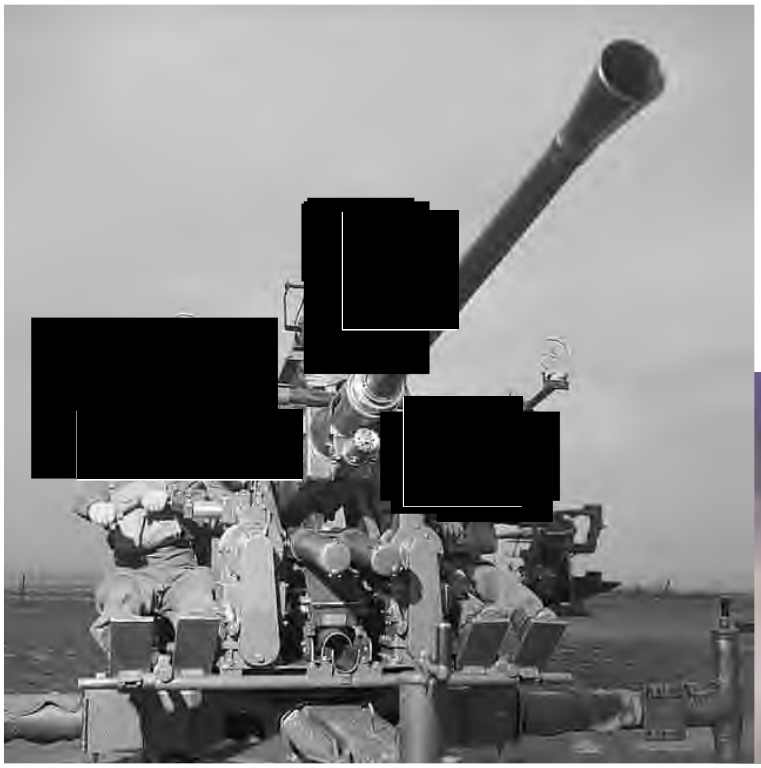
3.7" Anti-Aircraft Projectile

Weight: 12.7kg
Bomb Dimensions: 94 x 360mm
Rate of Fire: 10-20 rounds per minute
Carriage: Typically, white phosphorus
Ceiling: 9,000-18,000m
Muzzle Velocity: 72m/s
Remarks: 4.5" projectiles were also commonly utilized.







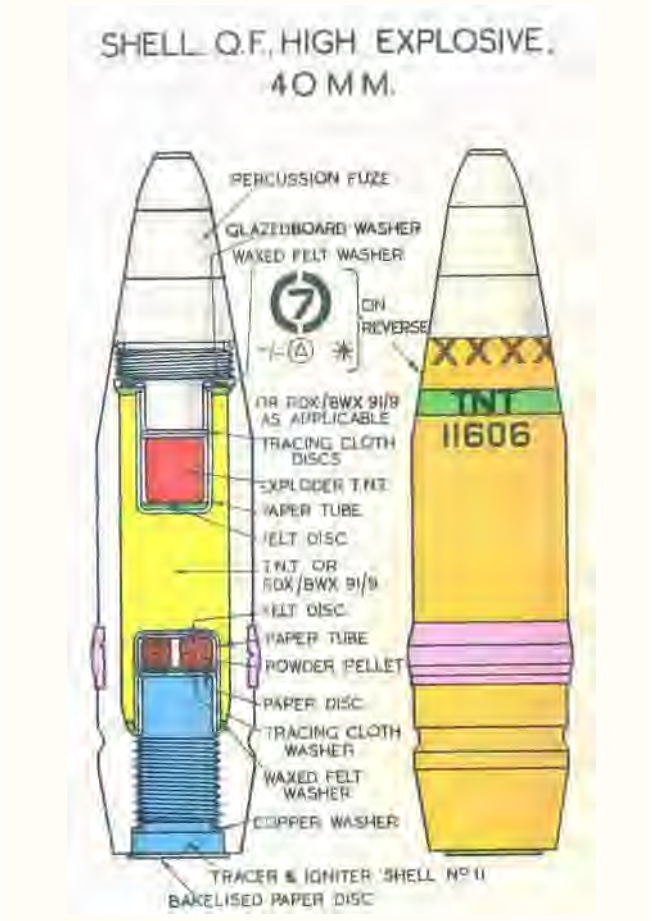




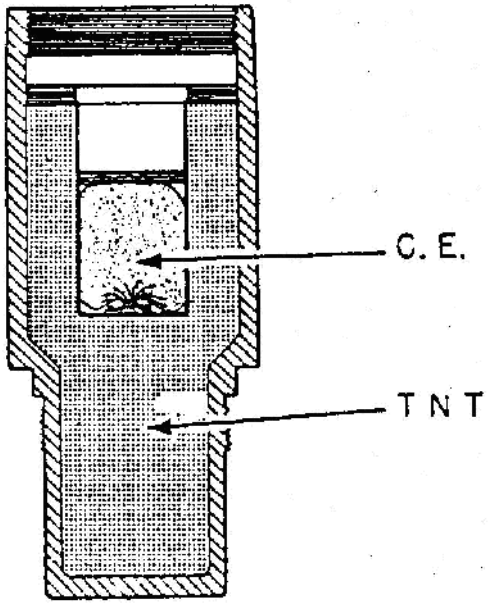


40mm Bofors Gun Projectile

Weight: 0.86kg
Bomb Dimensions: 40mm x 310mm
Rate of Fire: 120 rounds per minute
Ceiling: 7,000m
Muzzle Velocity: 881m/s
Remarks: Mobile batteries – normally few records of where these guns were located.

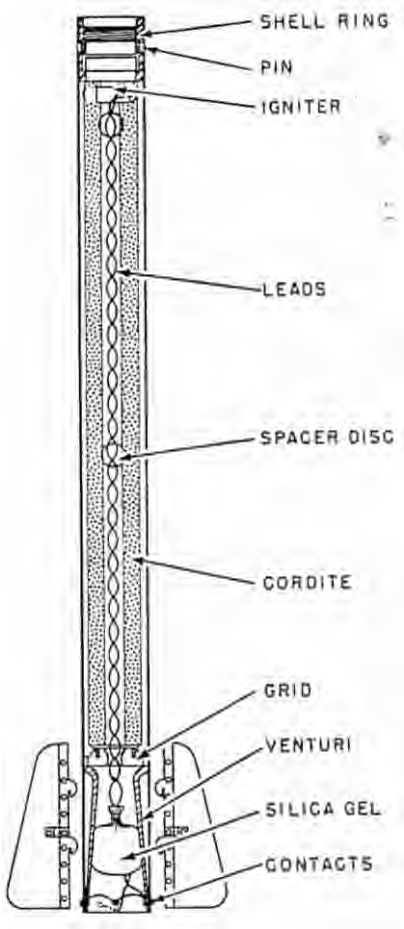






Rockets / Un-rotating Projectiles

Weight: 24.5kg
Bomb Dimensions: 94 x 360mm
Carriage: Typically, white phosphorus
Rate of Fire: 10-20 rounds per minute
Ceiling: 9,000-18,000m
Muzzle Velocity: 72m/s
Remarks: 4.5" projectiles were also commonly utilized.
Top-left image: Home Guard soldiers load an anti-aircraft rocket at a 'Z' Battery



SAFELANE
GLOBAL



Detailed Unexploded Ordnance
Risk Assessment

In Respect Of:
Richborough – Cable Route and Construction
Compounds Revision

For:
Mott MacDonald

Report Reference:
9758-4 RA



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This Report has been produced in compliance with the Construction Industry Research and Information Association guidelines for the preparation of Detailed Unexploded Ordnance Risk Assessments in the management of UXO risks in the construction industry. This report has been compiled using all due diligence and expertise and having made all proper but reasonable enquiries within given time limitations. However, in accepting and implementing the recommendations contained in this report, the client does so strictly at his own risk.

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Executive Summary

The Site	
Address:	Cottington Lane, Cliffsend, Ramsgate, CT12 5JN
OS National Grid Reference:	TR 33680 63702
Site Description:	The majority of the site comprises open ground. The northern section of the site is occupied by the northern extent of St. Augustine's Golf Course and associated infrastructure. These facilities are served by Cottington Lane, which enters the site from the north. Richborough Way (A256) crosses the south-western extent, north to south. This area of the site is also occupied by a small wooded area and a warehouse. Extension area: The extension is immediately to the north-west of the main area. It comprises open, agricultural fields, mature hedgerows and a section of Richborough Way.
Proposed Works	
The proposed ground investigation would include machine excavated trial pits to 4m bgl and cable percussion boreholes, maximum 35m bgl. Construction will comprise Horizontal Directional Drilling from offshore to onshore where the cable will be installed in an open cut trench to a max depth of 2m bgl. There will be some shallow earthworks carried out for temporary construction compounds and construction of the permanent substation/ convertor station platform. Piled foundations are also anticipated.	
Risk Assessment	
Risk Assessment Methodology: In accordance with CIRIA guidelines this assessment has carried out research, analysed the evidence and considered the likelihood that the site has been contaminated with unexploded ordnance; that such items remained on site; the risk that they could be encountered during any intrusive works and the consequences that could result. Appropriate risk mitigation measures have been proposed.	
UXO Risk Rating	**MEDIUM from the following UXO types:** • German Air-Delivered HE bombs • Anti-Aircraft Projectiles • Land Service Ammunition • Small Arms Ammunition
The full UXO Risk Assessment and a breakdown of the UXO Risk Level can be found in Section 11.	

Maximum Bomb Penetration Depth	It has been assessed that a 500kg bomb would have had an approximate maximum bomb penetration depth of between 10-12m below WWII ground level. Penetration depth could potentially have been greater if the UXB was larger (though only 4% of German bombs used in WWII over Britain were of that size). Note that UXBs may be found at any depth between just below the WWII ground level and the maximum penetration depth.

Recommended Risk Mitigation

Risk Level	Planned Site Activity	Recommendations
Medium	Shallow Intrusive Works eg excavations	• UXO Safety & Awareness Briefing (Toolbox Brief, TBB) • Site Specific Safety Instructions (SSSIs) Training Course • Non-Intrusive (NI) Magnetometer Survey (Greenfield areas only) • Target Investigation (Required as a follow-on from NI magnetometer survey)
	Deep intrusive works (eg piling)	• UXO Safety & Awareness Briefing (Toolbox Brief, TBB) • Site Specific Safety Instructions (SSSIs) Training Course • Intrusive Magnetometer Survey of pile/borehole positions

In making this assessment and recommending these risk mitigation measures, the proposed works outlined in the 'Scope of the Proposed Works' section were considered. Should the planned works be modified, or additional intrusive engineering works be considered, SafeLane Global should be consulted to see if re-assessment of the risk or mitigation recommendations is necessary.

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Ordnance Specifications and Information

Glossary of Terms

AAA	Anti-Aircraft Artillery
ARP	Air-raid Precautions
BDO	Bomb Disposal Officer
EOD	Explosive Ordnance Disposal (current term for "bomb" disposal)
HE	High Explosive
HG	Home Guard
IB	Incendiary Bomb
Kg	Kilogram
LM	Land Mine
LSA	Land Service Ammunition (includes grenades, mortars, etc.)
Luftwaffe	German Air Force
m bgl	Metres Below Ground Level
MoD	Ministry of Defence
OB	Oil Bomb
PM	Parachute Mine
RAF	Royal Air Force
SI	Site Investigation
SAA	Small Arms Ammunition (small calibre cartridges used in rifles & machine guns)
UXB	Unexploded Bomb
UXO	Unexploded Ordnance
V-1	"Doodlebug" the first cruise type missile, used against London from June 1944. Also known as 'Flying Bomb'
V-2	The first ballistic missile, used against London from September 1944
WWI	First World War (1914 -1918)
WWII	Second World War (1939 – 1945)

Detailed Unexploded Ordnance Risk Assessment

In Respect of

Richborough – Cable Route and Construction Compounds Revision

1 Introduction

Groundsure Limited, on behalf of Mott MacDonald, has commissioned SafeLane Global to conduct a Detailed Unexploded Ordnance Risk Assessment of the Richborough – Cable Route and Construction Compounds.

Unexploded Ordnance (UXO) presents a significant risk to construction projects in parts of the UK as a result of enemy actions during the two 20th Century World Wars and historic British and Allied military activity.

One of the legacies of this conflict is buried unexploded air-dropped bombs or anti-aircraft projectiles resulting from the failure of a proportion of the weapons to function as designed. It is commonly accepted that the failure rate of these munitions was approximately 10% and, depending on their shape, weight, velocity and ground conditions, many penetrated the ground and came to rest at depth.

In addition, it is estimated that over 20% of the UK landmass has been used by the military at some point and between 2006 and 2009, over 15,000 items of British / Allied ordnance (excluding small arms ammunition) were found on UK construction sites (CIRIA).

Intensive efforts were made during and after the war to locate and render safe all UXO but, unsurprisingly, not all were found and dealt with. This is evidenced by the regular, on-going discoveries of UXO during construction-related intrusive ground works.

As a result of a generally increased risk awareness amongst professionals involved in ground engineering works and proactive health and safety measures, the risk to life and limb from UXO has been minimised. However even the simple discovery of a suspected device during on-going works can cause considerable disruption to production and cause unwanted delays and expense.

Such risks can be more fully addressed by a better understanding of the site-specific risk and the implementation of appropriate risk mitigation measures.

2 Construction Industry Duties and Responsibilities

2.1 The UK Regulatory Environment

There is no legal requirement for the control and mitigation of UXO risk in the construction industry, but guidelines for good practice, information, and solutions with regards to UXO risk are detailed within CIRIA (C681): Unexploded Ordnance (UXO) A Guide for the Construction Industry.

These guidelines provide the construction industry with a set process for the management of risk associated with UXO, from preliminary risk assessment to implementation of site-specific risk mitigation strategies.

Specific legislation does however exist for health and safety, and is addressed under a number of regulatory instruments, as outlined below.

In practice, the regulations impose a responsibility on the construction industry to ensure that they discharge their obligations to protect those engaged in ground-intrusive operations (such as archaeology, site investigation, drilling, piling or excavations) from any reasonably foreseeable UXO risk.

2.2 The Health and Safety at Work Act, 1974

The Act places a duty of care on an employer to put in place safe systems of work to address, as far as is reasonably practicable, all risks (to employees and the general public) that are reasonably foreseeable.

2.3 Construction (Design and Management) Regulations 2015

CDM 2015 ensures that health and safety within the construction industry is continually improved:

- Works are sensibly planned and managed.
- Competent staff are engaged in the works.
- Risks are identified and managed.
- All parties cooperate and coordinate activities.
- Communication flows to those who require it.
- Workers are consulted and engaged about risks and how they are being managed.

In line with CDM 2015 legislation, SafeLane Global are able to assist parties in their discharge of CDM duties as follows:

- Assist Principal Designers with pre-construction information and risk assessments.
- Assist the Designer with the Designer's Risk Assessment.
- Issue UXO risks as have been identified and manage risks accordingly.
- Assist the Principal Contractor with the construction phase information, in particular risk assessments and mitigation strategies.
- Plan, manage and monitor survey and clearance works under SafeLane Global's control.

2.4 Other Legislation

Other relevant legislation includes the "Management of Health and Safety at Work Regulations 1999" and "The Corporate Manslaughter and Corporate Homicide Act 2007".

3 The Role of the Authorities and Commercial Contractors

3.1 The Authorities

The Police have the responsibilities for co-ordinating the emergency services in the case of an ordnance-related incident on a construction site. They will make an initial assessment (i.e. is there a risk that the find is ordnance or not?) and if they judge necessary impose a safety cordon and/or evacuation and call the military authorities (JSEODOC - Joint Services Explosive Ordnance Disposal Operations Centre) to arrange for investigation and/or disposal. In the absence of an EOD specialist on site many Police Officers will use the precautionary principle, impose cordon(s)/evacuation and await advice from the JSEODOC.

The priority given to the request by JSEODOC will depend on their judgement of the nature of the risk (ordnance, location, people and assets at risk) and the availability of resources. They will respond immediately or as resources are freed up. Depending on the on-site risk assessment the item of ordnance may be removed or demolished (by controlled explosion) in situ. In the latter case additional cordons and/or evacuations may be necessary.

Note, that the military authorities will only carry out further investigations or clearances in very high profile or high-risk situations. If there are regular ordnance finds on a site, the JSEODOC may not treat each occurrence as an emergency and will encourage the construction company to put in place alternative procedures (i.e. the appointment of a commercial contractor) to manage the situation and relieve pressure from the JSEOD disposal teams.

3.2 Commercial Contractors

In addition to pre-construction site surveys and follow-on clearance work, a commercial contractor is able to provide a reactive service on construction sites. The presence of a qualified EOD Engineer with ordnance recognition skills will avoid unnecessary call-outs to the authorities and the contractor will be able to arrange for the removal and disposal of low risk ordnance. If high risk ordnance is discovered actions will be co-ordinated with the authorities with the objective of causing the minimum possible disruption to site operations whilst putting immediate, safe and appropriate measures in place.

4 This Report

4.1 Aims and Objectives

The aim of this report is to examine the possibility of encountering any explosive ordnance during any intrusive works at the site. Risk mitigation measures will be recommended in line with the CIRIA C681 guidelines, to reduce the risk of initiating UXO, and the subsequent risk of harm / damage during the envisaged works to as low as reasonably practicable (ALARP).

4.2 Risk Assessment Methodology

The following issues will be addressed in the report:

- The likelihood that the site was contaminated with unexploded ordnance.

- The likelihood that unexploded ordnance remains on site.
- The likelihood that ordnance may be encountered during any intrusive works.
- The risk that ordnance may be initiated.
- The consequences of initiating or encountering ordnance.

Risk mitigation measures, appropriate to the assessed level of risk and site conditions, will be recommended.

4.3 Approach

In preparing this Unexploded Ordnance Risk assessment, SafeLane Global has considered general and, as far as possible, site specific factors including:

- Evidence of German bombing and delivery of UXBs.
- Site history, occupancy and conditions during WWII.
- The legacy of Allied military activity.
- Details of any known EOD clearance activity.
- The extent of any post war redevelopment.
- Scope of the current proposed works.

4.4 Sources of Information

SafeLane Global has carried out detailed historical research for this Unexploded Ordnance Risk Assessment including accessing military records and archived material held in the public domain and in the MoD.

Material from the following sources has been consulted:

- The National Archives.
- Kent Library and History Centre.
- National Collection of Aerial Photography (NCAP).
- Kent County Council.
- Kent Historic Environment Record.
- Groundsure Limited.
- Relevant information supplied by the client.
- Available material from 33 Engineer Regiment (EOD) Archive.
- SafeLane Global's extensive archives built up over many years of research and hands-on Explosive Ordnance Disposal activities in the UK.
- Open sources such as published books, local historical records and the internet.

4.5 Reliability of Historical Records

4.5.1 General Considerations

This report is based upon research of historical evidence. Whilst every effort has been made to locate all relevant material SafeLane Global cannot be held responsible for any changes to the assessed

level of risk or risk mitigation measures based on documentation or other information that may come to light at a later date.

The accuracy and comprehensiveness of wartime records is frequently difficult or impossible to verify. As a result, conclusions as to the exact location, quantity and nature of the ordnance risk can never be definitive but must be based on the accumulation and careful analysis of all accessible evidence. SafeLane Global cannot be held responsible for inaccuracies or gaps in the available historical information.

4.5.2 Bombing Records

During WWII, considerable efforts were expended in recording enemy air raids. Air Raid Precautions (ARP) wardens were responsible for making records of bomb strikes either through direct observation or by post-raid surveys. However, their immediate priority was to deal with casualties and limit damage, so it is to be expected that records are often incomplete and sometimes contradictory. Record keeping in the early days of bombing was not comprehensive and details of bombing in the early part of the war were sometimes destroyed in subsequent attacks. Some reports may cover a single attack, others a period of months or the entire war.

Records of raids that took place on sparsely or uninhabited areas were often based upon third party or hearsay information and are not always reliable; records of attacks on military or strategic targets were often maintained separately from the general records and have not always survived.

5 The Site and Scope of Proposed Works

Site Address	Cottington Lane, Cliffsend, Ramsgate, CT12 5JN	
OS National Grid Reference	TR 33680 63702	
Site Description	The majority of the site comprises open ground. The northern section of the site is occupied by the northern extent of St. Augustine's Golf Course and associated infrastructure. These facilities are served by Cottington Lane, which enters the site from the north. Richborough Way (A256) crosses the south-western extent, north to south. This area of the site is also occupied by a small, wooded area and a warehouse. Extension area: The extension is immediately to the north-west of the main area. It comprises open, agricultural fields, mature hedgerows and a section of Richborough Way.	
Proposed Works	The proposed ground investigation would include machine excavated trial pits to 4m bgl and cable percussion boreholes, maximum 35m bgl. Construction will comprise Horizontal Directional Drilling from offshore to onshore where the cable will be installed in an open cut trench to a max depth of 2m bgl. There will be some shallow earthworks carried out for temporary construction compounds and construction of the permanent substation/ convertor station platform. Piled foundations are also anticipated.	
References	**Site Location Maps**	**Annex A**
	Recent Aerial Photograph	**Annex B**

6 Ground Conditions

Data Source		Description
British Geological Survey Borehole	Borehole Reference	TR36SW99
	Location	On site
	Date	Not known
	Recorded Shallow Geology	• 0.3m of Topsoil • 1.21 of Thanet Sand (sand and stone) • 3.04m of Thanet Sand (loamy sand and shells) • 3.96m of Thanet Sand (loamy sand) • 18.89m of Thanet Sand (sandy clay)
British Geological Survey Mapping	Superficial Deposits	None recorded
	Bedrock	Thanet Formation – Sand, Silt and Clay

7 Pre and Post-WWII OS Mapping

	Date	Observations	Reference	Source
Pre-WWII	1933-38	• The majority of the site comprises open ground, forming part of *Cottington Hill*. • The northern section of the site is occupied by *St Augustine's Cross, Club House* with associated infrastructure. A railway embankment also encroaches into the northern extent. • Two roadways cross the site, including *Cottington Lane*. • Extension area: Comprises multiple fields and an orchard, an area of which is labelled *The Yellows*. • *Brook Lane* encroaches into the north-western extent while another road passes north to south through the eastern section.	Annex C-1	Groundsure Limited

Post-WWII	**1948-66**	• A small area of clearance is apparent in the northern section of the site, within the area of the *Club House*. • Typically, evidence of ruins, clearance and redevelopment is often indicative of bomb damage on early post-WWII OS mapping. • No further changes are noted on site or across the immediate surrounding area. Note, there is no coverage of the south-western section of the site. • Extension area: No significant changes are noted within the extension area.	**Annex C-2**	**Groundsure Limited**

8 The Threat from Aerial Bombing

8.1 General Bombing History of Kent

8.1.1 First World War

During WWI, Kent suffered extensive aerial bombardment from Zeppelin airships and fixed-wing aircraft. The first attack by the German Air Force was launched against Dover on the 21st December 1914 using naval seaplanes.

Bombing continued in Kent throughout the war; areas such as Ashford, Canterbury, Dover, Folkestone, Gravesend, Margate, Maidstone and Sheerness suffered particularly severe raids. The last raid on the county was on the night of the 19th May 1918 when a total of 14.55 tonnes of bombs were dropped on London, Faversham and Dover. Ramsgate, situated approximately 3km north-east of the site, gained the reputation as the most bombed seaside town in WWI. The town suffered from both aerial bombing and naval bombardment during WWI, with Zeppelin's scattering a number of bombs in all districts in the area.

WWI bombs were generally smaller than those used in WWII and were dropped from a lower altitude, resulting in limited UXB penetration depths. Aerial bombing was often such a novelty at the time that it attracted public interest and even spectators to watch the raids in progress. For these reasons, there is a limited risk that UXBs passed undiscovered. When combined with the relative infrequency of attacks and an overall low bombing density the risk from WWI UXBs is considered low and will not be further addressed in this report.

8.1.2 Second World War

At the start of WWII, the Luftwaffe planned to destroy key military installations, including RAF airfields and Royal Navy bases, during a series of daylight bombing raids. After the Battle of Britain these tactics were modified to include both economic and industrial sites. Targets included dock facilities, railway infrastructure, power stations, weapon manufacturing plants and gas works. As a result of aircraft losses, daylight raids were reduced in favour of attacking targets under the cover of darkness.

Kent played a key role in the defence of Britain in WWII. It was at the frontline during the Battle of Britain during which the Luftwaffe attempted to destroy the RAF and its airfields in order to gain air superiority over the south-east of England ahead of the planned German invasion. Bombing raids began in July 1940 from German-occupied France and in the following months many of the towns and cities in Kent were subjected to bombing attacks.

Within Kent, Manston Airfield, located 1km north of the site, was a key target for the Luftwaffe especially during the Battle of Britain, where RAF Manston sustained serious bomb damage. Most of the staff dispersed into the surrounding houses due to the destruction.

By May 1941, concentrated attacks were reduced as the Luftwaffe was diverted east to prepare for 'Operation Barbarossa', the invasion of Russia. Note however, that Canterbury, 14.5km south-west, was heavily bombed in mid-1942 as part of the Baedeker Blitz.

During 1942 and 1943, there were a number of minor raids carried out by small formations of fighter bombers and then between January and May 1944 the Luftwaffe returned to London en masse, for Operation Steinbock. These raids were executed by inexperienced Luftwaffe crews and were less frequent when compared to the original Blitz of 1940/41. Poor navigation and improved defences resulted in unsustainable Luftwaffe losses and many raids were unsuccessful.

Minster was situated within 'Hellfire Corner'; an area of Kent where aerial 'dog fights' and 'tip and run' bombing incidents were frequent during the Battle of Britain. The region was also under artillery bombardment from the coastal batteries located at Calais and Cap-Gris-Nez in occupied France. These batteries, including the *Lindemann* and *Todt Batteries*, bombarded the south coast until they were captured after the Allied D-Day Landings in 1944. The batteries covered an arc stretching from Ramsgate to Hythe and fired shells weighing approximately 1 ton each.

From mid-1944 the "V-weapon" (for Vengeance) campaign, using unmanned cruise missiles and rockets, represented Hitler's final attempt to reverse Germany's imminent defeat. The V1 (Flying Bomb or Doodlebug) and the V2 (Long Range Rocket) were launched from bases in Germany and occupied Europe.

Although these weapons caused considerable destruction, their relatively low numbers allowed accurate records of strikes to be maintained and these records have mostly survived. There is a negligible risk from unexploded V-weapons on land today since, even if an unexploded 1,000kg warhead had survived impact, the remains of the munition's body would have left incontrovertible evidence of the strike and would have been dealt with at the time.

8.2 Generic Types of WWII German Air-delivered Ordnance

The nature and characteristics of the ordnance used by the Luftwaffe allows an informed assessment of the hazards posed by any unexploded items that may remain today.

- HE Bombs: In terms of weight of ordnance dropped, HE bombs were the most frequent weapon deployed. Most bombs were 50kg, 250kg or 500kg (overall weight, about half of which was the high explosive) though large bombs of up to 2,000kg were also used. HE bombs had the weight, velocity and shape to easily penetrate the ground intact if they failed to explode. Post-raid surveys would not always have spotted the entry hole or other indications that a bomb penetrated the ground and failed to explode, and contemporary ARP documents describe the danger of assuming that damage, actually caused by a large UXB, was due to an exploded 50kg bomb. Unexploded HE bombs therefore present the greatest risk to present–day intrusive works.
- Blast Bombs/Parachute Mines: Blast bombs generally had a slow rate of descent and were extremely unlikely to have penetrated the ground. Non-retarded mines would have shattered on most ground types, if they had failed to explode. There have been extreme cases when these items have been found unexploded, but this was where the ground was either very soft or where standing water had reduced the impact. SafeLane Global does not consider there to be a significant risk from this type of munition on land.
- Large incendiary bombs: This type of bomb ranged in size from 36kg to 255kg and had a number of inflammable fill materials (including oil and white phosphorus), and a small explosive

charge. They were designed to explode and burn close to the surface, but their shape and weight meant that they did have penetration capability. If they penetrated the ground, complete combustion did not always occur, and, in such cases, they remain a risk to intrusive works.

- 1kg Incendiary Bombs (IB): These bombs, which were jettisoned from air-dropped containers, were just over 30cm in size and therefore highly likely to go unnoticed. They had the potential to penetrate soft ground and left a very small entry hole. Furthermore, if bombs did not initiate and fell in water or dense vegetation or became mixed with rubble in bomb damaged areas, they could have remained hidden to this day. Some variants had explosive heads, and these present a risk of detonation during intrusive works, particularly due to their shape, which leads them to often be misidentified.
- Anti-personnel (AP) Bomblets: AP bombs had little ground penetration ability and should have been located by the post-raid survey unless they fell into water, dense vegetation or bomb rubble.
- Specialist Bombs (smoke, flare, etc): These types do not contain high explosive and therefore a detonation consequence is unlikely. They were not designed to penetrate the ground.

Examples of the most commonly deployed German bombs are presented in the *Ordnance Specifications and Information* appendices at the end of this document.

8.3 Second World War Bombing Statistics

The following table summarises the quantity of German bombs (excluding 1kg incendiaries and anti-personnel bombs) falling on the Rural District of Eastry and Municipal Borough of Ramsgate between 1940 and 1945. While the majority of the site was located in the Rural District of Eastry, the north-eastern extent fell within the Municipal Borough of Ramsgate.

Record of German Ordnance Dropped		
Area	RD of Eastry	MB of Ramsgate
Area Acreage	54,276	3,624
High Explosive Bombs (all types)	646	771
Parachute Mines	14	5
Oil Bombs	11	3
Phosphorus Bombs	8	-
Fire Pots	38	-
Pilotless Missile (V1)	8	-
Long Range Rocket (V2)	1	-
Total	726	774
Items Per 1,000 Acres	**13.4**	**213.6**

Source: Home Office Statistics

Detailed records of the quantity and locations of the 1kg incendiary and anti-personnel bombs were not routinely maintained by the authorities as they were frequently too numerous to record.

Although the incendiaries are not particularly significant in the risk they pose, they nevertheless are items of ordnance that were designed to cause damage and inflict injury and should not be overlooked in assessing the general risk to personnel and equipment. The anti-personnel bombs were used in much smaller quantities and are rarely found today but are potentially more dangerous. This table does not include UXO found during or after WWII.

8.4 Site Specific WWII Bombing Records

8.4.1 Kent Bomb Census Maps

A review was conducted of the Kent Bomb Census Maps. Those showing incidents on or close to the site are listed below. Note, the maps are small in scale and lack any clear geographical indicators, therefore the site and distance(s) listed below can be considered an approximate.

Date	Weapon	Details
09/07/1940	HE bombs Incendiary bombs	Over the site
06/11/1940	2 x HE bombs	Immediately to the west of the extension area
Reference		**Annex D**

8.4.2 Kent V1 Bomb Census Map

Following the beginning of the V1 campaign in mid-1944, a series of maps showing where these weapons fell was produced for the London Civil Defence region and these were updated as the war progressed.

V1 Strike Recorded on Site (or in Vicinity)	✘
Distance from Site	None recorded in Minster Parish
Reference	**Not annexed**

8.4.3 Original ARP Bombing Incident Records

Throughout WWII, records of bombing incidents were kept by the ARP and Civil Defence Office. These records were kept in the form of typed or hand-written notes and/or presented on bomb plot maps. Some other organisations, such as port authorities and railways, maintained separate records.

Records which include Map References have been plotted onto a map presented in **Annex E**.

Written ARP records were reviewed for	Ramsgate, Sandwich and Rural District of Eastry		
Source	Kent History & Library Centre		
Records of bombing on / near the site were found			✓
Date	**Weapon**	**Map Reference**	**Details**
08-09/04/1940	4 x HEs	n/a	Minster.
19-20/07/1940	13 x HEs 1 x UX HE	n/a	Minster.
14/08/1940	5 x HEs	n/a	Minster.
22/08/1940	1 x HE	n/a	Minster.
22-23/08/1940	10 x HEs 2 x UX HEs	n/a	Minster and Ash.
13/09/1940	2 x HEs	n/a	Foads Hill, Cliffsend. Foads Hill is located approximately 770m north-east.
16-17/09/1940	1 x HE	n/a	Minster.
17/09/1940	1 x UX HE	776830	North of Thorne. 1km north-west.
18/09/1940	1 x UXB	n/a	St Augustine's Golf Links about 30 yards from Ramsgate-Sandwich Road. Bomb believed to have resulted from enemy action on 17/09/1940. On or in close proximity to the site.
	1 x UX HE 2 x HEs	780820	St Augustine's Golf Course. On site.
18-19/09/1940	2 x HEs 1 x UX HE	n/a	Minster.
26/09/1940	1 x UX HE	767819	Minster – 500yrds south of Brook Cottages. 460m north-west.

27/10/1940	2 X HEs	n/a	Cliffsend.
30/10/1940	1 x UX HE	771815	Near Brook Cottage. On site (extension area).
	1 x HE	n/a	Near Ramsgate, Sandwich Road. Two and a half miles north-east of Sandwich.
06/11/1940	1 x UX HE	770824	North-west of Sevenscore Railway Crossing. 8400m north.
	1 x UX HE	770810	West of Ebbsfleet Farm House. 200m south-west.
08/12/1940	2 x IBs	795821	In open field at Cliffsend. 930m north-east.
	1 x HE	774823	Sevenscore Farm. 570m north-west.
	2 x IBs	768826	Sandwich Road. 1.2km north-west.
05/02/1941	4 x HEs	n/a	Cliffsend, Ramsgate. Eight bungalows slightly damaged.
21/03/1941	1 x UX HE	n/a	Minster.
04/05/1941	1 x HE	773821	North-west of Sevenscore Railway Crossing. 600m west.
	1 x HE	776819	Cottington Hill. 190m west.
	1 x HE	775817	Cottington Hill. On/immediately adjacent with site boundary.
05/05/1941	3 x HEs	n/a	Minster.
19/03/1942	1 x UXB	775828	Thorne Farm. 820m north.

8.4.4 Secondary Source / Anecdotal Evidence

Anecdotal evidence of local bombing incidents was sought from publications and web resources. The following references to incidents on site or in the surrounding area were found.

Date	Weapon	Details
13th September 1940	2 x HEs 2 x IBs	*"Two high explosive bombs and two incendiary bombs at Foadshill, Cliffs End."* Foads Hill is located approximately 770m north-east.
17th September 1940	UXB	*"One unexploded bomb at St Augustine's golf course."* Possibly on or adjacent to the site.
1940-1945	HE Bombs	A news article dating from 18th December 1945[1] details how farmland in the surrounding area of Cliffsend, particularly Bethlehem Farm (~ 600m north-east of the site) sustained bombing in WWII. At least 22 bombs fell in fields and nine RAF planes either crashed or made forced landings.

8.4.5 WWII-era RAF Aerial Photography

The following WWII-era aerial photography was reviewed for the site:

Date	3rd March 1942
Source	National Collection of Aerial Photography (NCAP)
Image Type	Aerial
Image quality	High resolution and small scale, partial coverage
Observations	• The aerial image confirms the site predominantly comprised open ground, agricultural ground and a golf course. • Within the north-eastern section of the site a small AA gun site is apparent, including a Nissen hut. • A crater-like feature, consistent with a HE bomb strike, has been highlighted approximately 180m south of the site. • The structures on site appear to have survived WWII largely intact. However, due to the small scale of the image an accurate assessment for any structural damage is not possible.
Reference	**Annex F-1**

[1] Thanet Advisor and Echo – 18th December 1945.

Date	Circa 1946
Source	Kent County Council
Image Type	Aerial
Image quality	Moderate resolution and small scale
Observations	• The aerial image shows the entirety of the site. The south-western extent is a mixture of agricultural land, orchards and marshland. • Another crater-like feature has been highlighted approximately 230m south-west of the southern extent of the site. • It appears that the structures occupying the site have survived WWII largely intact. However, like the previous image, an accurate assessment for any structural damage is not possible. • The AA battery in the northern section of the site has been cleared. • Extension area: This area largely comprised open ground, including a large orchard and smaller wooded area in the northern half. Several small drainage ditches are apparent in the south-western corner. No evidence of significant bomb damage is apparent within its boundary.
Reference	**Annex F-2**

8.4.6 Abandoned Bombs

A post-air raid survey of buildings, facilities and installations would have included a search for evidence of bomb entry holes. If evidence was encountered, Bomb Disposal Officer teams would normally have been requested to attempt to locate, render safe and dispose of the bomb. Occasionally evidence of UXBs was discovered but due to a relatively benign position, access problems or a shortage of resources the UXB could not be exposed and rendered safe. Such an incident may have been recorded and noted as an Abandoned Bomb.

Given the inaccuracy of WWII records and the fact that these bombs were 'abandoned', their locations cannot be considered definitive, nor the lists exhaustive. The MoD states that 'action to make the devices safe would be taken only if it was thought they were unstable'. It should be noted that other than the 'officially' abandoned bombs, there will inevitably be UXBs that were never recorded.

SafeLane Global holds records of officially registered abandoned bombs at or near the site	✓
Additional Comments	• 1 x 50kg HE bomb – St Augustine's Golf Course (approximately 220m south of the north-eastern extent of the site). • 1 x unknown UXB – In marshes near Brook Lane, Minster (approximately 90m north of the extension area). • 2 x unknown UXBs – south of Brook Lane, Minster (approximately 270m west of the extension area).

8.5 UXB Ground Penetration

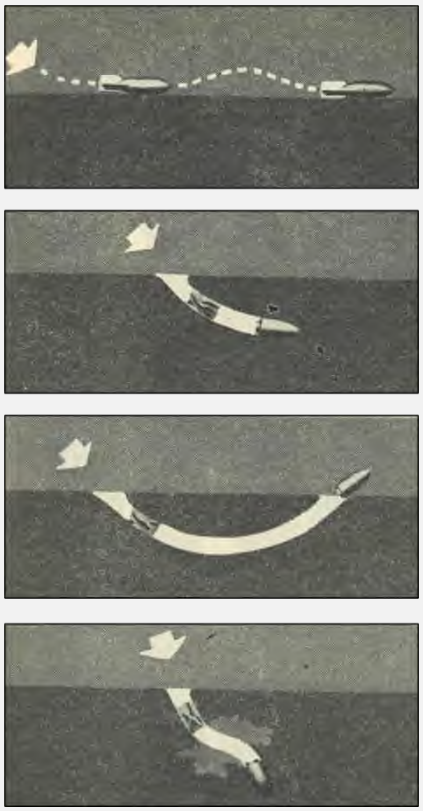
8.5.1 General Considerations

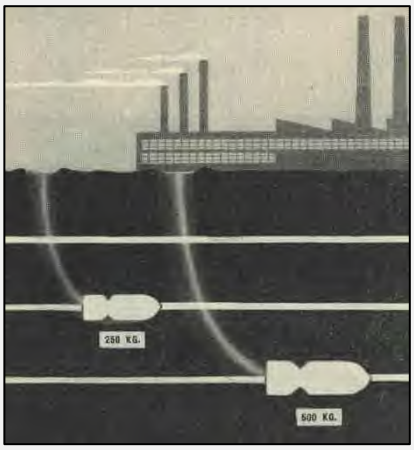
The actual penetration depth of aerial delivered bombs into the ground will have been determined by the mass and shape of the bomb, the velocity and angle of the bomb on impact (dependent on the height of release) and the nature of the ground and ground cover; the softer the ground, the greater the potential penetration. Peat, alluvium and soft clays are easier to penetrate than gravel and sand. Bombs are brought to rest or are commonly deflected by bedrock or large boulders.

8.5.2 The "j" Curve Effect

An air-dropped bomb released from normal bombing altitude (approx. 5,000m) on its curved trajectory can reach a terminal velocity of between 350-400 ms-1. In this case of high-level bombing, the angle of which the bomb enters the earth is approx. 15° from the perpendicular and its exact path is difficult to trace. The bomb is being driven by its kinetic energy can unless deflected, will continue its line of flight and can turn in an upwards curve towards the ground surface as it comes to rest. The upwards curve is caused by the transfer of energy as the bomb travels through the ground. The nose of the bomb travels slower than the rear of the bomb due to the drag/friction of it passing through the ground. The rear of the bomb, having more energy due to less drag/friction is travelling much quicker.

The location of the bomb is thus ''offset'' from the hole of entry. This ''offset'' from vertical is generally understood to be about one third of the penetration depth but can reach up to (and have been found at) 15m/50 ft from point of entry, dependent on ground conditions and the bomb's angle of impact. The figure below depicts the various paths of UXB through homogenous ground, showing how the J-curve effect can lead to a UXB coming to rest beneath undamaged buildings.





A UXB can come to rest beneath undamaged buildings due to the J-Curve effect if it lands in nearby soft ground.

Image source: Field Manual for Unexploded Bombs: Organisation and Operation For Disposal, United States War Department 1943

Left: Path of UXB in soft ground:

1. Ricochet resulting from low level attack: UXB stays perpendicular to ground and rests at surface.
2. Buried UXB with J-Curve: Bomb curves horizontally and rests perpendicular to surface.
3. UXB returning to surface due to J-Curve: Bomb points towards surface but may remain partially or completely below ground level.
4. UXB deflected by buried objects: Results in unpredictable path and unusual shift.

8.5.3 Second World War Bomb Penetration Studies

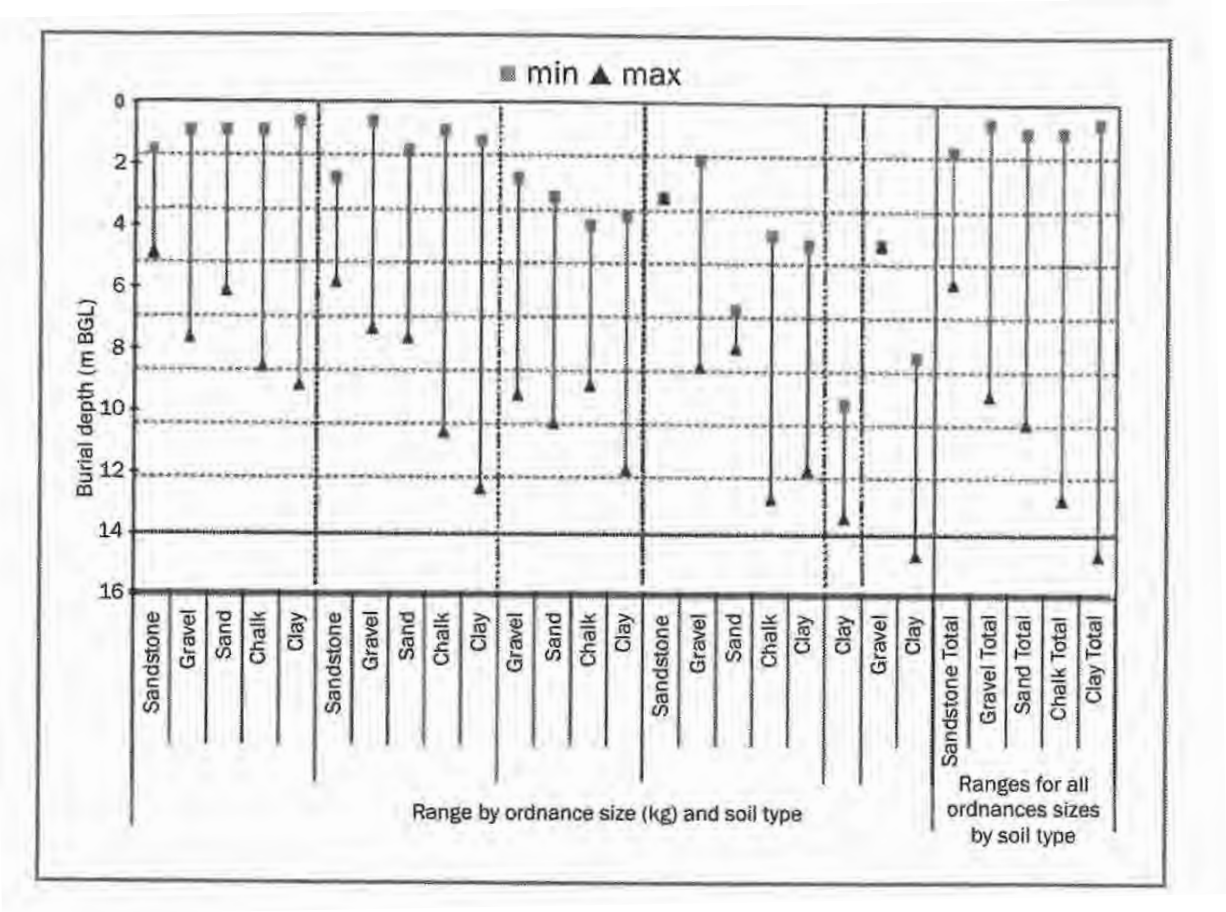
During WWII, the Ministry of Home Security undertook a major study on actual bomb penetration depths, carrying out statistical analysis on the measured depths of 1,328 bombs as reported by Bomb Disposal, mostly in the London area. They then came to conclusions as to the likely average and maximum depths of penetration of different sized bombs in different geological strata.

The median penetration of 430 x 50kg German bombs in London Clay was 4.6m and the maximum penetration observed for the SC50 bomb was 9m.

They concluded that the largest common German bomb, 500kg, had a likely penetration depth of 6m in sand or gravel but 8.7m in clay. The maximum observed depth for a 500kg bomb was 10.2m and for a 1,000kg bomb 12.7m. Theoretical calculations suggested that significantly greater penetration depths were probable.

8.5.4 CIRIA Bomb Penetration Depth Specifications

As stated within C681, the ground conditions at any individual site are likely to be highly variable and this results in a large range of burial depths for each different size bomb. The below chart shows the observed variation in burial depths of various sizes of air-delivered UXO for different ground conditions.



8.5.5 Site Specific Bomb Penetration Considerations

When considering an assessment of the bomb penetration at the site, the following parameters would be used:

- Geology – 0.3m of Topsoil and > 27.1m of Thanet Sand (sand, silt and clay)

- Impact Angle and Velocity – 80-90° from horizontal and 267 metres per second.
- Bomb Mass and Configuration – The 500kg SC (General Purpose) HE bomb, without retarder units or armour piercing nose. This was the largest of the common bombs used against Britain.

Taking into account the above-mentioned factors it has been assessed that a 500kg bomb would have had an approximate maximum bomb penetration depth of between 10-12m below WWII ground level. Penetration depth could potentially have been greater if the UXB was larger (though only 4% of German bombs used in WWII over Britain were of that size). Note that UXBs may be found at any depth between just below the WWII ground level and the maximum penetration depth.

8.6 Likelihood of Post-raid UXO Detection

Utilising the available historical bombing records as reviewed in Section 8.4, it is possible to make an assessment of the likelihood that evidence of UXO would have been noted on a site during the war and the incident dealt with or recorded at the time. Factors such as bombing density, frequency of access, ground cover, damage and failure rate have been taken into consideration.

8.6.1 Density of Bombing

Bombing density is an important consideration for assessing the possibility that UXBs remain in an area. A very high density of bombs will have increased the likelihood of errors in record keeping at the time, as civil defence personnel and emergency services may have been overwhelmed. A higher density of bombing also increases the number of UXBs actually occurring in a given area.

The type and specific location of recorded bomb strikes is also an important consideration. If a stick of bombs (one individual aircraft's bomb load) is plotted in line with a site or is shown to straddle a site, then this raises the possibility that an unrecorded UXB from the same stick struck that site.

8.6.2 Bomb Damage

In Blitzed cities / towns throughout Britain, bomb sites were often not cleared of rubble until after the war and mid-war repairs to buildings were only carried out on the most vital facilities (power stations, gas works, weapons factories etc.). However, if a building only sustained bomb damage to its upper floors, any subsequent UXB strike to the structure will still have caused obvious damage, at ground floor level, which would have been reported and dealt with at the time.

HE bomb strikes to open ground will have resulted in a large crater and local soil disturbance. Any subsequent UXB strike will not have resulted in an easily identifiable entry hole and as such is likely to have gone unnoticed amongst the disturbed ground.

In London and south-east England, the German V1 Flying Bomb and V2 Long Range Rocket campaigns caused widespread devastation. However, as these weapons began to be utilised after the final significant Luftwaffe air raids had occurred, any serious damage caused by such weapons does not necessarily indicate an increased risk of Luftwaffe freefall UXB contamination. However, it is quite possible that serious damage inflicted during the 1940-1944 campaigns by Luftwaffe freefall bombs could have been erased by a subsequent V Weapon strike.

8.6.3 Frequency of Access

A UXB strike at a site where human access was infrequent would have had a lower chance of being observed, reported and recorded compared to a site which was developed and subject to regular access. UXB strikes during night time raids (when German planes could more easily evade anti-aircraft defences) are also more likely to have fallen unobserved than ones dropped during a daylight attack.

In frequently bombed cities / towns, ARP Wardens were tasked with carrying out searches for UXBs within recently bombed residential areas and schools. Similarly, many important home front facilities (factories, gas works, power stations, docks etc.) had their own dedicated ARP teams or Fire Watchers tasked with observing local air raids. Fire Watchers were mainly responsible for extinguishing 1kg incendiary bombs as well as reporting any UXB strikes. Anecdotal evidence however indicates that Fire Watchers did not always turn up for their shifts and therefore such UXB mitigating activities should not be assumed in the absence of site-specific evidence. Less important buildings sustaining bomb damage would have been abandoned until after the German bombing campaign in that area had ceased and repairs could be made, greatly decreasing the level of access to that site.

Schools closed due to the evacuation of children were often requisitioned by the Civil Defence authorities to be utilised as night time First Aid posts and reception centres (providing emergency accommodation for bombed out civilians). Therefore, an increased level of access is likely at these locations.

8.6.4 Ground Cover

The entry hole of a 50kg UXB (the most commonly deployed German HE bomb) could have been as little as 20cm in diameter. Wartime records also confirm that small German Incendiary Bombs, weighing just 1kg, were capable of significant penetration into soil, resulting in very small entry holes (5cm) or complete burial.

The quantity and type of ground cover present on a site during WWII would have had a significant effect, at ground level, on the visual evidence of buried UXO.

Evidence of UXO could be obscured in dense vegetation, soft ground, rubble, railway ballast or amongst stockpiled material (such as aggregate, coal or refuse heaps). A UXB strike to waterlogged ground or open water would have been immediately obscured from view beneath the waterline. Had such an incident occurred within a tidal mudflat or river bank, the resulting entry hole will have remained only temporarily, before becoming in-filled by water and sediment. Any HE UXB strike to elevated risk ground cover could potentially have come to rest beneath neighbouring undamaged buildings or hard-standing due to the 'J-Curve' Effect.

UXB strikes to undamaged/superficially damaged buildings and hard-surfaced ground will still have caused substantial damage or an easily identifiable and persistent entry hole. Similarly, it is unlikely that an HE UXB entry hole on well-maintained / manicured lawns (tennis courts, bowling greens, golf course fairways / greens, gardens in affluent areas etc), would have been overlooked. Such incidents would have been reported and the UXB subsequently removed.

8.6.5 German Air-Delivered Ordnance Failure Rate

Based on empirical evidence, it is generally accepted that 10% of the German HE bombs dropped during WWII failed to explode as designed. This estimate is probably based on the statistics of wartime recovered UXBs and therefore will not have taken account of the unknown numbers of UXBs that were not recorded at the time and is probably an underestimate.

The reasons for failures include:

- Fuze or gaine malfunction due to manufacturing fault, sabotage (by forced labour) or faulty installation.
- Clockwork mechanism failure in delayed action bombs.
- Failure of the bomber aircraft to arm the bombs (charge the electrical condensers which supplied the energy to initiate the detonation sequence) due to human error or equipment defect.

- Jettison of the bomb before it was armed or from a very low altitude. Most likely if the bomber was under attack or crashing.

War Office Statistics document that a daily average of 84 bombs which failed to function were dropped on civilian targets in Great Britain between 21st September 1940 and 5th July 1941. 1 in 12 of these (probably mostly fitted with time delay fuzes) exploded sometime after they fell; the remainder were unintentional failures.

From 1940 to 1945 bomb disposal teams dealt with a total of 50,000 explosive items of 50kg and over (i.e. German bombs), 7,000 AAA shells and 300,000 beach mines. These operations resulted in the deaths of 394 officers and men. However, UXO is still regularly encountered across the UK.

Note, due to manufacturing fault or failure of the bomber crew to correctly arm their munitions, whole bomb loads often failed to detonate. Therefore, the presence of reported UXBs increases the likelihood of an additional unrecorded UXB in the vicinity.

8.6.6 Site Specific Analysis

The following table will place the site in context with these factors, in order to assess the likelihood of post-raid UXO detection within the project site.

Likelihood of Post Raid UXO Detection on Site			
Site-Specific Factors			**Additional Comments**
Density of Bombing Assessment	Based on wartime records or secondary source information, what was the bombing density over the site?	Moderate	While the overall bombing density of the Rural District of Eastry was low, the Parish of Minster sustained a comparatively higher density of bombing due to the presence of RAF Manston.
	Was the site ever subjected to one or more large-scale (>100 tons of ordnance) night time Blitz raids?	✘	
	Were any HE bomb strikes recorded on site?	✓	The following were recorded on site: 2 x HE bombs and 2 x UXBs. The following were recorded on site/immediately adjacent with its boundary: 1 x HE bomb.
	What is the distance between the site boundary and the closest recorded large bomb strike?	On site	
	How many HE, Parachute Mine, Oil Incendiary, Phosphorus Incendiary or Fire Pot bombs (large bombs) were recorded within a 300m radius of the site?	5	
	Were any nearby sticks of large bombs recorded in line with the site?	✓	

	Were any 1kg incendiary bomb showers recorded over the site?	✗	
Bomb Damage Assessment	A comparison of the historical records confirms that buildings within the site boundary sustained serious bomb damage.	✓	
	Direct or indirect evidence of HE bomb craters in open ground (within the site boundary) has been found.	✗	
	Buildings on site were seriously damaged by a V1 and / or V2 strike.	✗	
	Buildings on site could have been seriously damaged prior to the nearby V1 or V2 strike?	n/a	
Frequency of Access Assessment	The site was situated in a densely populated urban area during WWII and therefore would have been accessed at the outbreak of WWII.	✗	
	The site was exclusively or partially developed during WWII.	✓	A number of farm and Golf Club buildings were present on site.
	Buildings on site survived WWII intact and therefore likely remained inhabited or in use, suggesting these localities and their immediate environs were accessed throughout the war.	✓	
	The site was crossed by roads / pavements or footpaths which would have been regularly used / subject to daily footfall.	✓	
	The site was occupied by small residential back yards / gardens, likely to have been put to use for cultivation as a result of the government's Dig for Victory Campaign.	✗	
	The site was occupied by a school during WWII.	✗	
	Part of the site is likely to have been subject to post-raid searches for UXO.	✓	It is possible the AA battery on site was subjected to post-raid searches for UXO.
	Buildings on site sustained serious bomb damage and as a result were likely abandoned (along with any associated gardens / open ground) for the remainder of the war.	✓	

	The site was occupied by peripheral open ground / wasteland, with no apparent use, which may have been neglected.	✓	
	The site may have been occupied by recreational land / sports fields which may have only experienced seasonal access.	✓	
	The site was occupied by a graveyard which would have experienced limited access.	✗	
	The site was occupied by agricultural land, rural countryside or woodland which would not have been accessed in full, either regularly or frequently.	✓	
	The site was occupied by railway sidings which may not have been as regularly checked for buckling as mainline railway tracks.	✗	
	The site was occupied by soft railway embankments which are likely to have been neglected during the war.	✓	
Ground Cover Assessment	The site was partially or entirely abandoned, due to bomb damage, resulting in associated open ground likely becoming overgrown.	✗	
	The site was occupied by dense, inaccessible vegetation during WWII.	Possibly	
	The site may have been susceptible to waterlogged conditions during WWII.	✓	
	The site was occupied by (possibly) unmaintained grass field during WWII.	✓	
	The site was part occupied by a canal, river, dock basin, lake or reservoir during WWII.	✓	
	The site was occupied by tidal mud or marshland during WWII.	✓	
	The site was occupied by railway tracks crossing soft ground during WWII.	✓	
	The site was occupied by stockpiled material during WWII.	✗	

	The site was occupied by buildings, hard-standing or other manmade structures that did not sustain any degree of bomb damage.	✓	
	A comparison of the historical records confirms that buildings on site sustained inconsequential minor / moderate damage.	✗	
	The site was occupied by well-maintained, manicured lawn during WWII.	✓	
	Undamaged, developed parts of the site would have been vulnerable to the J-Curve Effect.	✓	
Bomb Failure Rate	Evidence has been found which suggests that the bomb failure rate in the vicinity of the site would have been different from the "approximately 10%" figure normally used.	✗	

9 The Threat from Allied Military Ordnance

The following potential historical and modern sources of UXO contamination on site or in the surrounding area have been considered:

Potential Source of Contamination on Site	
Army, Navy and RAF Bases / Installations	✗
Military Training Areas / Weapons Ranges	✓
Ordnance / Explosives Factories and Storage Depots	✗
Sites Requisitioned for Military Use	✓
Sites Used or Occupied by the Home Guard	✓
Military Fortifications and Coastal Defences	✓
Locations of Army Explosive Ordnance Clearance Tasks	✗
WWII Anti-Aircraft Batteries	✓
WWII Pipe Mined Locations and Beach Minefields	✗

The risk of contamination from Allied UXO on site is discussed below.

9.1 Port Richborough

Port Richborough, nicknamed port "Q", was established in 1914 on the banks of the River Stour, was kept a secret and served as a significant military outpost. Throughout WWI, the port was used for manning and arming barges being sent to Dover and subsequently France.[2] The port became militarised during WWI, multiple stores for equipment used for supplying the barges were erected in and around the banks. Moreover, defensive positions were established around the Port especially on the flats towards the mouth of the River Stour.

During WWII the port served as a military outpost for the Royal Marines in 1942, named H.M.S Robertson. The Port was considered "a hive of industry" in preparation for D-Day, with many troops were stationed in the nearby Richborough Camp and factory workers working throughout the blackout in the port factory.[3] The port was located approximately 900m south of the site.

9.2 Home Guard Activity

The Home Guard (HG) was a defence organisation of the British Army, operational between 1940 and 1944. It comprised 1.5 million local volunteers, otherwise ineligible for military service and acted as a secondary defence force in case of enemy invasion. The HG guarded the coastal areas of Britain and other important facilities such as airfields, factories and explosives stores. They were also active in county towns and cities.

Official records were rarely kept by the HG and therefore any present-day evidence is usually anecdotal. However, it is known that HG personnel often carried out training (including weapons training) in open countryside on the outskirts of cities / towns. Today, items of ordnance related to the HG are occasionally encountered by members of the public and the construction industry in the British countryside. This suggests a culture of ill-discipline regarding live ammunition within HG units.

HG personnel are known to have purposefully buried caches of ammunition and weapons in tactical positions, to be exhumed and used in case of invasion. Records of such caches were not rigorously kept, and some were therefore forgotten about. This is substantiated by several HG UXO finds over recent years. The below table shows just a handful of examples:[4]

[2] *https://blog.railwaymuseum.org.uk/port-of-richborough-and-the-birth-of-the-cross-channel-train-ferry/*

[3] *http://www.open-sandwich.co.uk/town_history/richborough_port.htm*

[4] Various News Sources

Home Guard UXO Finds:	
	Unexploded Spigot Mortar Round, used by the Home Guard in WWII, found and disposed of in Hayle, Cornwall – January 2021
	24 x WWII grenades found buried in a field in Sibton, Suffolk – May 2019
	A cache of 80 phosphorous grenades buried by the Home Guard found in Eastbourne – September 2015
	Home Guard Phosphorous Grenades found buried beneath a bridge in Herne Bay – July 2015

9.3 Anti-Aircraft Gun Batteries

At the start of the war two types of AAA guns were deployed: Heavy Anti-Aircraft Artillery (HAA) and Light Anti-Aircraft Artillery (LAA). The LAA batteries were intended to engage fast low flying aircraft and were typically deployed around airfields or strategic installations. These batteries were mobile and could be moved to new positions with relative ease when required. With four guns per battery firing several rounds per minute, AA batteries could expel numerous shells in even the shortest engagements. Numerous unexploded AAA shells were recovered during and following WWII and are still occasionally encountered on sites today.

The maximum ceiling height of fire at that time was around 11,000m however, as the war progressed, improved variants of the 3.7" gun were introduced and, from 1942, large 5.25-inch weapons were brought into service. These had significantly improved ceiling heights of fire reaching over 18,000m.

When the supply of clockwork fuses from Switzerland was cut off, Britain was forced to make its own. After four years of war, the country still lacked the engineering skills to produce a reliable fuse. This resulted in a considerable number of AA projectiles exploding prematurely, killing the gunners or failing to explode at all and falling to the ground as UXBs. In January 1944, more people in London were killed by HAA shells than by German bombs.

9.4 Site-Specific Threat from Allied Military Ordnance

The following table identifies the potential threat to the site of contamination from British / Allied UXO.

Potential Source	Details
Nearest Home Guard Battalion to the site	6th Kent (Thanet) Home Guard Battalion
Home Guard Activity on site	• The Thanet Battalion primarily operated out of Margate, approximately 7km north-east from the site. However, the exact locations of their HQ or training areas were not found. • A number of defensive positions were located on and in close proximity to the site (see below). These points would have been manned by HG / military personnel armed with LSA / SAA. • Typically, HG soldiers would take part in training exercises in areas occupied by open countryside. Furthermore, HG personnel are known to have purposefully buried caches of ammunition and weapons in tactical positions, to be exhumed and used in case of invasion. • Marshy land between Minster and Pegwell Bay was used as a mortar training range during WWII, however no details regarding the full extent of the training area could be located. Therefore the possibility of such training taking place on site cannot be discounted. • Given the strong military / HG presence in the area and the site comprising undeveloped ground, the possibility the site was used for training purposes cannot be discounted.

Defensive features within the vicinity	• St Augustine's Golf Course was covered in anti-invasion defences including barbed wire, trenches and gun pits[5]. • A newspaper article reported that mines were laid across farmland at Cliffsend when enemy invasion appeared to be imminent. This included Bethlehem Farm 550m north-east of the site[6]. The full extent of these minefields is unknown. • 4 x Pillboxes were located within 460m of the site, the closest of which was approximately 100m east. • A WWII road block was established across Ebsfleet Lane, approximately 130m east[7].
Number of HAA batteries within 5km of the site	6
Threat to the site from unexploded AA shells	• The nearest HAA battery was approximately 1.9km north-east from the site, situated close to RAF Manston. • Furthermore, a number of light AA batteries were established across the area. This included Bethlehem Battery, situated within the north-eastern section of the site. This Battery was armed with 6in breech loading guns. However, by May 1942 the AA emplacement was backfilled and replaced with two gun pits on either side of where the gun emplacement previously stood[8]. Provision for the storage and possibly the disposal of munitions would have been made on site. • RAF Manston and the surrounding area was targeted and attacked by the Luftwaffe several times during WWII. During such attacks, it is likely that a significant degree of AA fire would have occurred over the site. • The site was occupied by open ground during WWII. In such ground conditions, an unexploded AA shell could go unnoticed.

9.5 Generic Types of WWII British / Allied Unexploded Ordnance

9.5.1 Land Service Ammunition (LSA)

9.5.1.1 General

The term Land Service Ammunition covers all items of ordnance that are propelled, placed or thrown during land warfare. They may be filled or charged with explosives, smoke, incendiary or pyrotechnics. They can be broken into five main groups:

a. Mortars

b. Grenades

c. Projectiles

d. Rockets

e. Landmines

[5] Thanet Advisor – 13th March 1945
[6] Thanet Advisor – 18th December 1945
[7] https://webapps.kent.gov.uk/KCC.ExploringKentsPast.Web.Sites.Public/SingleResult.aspx?uid=MWX43194
[8] https://webapps.kent.gov.uk/KCC.ExploringKentsPast.Web.Sites.Public/SingleResult.aspx?uid=MKE39272

Unexploded or partially unexploded Mortars and Grenades are among the most common items of UXO encountered in the UK. They are commonly encountered in areas used by the military for training and are often found discarded on or near historic military bases.

Examples of the most commonly used British / Allied Land Service Ammunition types are presented in the *Ordnance Specifications and Information* appendices, at the end of this document.

9.5.1.2 Mortars

A mortar bomb is a fin-stabilised munition, normally nose-fuzed and fitted with its own propelling charge (primary cartridge). Range is increased by adding extra propellant (augmenting charges). They are either HE or Carrier and generally identified by their tear-dropped shape (older variants however are parallel sided) and a finned 'spigot tube' screwed or welded to the rear end of the body housing the propellant charge.

A mortar relies on a striker hitting a detonator for explosion to occur. It is possible that the striker may already be in contact with the detonator and that only a slight increase in pressure would be required for initiation. Discarded augmenting charges are often encountered around mortar firing areas/bases.

9.5.1.3 Grenades

A grenade is a short-range weapon which may be thrown by hand, fired from the end of a rifle or projected/propelled from a special purpose grenade launcher. They are divided into two categories; HE and Carrier (generally smoke). As with mortars, a grenade striker may either be in contact with the detonator or still be retained by a spring under tension, and therefore shock may cause it to function. A grenade can have an explosive range of 15-20m. Common older variants have a classic 'pineapple' shape; modern grenades tend to be smooth-sided.

9.5.2 Small Arms Ammunition (SAA)

The most likely type of ordnance to be encountered on site are items of SAA (bullets), especially .303" ammunition which was the standard British and Commonwealth military cartridge from 1889 until the 1950s.

However even if an item such as this functioned, the explosion would not be contained within a barrel and detonation would only result in local overpressure and very minor fragmentation from the cartridge case.

Some LAA guns and RAF fighter cannons in use with British forces during WWII utilised the 20mm round. These bullets had a small fuse and a ~4gram HE or incendiary charge. Although small, this fill quantity still has the potential to cause serious injury.

Examples of the most commonly used British / Allied Small Arms Ammunition types are presented in the *Ordnance Specifications and Information* appendices, at the end of this document.

9.5.3 Anti-Aircraft Shells

At the start of the war two types of AAA guns were deployed: Heavy Anti-Aircraft Artillery (HAA) using large calibre weapons such as the 3.7" QF (Quick Firing) gun and Light Anti-Aircraft Artillery (LAA) using smaller calibre weapons such as 40mm Bofors gun which could fire up to 120 x 40mm HE shells per minute to over 1,800m. During the early war period there was a severe shortage of AAA so older WWI 3" and modified naval 4.5" guns were also deployed.

These shells are frequently mistakenly identified as small German air-delivered bombs but are differentiated by the copper driving band found in front of the base. Although the larger unexploded projectiles could enter the ground, they did not have great penetration ability and are therefore likely to be found close to WWII ground level. With a HE fill and fragmentation hazard these items of UXO also present a significant risk if encountered.

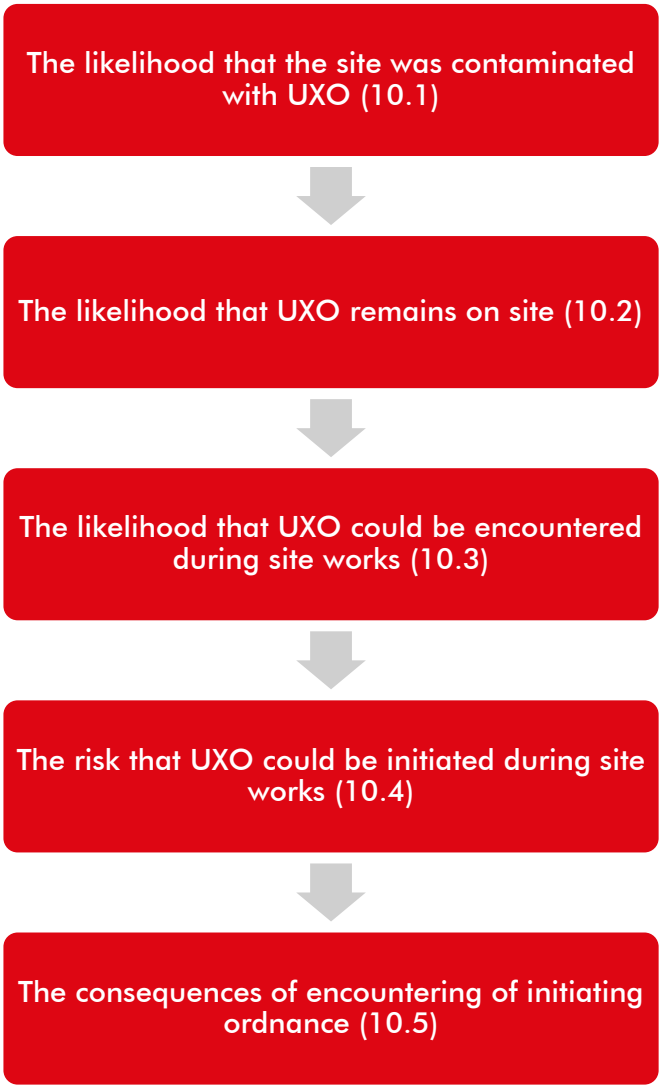
The smaller 40mm projectiles are similar in appearance and effect to small arms ammunition and, although still dangerous, present a lower risk. Details of the most commonly deployed WWII AAA projectiles are shown below:

Gun type	Calibre	Shell Dimensions	Shell Weight	HE Fill Weight
3.7 Inch	94mm	94mm x 438mm	12.7kg	1.1kg
4.5 Inch	114mm	114mm x 578mm	24.7kg	1.7kg
40mm	40mm	40mm x 311mm	0.84kg	70g

Examples of the most commonly used British / Allied Anti-Aircraft Ammunition types are presented in the *Ordnance Specifications and Information* appendices, at the end of this document.

10 The Overall Unexploded Ordnance Risk Assessment Methodology

Taking into account the quality of the historical evidence, the assessment of the overall risk to any intrusive works from UXO must evaluate the following factors:



Each of these steps will be evaluated in the following sections in order to conclude the total risk from UXO to the proposed works to be undertaken within the project site.

10.1 The Likelihood that the Site was Contaminated with Unexploded Ordnance

10.1.1 General

The below is a generalised table of factors used to determine the likelihood that the site was contaminated with unexploded ordnance. Note that additional site-specific information can adjust UXO risk beyond these criteria:

Low Likelihood	Medium Likelihood	High Likelihood
German Air-Delivered Ordnance / Allied Anti-Aircraft Shells		
No evidence of bombing / bomb damage on site coupled with low local bombing density.	Moderate to High local bombing density or evidence of bombing / bomb damage on or close to the site.	High local bombing density or evidence of bombing /bomb damage on or adjacent to the site. Confirmed finds of WWII UXB.
Ground conditions that would prevent UXB penetration or lead to easily identifiable entry holes.	Ground conditions that allow for bomb penetration.	Ground conditions that would have immediately and completely obscured the existence of UXB.
Site was occupied and accessed fully throughout the bombing campaign.	Site located in an area that was infrequently observed or accessed, with a low likelihood that a UXB strike would have been noticed.	Site may be completely obscured from view or subject to very infrequent access.
British / Allied Ordnance		
No evidence of Allied military activity on or near the site. Or Military sites which have been cleared / redeveloped since their use Or Military-owned sites which have not been used for training with live munitions.	Clear evidence of military training activity on site involving live ammunition / munitions. Military sites which have not undergone clearance operations or redevelopment since use. Evidence of weapons storage on site.	Evidence of weapons testing or disposal on or adjacent to the site.
Developed areas that are unlikely to have been used for military exercises.	Open or unmaintained ground that may have been used for disposal or caching of munitions.	Evidence of UXO finds on or in the vicinity of the site.

The following sections assess the likelihood of contamination from German UXO and British / Allied UXO, based on the evidence discussed in the previous sections.

10.1.2 Likelihood of Contamination from German UXO

The following table discusses the overall likelihood of contamination from German UXO, based on the evidence discussed in Section 8.

Overview of the Potential Sources of German Air-Delivered UXO	
Bombing density	• Moderate bombing density. • 2 x HE bombs plotted on site. • 2 x UXBs plotted on site. • 2 x HE bombs plotted on/immediately adjacent to the site.
Bomb Damage	• One building appears to have sustained bomb damage.
Ground Conditions	• Majority of the site comprised open ground, including a golf course, agricultural land and marshland. • A golf club and farm buildings occupied the site. • A railway embankment encroached into northern extent.
Frequency of Access	• Likely infrequent access to marshland. • Infrequent access to the golf course. • Likely seasonal access to farmland.
J-Curve Effect	• Had any UXB landed within the soft ground on site, it could have come to rest beneath the adjacent undamaged areas.
Other considerations	• 4 x abandoned bombs reported within 300m of the site. • A UXB was found in Pegwell Bay Country Park, approximately 420m south-east of the site, in 2017.
Overall Likelihood of Contamination	**Medium**

10.1.3 Likelihood of Contamination from British / Allied UXO

The following table discusses the overall likelihood of contamination from British / Allied UXO, based on the evidence discussed in Section 9.

Overview of the Potential Sources of British / Allied UXO	
Land Service Ammunition / Small Arms Ammunition	• Several Platoons of the Thanet Home Guard Battalion operated in the area. • St Augustine's Golf Course was covered in anti-invasion defences including barbed wire, trenches and gun pits.

	• 4 x Pillboxes within 460m of the site, closest of which was 100m east. • Marshy land between Minster and Pegwell Bay used as a mortar training range during WWII. • Given the strong military / HG presence in the area and the site comprising undeveloped ground, the possibility the site was used for training purposes cannot be discounted.
Anti-Aircraft Projectiles	• Six HAA batteries were situated within a 5km radius of the site during WWII, the closest of which was approximately 1.9km north-east from the site. • Bethlehem Battery, situated within the north-eastern section of the site. This was replaced by May 1942 with two gun pits. Provision for the storage and possibly the disposal of munitions would have been made on site. • The site was occupied by open ground during WWII. In such ground conditions, an unexploded AA shell could go unnoticed.
Overall Likelihood of Contamination	**Medium**

10.2 The Likelihood that Unexploded Ordnance Remains on Site

10.2.1 General

The extent to which any ordnance clearance activities have taken place on site or extensive ground works have occurred is relevant since they may indicate previous ordnance contamination but also may have reduced the risk that ordnance remains undiscovered.

10.2.2 EOD Bomb Disposal and Clearance Tasks

SafeLane Global holds a number of official records of explosive ordnance disposal operations during and following WWII, obtained from the Explosive Ordnance Disposal (EOD) Archive Information Office at 33 Engineer Regiment (EOD), British Army.

Potential Source	Details
Records of Army EOD tasks having taken place on site or in the vicinity	None
Local ordnance finds	• July 2017 - A UXB was found in Pegwell Bay Country Park. An Army disposal team carried out a controlled detonation.[9] Pegwell Bay County Park 420m south-east of the site.

[9] https://theisleofthanetnews.com/the-army-has-carried-out-another-controlled-explosion-of-war-time-bombs-at-cliffsend/

	• 1st July 2017 – A UXB was discovered near Sandwich Road, Cliffsend. The precise location of where this UXB was discovered is unknown.[10]
Local tasks undertaken by SafeLane Global	None

10.2.3 Post War Redevelopment

The nature of post-WWII ground works, redevelopment and construction has been considered. Significant structural redevelopment on site can, in some cases, provide a level of mitigation, particularly from shallow buried items. However, if a site has not undergone any extent of redevelopment, the likelihood of UXO remaining within its boundaries can remain.

The site has been redeveloped post-WWII	✓
Further Details	• The majority of the site has not been subject to significant redevelopment works in the post-war period. • Between 1964 and 1990 Cottington Lane was removed from the centre of the site. During this same period the orchard was also cleared from the south-western extent. • By 1990 a large warehouse was constructed at Ebbsfleet Farm, in the southern extent of the site. Between 2009 and 2013 this warehouse was downsized and the present day A256 constructed. • Extension area: Beyond the clearance of the orchard and the construction of Richborough Way, no significant redevelopment works have been carried out.

10.2.4 Site-Specific Analysis

The following table discusses the likelihood that UXO could remain on site, following any post-WWII activity.

Mitigating factors during post-WWII period	Beyond the creation of the A256, and minor redevelopment works at the Golf Course and Ebbsfleet Farm, much of the site has not been subject to significant intrusive works.
Further comments	Within the footprints of the post-war redevelopment / ground works, the risk of shallow buried UXO (especially German 1kg incendiaries) remaining will have been partially mitigated since any such items could have been encountered and removed during soil stripping and levelling. Only within the volume of any post-war basement level bulk excavations and at the precise locations of any post-war pile foundations / boreholes, will the risk from deeper buried German HE UXBs have been completely mitigated. At any location on site where no known bulk excavations have been carried out, the risk from deep buried UXO remains unmitigated to the maximum bomb penetration depth

[10] Kent Live – 1st July 2017

10.3 The Likelihood that Ordnance may be Encountered during the Works

The following table discusses the likelihood that UXO could be encountered on site during the proposed works.

At-Risk Scenarios	The most likely scenarios under which a UXO could be encountered during construction works is during piling, drilling operations or bulk excavations for basement levels. The overall risk will depend on the extent of the works, such as the numbers of boreholes/piles (if required) and the volume of the excavations. Since an air-dropped bomb may come to rest at any depth between just below ground level and its approximate penetration depth there is also a chance that such an item could be encountered during shallow excavations (for services or site investigations) into the original WWII ground level. If the proposed works are due to be undertaken within post war fill material / made ground, the risk of encountering WWII UXBs is low. However, if works are to be undertaken below WWII ground level this risk is significantly higher.
Likelihood of UXO being encountered during the proposed works	The proposed works comprise ground investigations including machine excavated trial bits and cable percussion boreholes. There is an elevated likelihood of UXO being encountered during these works.

10.4 The Risk that Ordnance may be Initiated

Items of ordnance do not become inert or lose their effectiveness with age. Time can indeed cause items to become more sensitive and less stable. This applies equally to items submerged in water or embedded in silts, clays or similar materials. The greatest risk occurs when an item of ordnance is struck or interfered with. This is likely to occur when mechanical equipment is used or when unqualified personnel pick up munitions.

10.4.1 Initiation of Unexploded Bombs

In the case of unexploded German bombs discovered within the construction site environment, there are a number of potential initiation mechanisms:

Direct Impact onto the main body of the bomb	Unless the fuze or fuze pocket is struck, there needs to be a significant impact to initiate a buried iron bomb.
Re-starting the clock timer in the fuze	Only a small proportion of German WWII bombs employed clockwork fuzes. It is probable that significant corrosion has taken place within the fuze since the end of WWII that would prevent clockwork mechanisms from functioning, nevertheless it was reported that the fuze in a UXB dealt with by 33 EOD Regiment in Surrey in 2002 did recommence.
Induction of a static charge, causing a current in an electric fuze	The majority of German WWII bombs employed electric fuzes. It is probable that significant corrosion has taken place within the fuze mechanism since the end of WWII such that the fuze circuit could not be activated.
Friction impact initiating the (shock-	This is the most likely scenario resulting in the bomb detonating.

sensitive) fuze explosive	

10.4.2 Activities that may Result in the Initiation of Unexploded Ordnance

Unexploded bombs do not spontaneously explode. All high explosive requires significant energy to create the conditions for detonation to occur. The risk that UXO could be initiated if encountered will depend on its condition, how it is found and the energy with which it is struck. However certain activities pose a greater risk than others.

Percussive piling or deep mechanical excavations	The most violent activity on most construction sites is percussive piling or deep mechanical excavations. If an item is struck with a significant enough impact, be it direct or through friction/vibration, it risks detonation.
Shallow excavation	Soil levelling and shallow excavation such as trial pits can pose a similar risk to deeper excavations, since UXO can be found at any depth between ground level and the maximum bomb penetration depth. In addition to risk of initiation by violent impact or vibration, detonation can also occur if discovered items are mishandled by unqualified personnel. This is particularly common when onsite personnel are not trained in the recognition of ordnance.
Non-intrusive works	In the case of non-intrusive planned works, little risk is posed by items of UXO that are buried beneath the ground. However, risk can arise from unburied munitions, particularly items of ordnance discarded in periphery areas of military sites. These items are frequently discovered by onsite personnel and remain live and liable to activate if mishandled.

10.5 The Consequences of Encountering or Initiating Ordnance

Clearly the consequences of an inadvertent detonation of UXO during construction operations would be catastrophic with a serious risk to life, damage to plant and a total site shutdown during follow-up investigations.

Since the risk of initiating ordnance is significantly reduced if appropriate mitigation measures are undertaken, the most important consequence of the discovery of ordnance will be economic. This would be particularly so in the case of high-profile locations and could involve the evacuation of the public.

The unexpected discovery of ordnance may require the closing of the site for any time between a few hours and a week with a potentially significant cost in lost time. Note also that the suspected find of ordnance, if handled solely through the authorities, may also involve loss of production since the first action of the Police in most cases will be to isolate the locale whilst awaiting military assistance, even if this turns out to have been unnecessary.

The following tables review a number of finds over recent years both in the UK and overseas that have seen large-scale disruptions, damage and injury/death:

UXB Incidents where intrusive works have caused detonation, resulting in death, injury and damage to plant	
 RESCUE workers search for survivors after a Second World War bomb exploded at a building site in Berlin, killing three people and injuring at least eight others. A fire brigade spokesman said he feared the final death toll could be higher. One worker was still missing, believed to be trapped under a machine. "We've found human remains 100 metres away but we can't tell if they belong to the dead already found," the spokesman said. The blast, set off by drilling work on Frankfurter Allee, one of east Berlin's busiest avenues, trapped workers under building machinery and sent huge chunks of concrete tumbling through the air. A large office block was being built on the site of the explosion which sent shoppers scrambling for shelter and paralysed dense afternoon traffic. One eyewitness said: "There was a bang, then silence, and then it started raining stones and dirt." Dozens of cars within a 250-metre radius were wrecked and the top two floors of a nearby apartment block caved in. Radio reports claimed that the total number of injured stood at 14. **Blown up by history**	A WWII bomb killed 3 and injured 8 in Berlin - 1994
	WWII bomb killed 3 in Goettingen, Germany – 2010.
	Excavator operator killed by WWII bomb in Euskirchen, Germany – 2014. A WWII bomb exploded at a construction site near a west German town, killing a man and injuring 8 others. The explosion occurred with a digger accidently struck the device during excavation works.

UXB Incidents where intrusive works have caused detonation, resulting in death, injury and damage to plant	
	A highway construction worker in Germany accidentally struck a WWII bomb, killing himself and wrecking several passing cars – 2006.
	Destroyed piling rig and dump truck after detonation of WWII UXB in Austria – 2006.
	WWII bomb injures 17 at construction site in Hattingen, Germany – 2008.
	A buried WWII-era bomb exploded during construction works in Bandar Malaysia, Kuala Lumpur – 2017.

UXB Incidents in the UK, resulting in delays, site shutdowns, evacuations, and disruptions	
	London City Airport shut: Flights cancelled after WWII bomb found in River Thames dock. London City Airport was closed after the discovery of a 250kg WWII German bomb, affecting tens of thousands of passengers. All flights into and out of the airport were stopped after the device was found by SafeLane Global in the nearby King George V dock. A 700ft exclusion zone was put in place and people living nearby were evacuated.
	Unexploded WWII 1000kg HE bomb found in Exeter, causing a construction site and the surrounding area to be evacuated. The subsequent detonation caused substantial damage to nearby buildings.
	A WWII UXB was found near to the Aston Expressway, leading to the evacuation of around 200 residents and a 500m cordon. Following the discovery, the weapon was safely detonated by the Army. However, although the M6 was reopened after the blast, the key Aston Expressway stayed shut until 6pm, extending traffic disruption. All nearby rail services and other roads were also disrupted.
	Up to 1000 homes were evacuated and a 300m exclusion zone was put in place following the discovery of a WWII UXB in Lansdown Road, Bath. The 500lb bomb was found just a meter beneath a playground at the former Royal High Junior School.

11 SafeLane Global's Risk Assessment

The Risk Assessment made by SafeLane Global for the site is based upon the likelihood that the site was contaminated, the risk of the contaminant item remaining, and the likelihood of, and potential consequences, should the item be struck during the proposed works. The following section discusses the risk that each ordnance type presents to the scope of works for the project site.

11.1 Conclusions

Taking into consideration the findings of this study, SafeLane Global considers the UXO risk at the site to be Medium.

Type of Ordnance	Likelihood of Contamination	Likelihood of UXO remaining	Likelihood of encounter	Potential Consequence	Overall Risk level
German High Explosive Bombs	Medium	Medium	Medium	Severe	**Medium**
German 1kg Incendiary Bombs	Medium	Low	Low	Severe	**Low**
Allied Anti-Aircraft Shells	Medium	Medium	Medium	Minor	**Medium**
British / Allied Small Arms	Medium	Medium	Medium	Not Significant	**Medium**
Land Service Ammunition	Medium	Medium	Medium	Moderate	**Medium**

12 Proposed Risk Mitigation Strategy

SafeLane Global recommends the following minimum risk mitigation measures be deployed to support the proposed ground works at the site.

12.1 Summary

Based on the findings of the report, the following mitigation measures have been recommended for the proposed works on the site. Further detail on each method is presented in **Section 12.2**.

Risk Level	Planned Site Activity	Recommendations
Medium	Shallow Intrusive Works eg. excavations	• UXO Safety & Awareness Briefing (Toolbox Brief, TBB) • Site Specific Safety Instructions (SSSIs) Training Course • Explosive Ordnance Disposal (EOD) Engineer to support Site Investigation (SI) • Non-Intrusive (NI) Magnetometer Survey (Greenfield areas only) • Target Investigation (Required as a follow-on from NI magnetometer survey)
	Deep intrusive works (eg. piling)	• UXO Safety & Awareness Briefing (Toolbox Brief, TBB) • Site Specific Safety Instructions (SSSIs) Training Course • Intrusive Magnetometer Survey of pile/borehole positions

12.2 Additional Notes

Risk Mitigation Measures – Further Detail	
Site Specific Explosive Ordnance Safety and Awareness Briefings (UXO Toolbox Briefing) to all personnel conducting intrusive works	These briefings are intended to make site operatives aware of the nature of explosive ordnance that may be encountered on their project site. • Delivered by a specialist Explosive Ordnance Disposal Engineer. • Provides information on the site-specific explosive ordnance risk • Basic ordnance identification. • What to do in the event of an encounter with a suspicious object. • Provide UXO response procedures.
Site Specific Safety Instruction (SSSI)	For longer term projects that require Explosive Ordnance Safety and Awareness Briefings as part of the Explosive Ordnance Risk Mitigation measures for the project, SSSIs can be provided to allow nominated site representatives to deliver these briefings after initial training. • 2/3-hour presentation and training course. • Delivered by a fully qualified senior EOD Engineer.

	• Suitable for Project Site Manager HSE representative and supervisors. • Includes briefing pack. This provides a cost-effective solution to ensure that the Explosive Ordnance Safety and Awareness Briefings can be delivered effectively and efficiently to the required standard.
Explosive Ordnance Disposal (EOD) Engineer On-Site Support	In areas where the risk posed by the potential presence of explosive ordnance is low or where the conditions are not suitable for pro-active survey, EOD On-Site Support can provide a reactive response to any suspicious object that may be encountered during open excavation works. The presence of the EOD Engineer (sometimes referred to as 'high risk dig wardens') on-site in support of shallow intrusive work allows for a direct monitoring of works using visual recognition and instrumentation and provides an immediate response to reports of suspicious objects or suspected items of ordnance that have been recovered by ground workers. SafeLane Global EOD personnel on-site also have the additional benefit of providing Explosive Ordnance Safety and Awareness briefings (UXO TBB) to any staff that have not received them earlier and can advise staff of the need to modify working practices to take account of the ordnance threat. The EOD Engineer will also aid potential incident management which would involve liaison with the local authorities and police should ordnance that presents an explosive hazard be identified. • Specialist Explosive Ordnance Disposal Engineer. • Maintains a watching brief over all excavations. • Provides safety and awareness briefings to construction personnel as required. • Provides immediate identification of any suspicious item that is encountered. • Identifies whether any UXO item is live or inert. • Provides liaison assistance with the relevant authorities when dealing with any live UXO. Avoids on site delays which can be caused by the incorrect identification of a suspect item being potential UXO.
Explosive Ordnance Disposal (EOD) Engineer to support site investigation works	For cost effective Explosive Ordnance Risk Mitigation for site investigation work, the EOD Engineer can survey ahead of trial pits, monitor excavations when the ground conditions are not suitable for a pro-active survey and conduct intrusive surveys for borehole and window sample locations working in conjunction with the site investigation team. The On-Site Support will also provide a reactive response to any suspicious object that may be encountered during open excavation works. SafeLane Global EOD personnel on-site also have the additional benefit of providing Explosive Ordnance Safety and Awareness briefings to any staff that have not received them earlier and can advise staff of the need to modify working practices to take account of the ordnance threat. The EOD Engineer will also aid potential Incident Management which would involve liaison with the local authorities and police should ordnance be identified and present an explosive hazard.

	• Specialist Explosive Ordnance Disposal Engineer. • Maintains a watching brief over all trial pit excavations. • Provides safety and awareness briefings to construction personnel as required. • Works in conjunction with the drilling team to survey all borehole and window sample locations in real-time using a staged drilling and magnetometer survey procedure. • Provides immediate identification of any suspicious item that is encountered. • Identifies whether any UXO item is live or inert. • Provides liaison assistance with the relevant authorities when dealing with any live UXO. • Avoids on site delays which can be caused by the incorrect identification of a suspect item being potential UXO. *Technical Information* 1. In optimum ground conditions each survey using the borehole technique will have a 1 metre look ahead capability. 2. Any steel casing used for borehole surveys will need to be retracted by 3 metres to allow the magnetometer survey to be conducted. Non-ferrous pipe will be required to support the borehole during the survey minimum diameter 60mm (to be supplied by the client).
Search & Clear	Where a non-intrusive magnetometer survey is not possible (e.g. wooded areas) SafeLane Global can deploy a two-man Explosive Ordnance Disposal Engineer team using handheld magnetometer equipment who will proactively survey either in search lanes or boxes, investigating each reading with the support of an operated excavator. The survey is suited to detecting suspicious ferro-magnetic buried objects that may be munitions and/or explosive ordnance related. All SafeLane Global personnel involved with the Search and Clearance Works will be former military personnel who have gained formal NATO Military Explosive Ordnance Disposal Qualifications, having completed training at the Defence Explosive Ordnance Disposal School (DEODS) Chattenden, Kent or similar establishment throughout their military service. The client will be responsible for: • Demarcating the areas to be searched. • Providing services clearance and permit to dig. • Providing operated excavator to access deeper targets if required (SafeLane Global can provide this service at additional cost). • Providing coordinates of positions where debris have been identified (if information required in report). • Providing storage for recovered debris. Output will depend upon terrain and contamination (number of readings to be investigated).

Non-Intrusive Magnetometer Survey and Target Investigation (greenfield land only)	**Non-Intrusive Survey** This survey type is designed for use on magnetically 'clean' land commonly referred to as 'greenfield'. Brownfield land is often described as that which has had previous industrial or commercial use. In this context it specifically encompasses sites with are underlain by 'made ground' which may contain metallic contamination. Non-intrusive magnetometry or electromagnetic equipment which is used in the search for buried UXO relies upon the detection of small changes between clear ground and that containing UXO. The technique operates very successfully in environments where there is minimal ground contamination from other sources such as fired bricks, reinforced concrete, discarded scrap metal and buried services. There are also man-made ambient effects on magnetic and electromagnetic non-intrusive survey systems which include moving plant vehicles, power cables, electric trains etc. Non-Intrusive survey is carried out using either total-field or gradiometer magnetometry, dependent upon site conditions. Data is recorded and then interpreted using advanced AGSPRoc software in order to map magnetic fields and model discrete magnetic anomalies (variations in the Earth's magnetic field caused by ferro-magnetic objects electrical fields or geology). The location of such anomalies is determined, and mathematical modelling used to estimate their mass and depth. The survey will also locate any buried services with a magnetic signature and indicate any areas of gross magnetic "contamination" which may indicate the presence of unknown obstructions. Additionally, the survey can provide information on archaeological features. The system can detect the magnetic field from a 50kg WWII air-dropped bomb at a depth of 4m and smaller items such as Land Service Ammunition to depths of up to 1.5m in ground with a low ambient magnetic field. In the case of soft geology, it should be noted that a 50kg high explosive bomb may be buried greater than 4 metres below ground level and therefore may not be detected by the survey. In this instance intrusive surveys may be required. The non-intrusive survey system will be deployed utilising the pedestrian survey frame. The output for the pedestrian frame is estimated at up to 2Ha per day. *Technical information:* • Client to clearly demarcate area to be surveyed prior to start and highlight any known services/underground obstructions. • Ground must be level, free of obstacles / obstructions and clear of undergrowth. Height of any crops should be no more than 400mm and where crops are present SafeLane Global would require written approval from the landowner or client to walk over the site area. • When working adjacent to existing infrastructure the survey may be ineffective due to the ferro magnetic interference caused by passing vehicles and the presence of underground buried services. A site visit may be recommended prior to commencement. • Note: the survey will be ineffective on Brownfield sites due to the magnetic nature of building rubble, which typically masks the weaker magnetic signatures of buried objects. If parts of the site are contaminated, then alternative risk mitigation measures may need to be considered. **Target Investigation**

	If a buried anomaly is detected that cannot be discounted as a potential UXO / UXB then the object will need to be investigated to positively identify the item. The process will include; • Specialist two-man Explosive Ordnance Disposal Team. • Combination of manual and mechanical excavation techniques. • Excavator shafting, shoring and dewatering equipment can be provided by SafeLane Global if required. • Excavation techniques will be defined and agreed prior to the commence. A factual report with clearance certificate will be issued on completion of the investigation.
Intrusive Magnetometer Survey of all pile locations down to the maximum bomb penetration depth	SafeLane Global can deploy a range of intrusive magnetometry techniques to clear ahead of all the pile locations. The appropriate technique is governed by a number of factors, but most importantly the site's ground conditions. The appropriate survey methodology would be confirmed once the enabling works have been completed. A site meeting would be required between SafeLane Global and the client to determine the methodology suitable for this site. Target investigation or avoidance will be recommended as appropriate.

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The key sources consulted during this assessment are listed below;

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iii. Fegan, T., *The Baby Killers': German Air raids on Britain in the First World War*, (Leo Cooper Ltd. 2002).

iv. Fleischer, W., *German Air-Dropped Weapons to 1945*, (Midland Publishing. 2004).

v. Jappy, M. J., *Danger UXB: The Remarkable Story of the Disposal of Unexploded Bombs during the Second World War*, (Channel 4 Books, 2001).

vi. Price, A., *Blitz on Britain, The Bomber Attacks on the United Kingdom 1939 – 1945*, (Purnell Book Services Ltd. 1977).

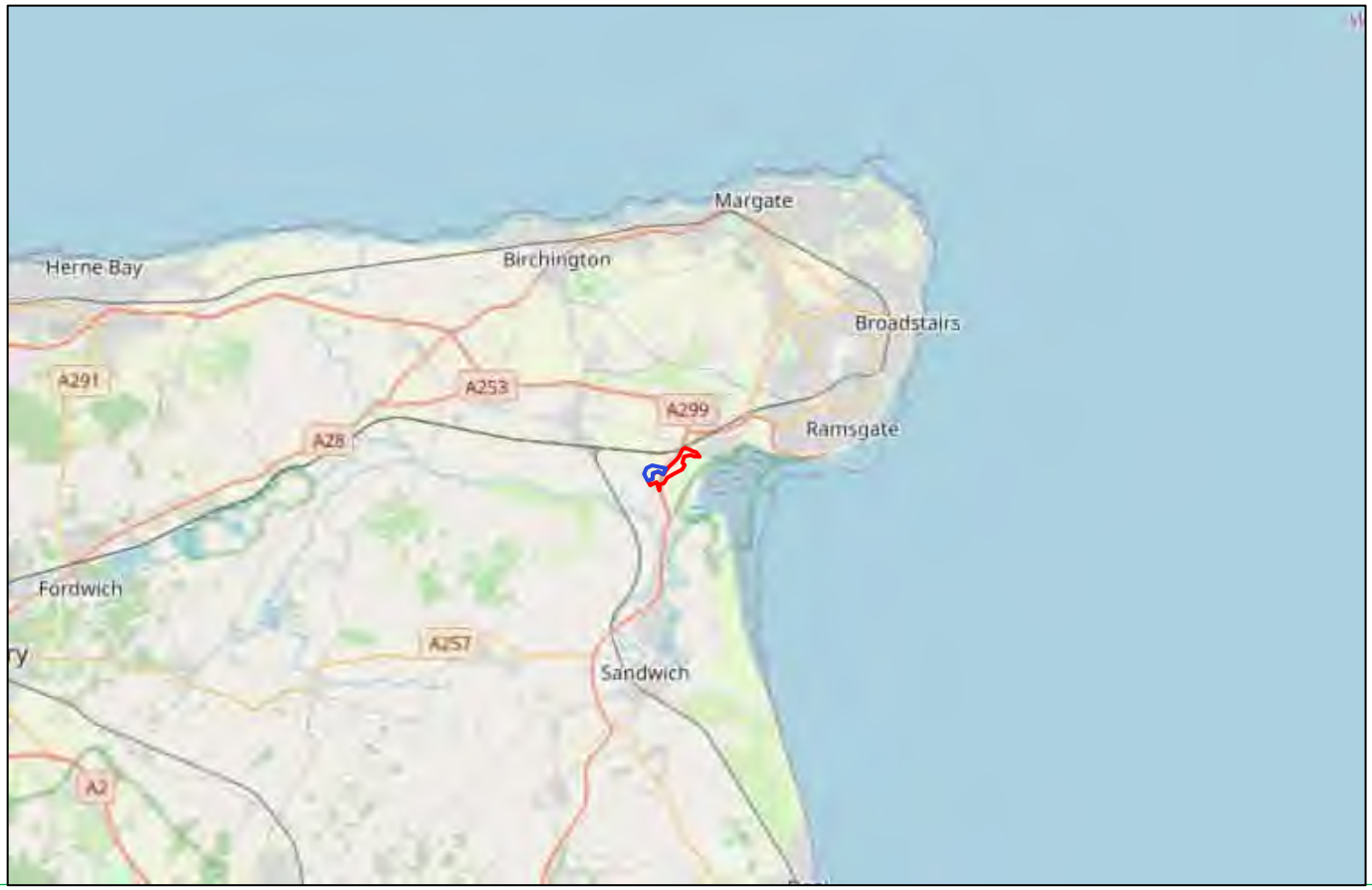
vii. Ramsey, W., *The Blitz Then and Now, Volume 1*, (Battle of Britain Prints International Limited. 1987).

viii. Ramsey, W., *The Blitz Then and Now, Volume 2*, (Battle of Britain Prints International Limited. 1988).

ix. Ramsey, W., *The Blitz Then and Now, Volume 3*, (Battle of Britain Prints International Limited. 1990).

x. Whiting, C., *Britain Under Fire: The Bombing of Britain's* Cities 1940-1945, (Pen & Sword Books Ltd. 1999).





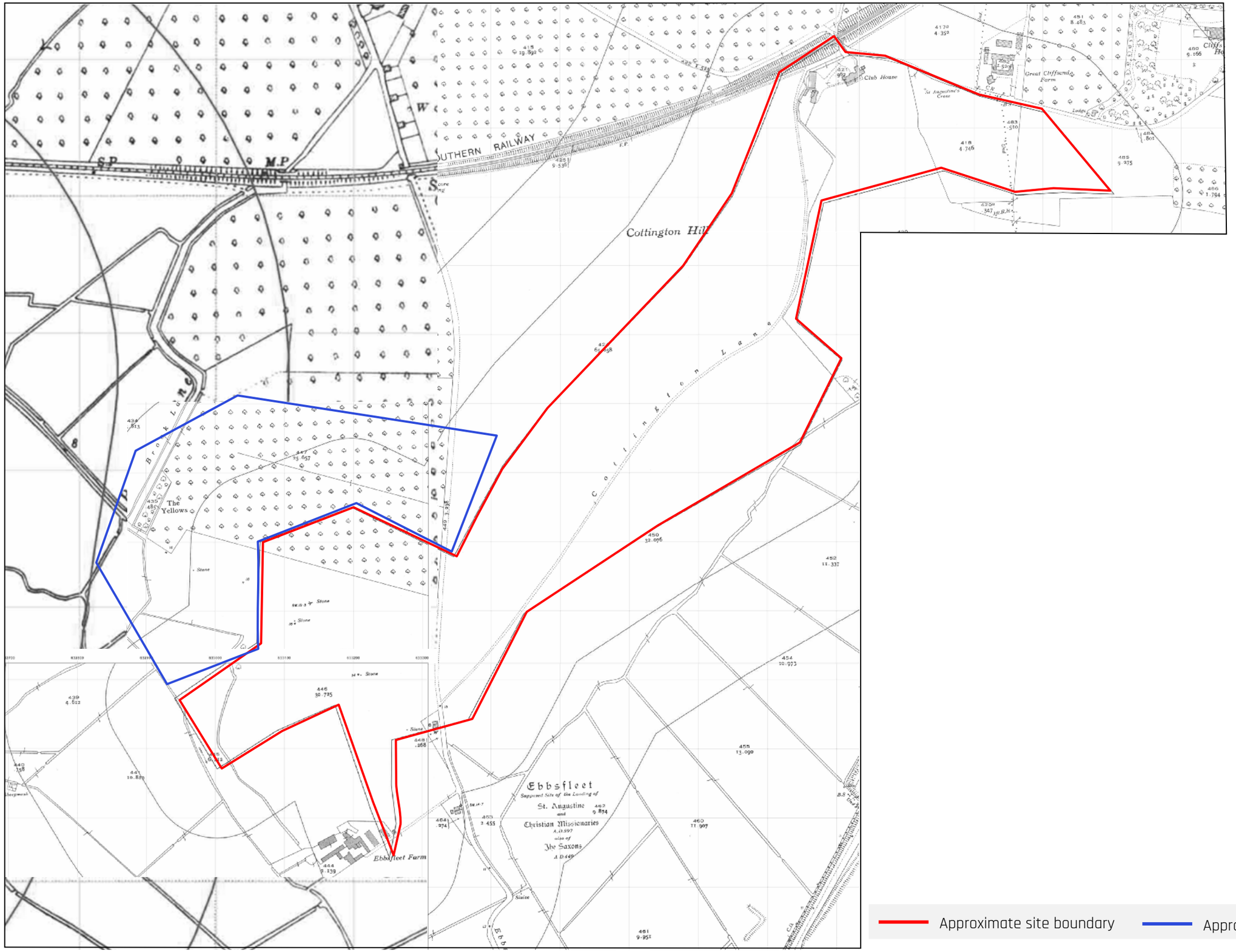
© OpenStreetMap contributors

Recent Aerial Photograph

N



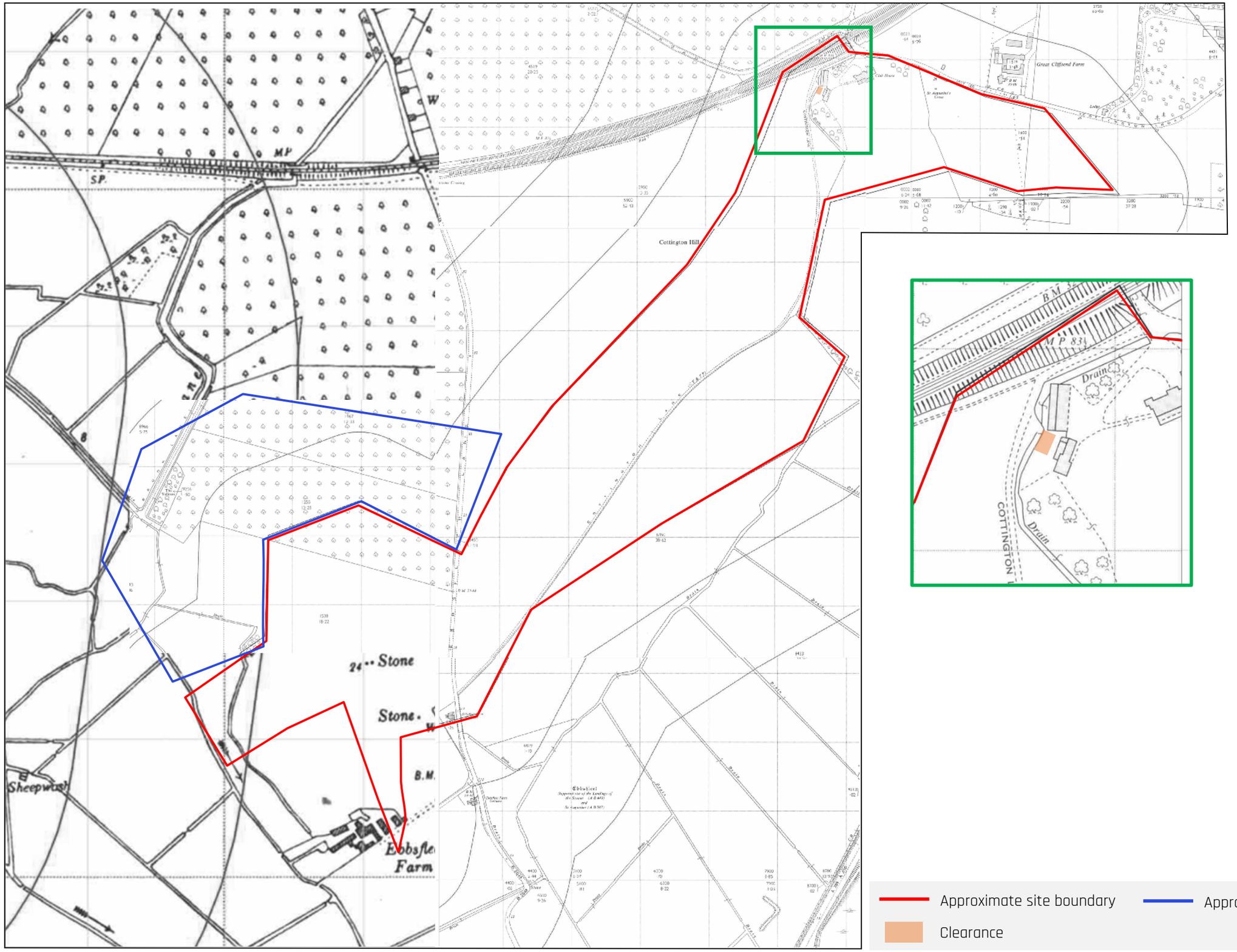
Approximate site boundary Approximate extension area



N

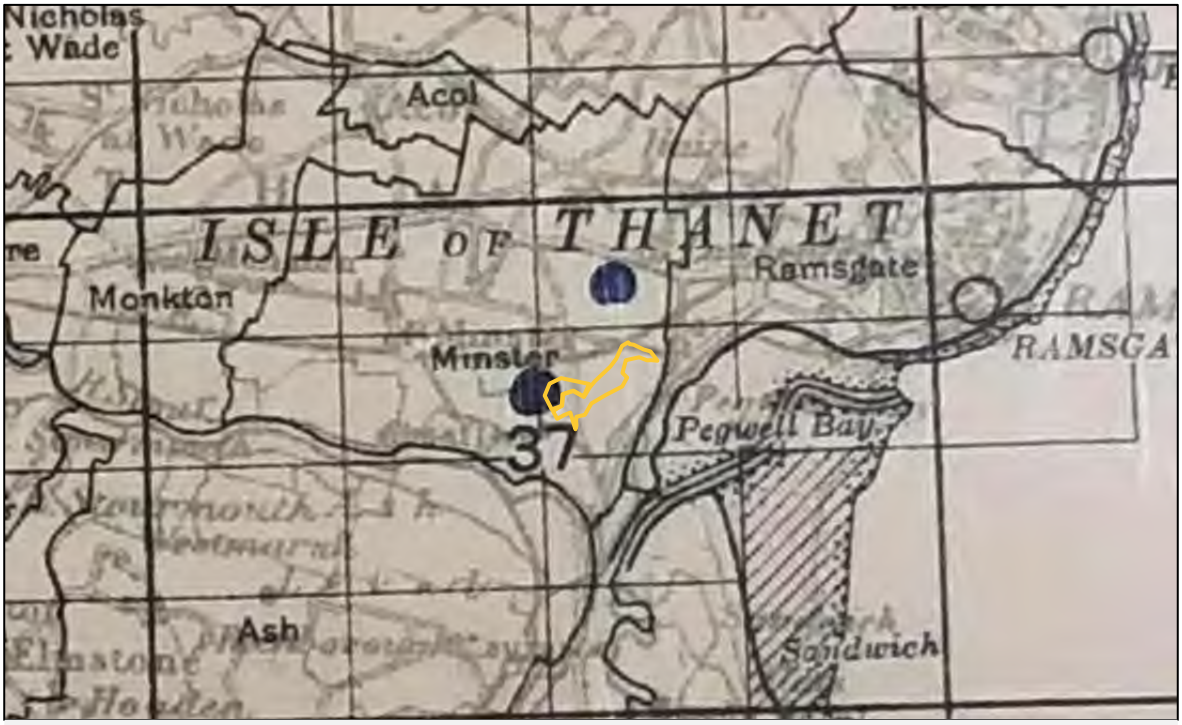
Approximate site boundary

Approximate extension area


N
Great Cliffsend Farm
Cottington Hill
Stone
Sheepwash
Ebbsfleet Farm
B.M.
M P 833
Drain
COTTINGTON
Approximate site boundary
Approximate extension area
Clearance



9th July 1940



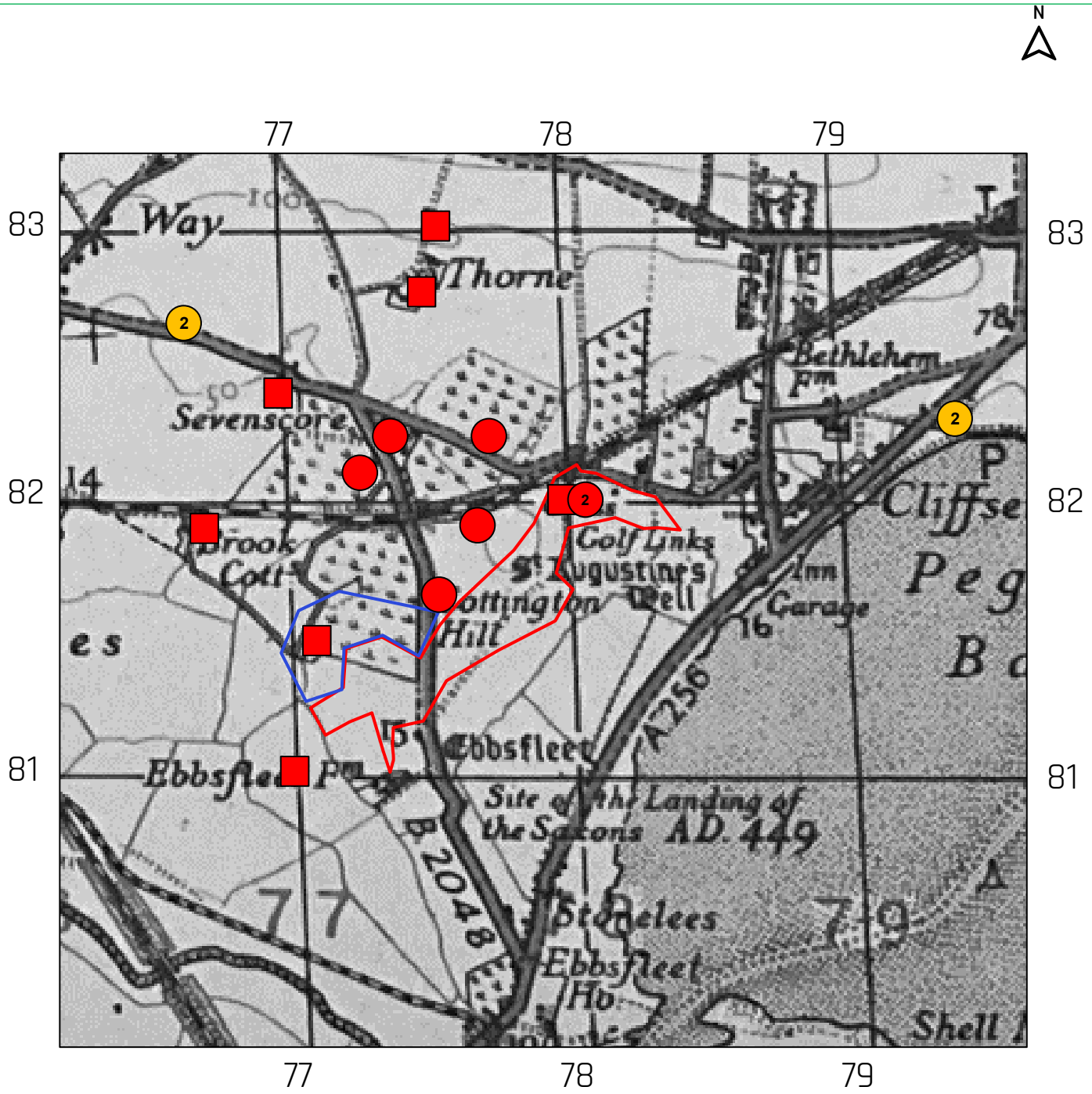
6th November 1940

Approximate site boundary

HE bomb strike

Incendiary shower

HE bomb area



Approximate site boundary

Approximate extension area

HE bomb

Unexploded HE bomb

Incendiary bomb

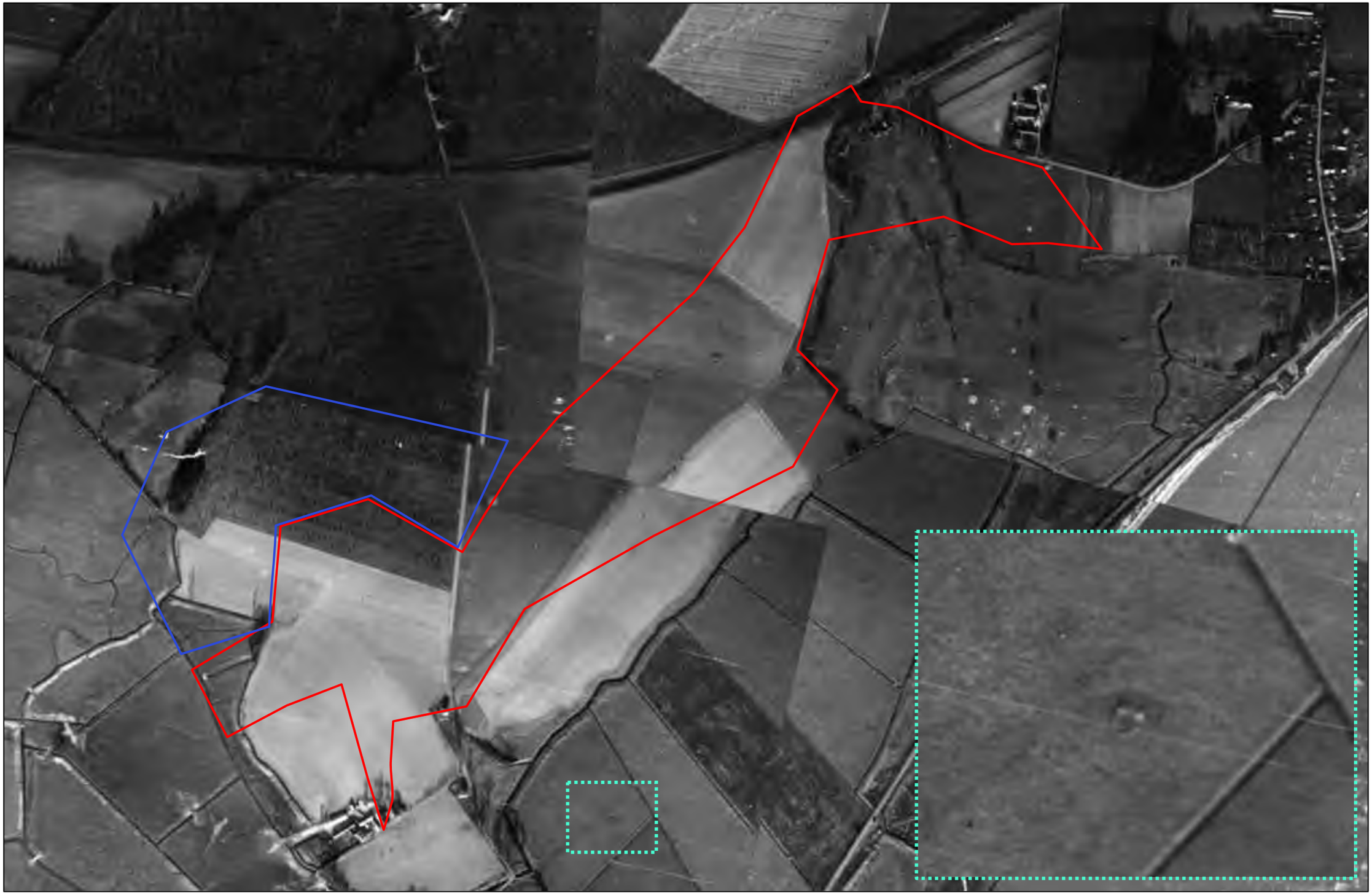
(Numbers in circles denote quantity of explosive ordnance recorded)

WWII-era RAF Aerial Photography – 3rd March 1942



Approximate site boundary Potential ground disturbance AA gun site

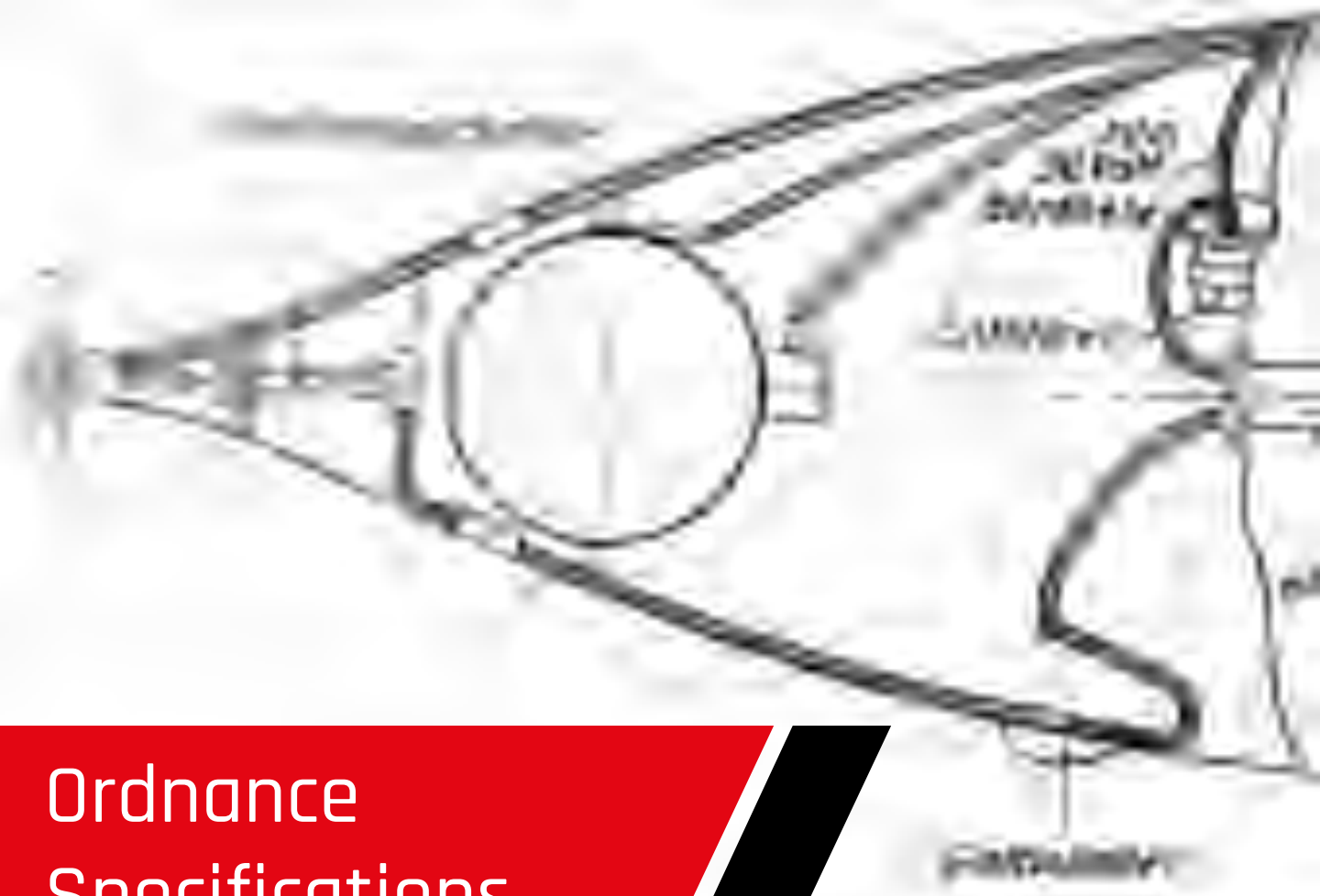
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Approximate site boundary

Potential ground disturbance

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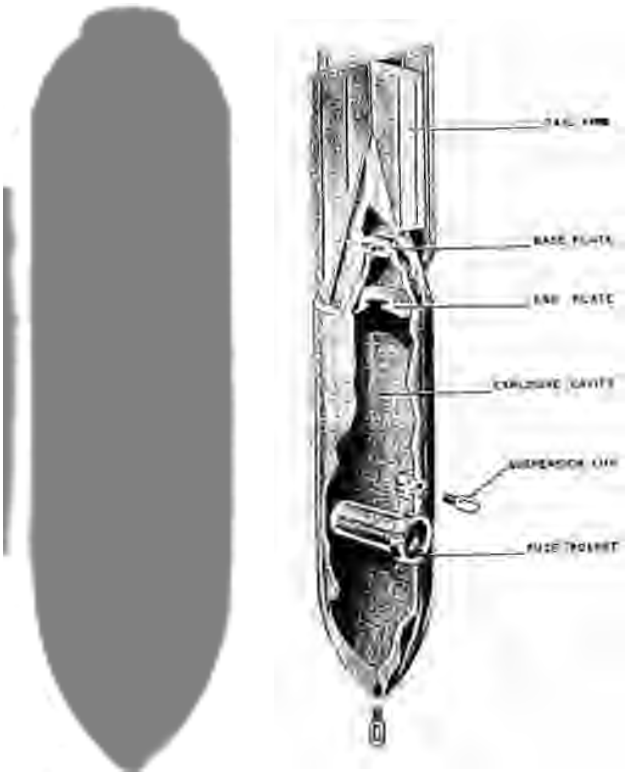


Ordnance Specifications and Information





German Ordnance





Sprengbombe Cylindrisch 50

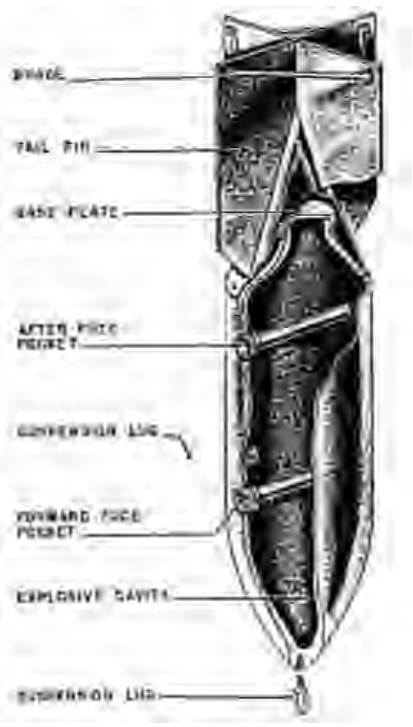
Bomb weight: 40-54kg
Fuze Type: Impact fuze / electro-mechanical time delay fuze
Bomb Dimensions: 1090 x 280mm
Body Diameter: 200mm
Use: Used against lightly damageable materials, hangars, railway rolling stock, ammunition depots, light bridges and buildings up to 3-storeys.
Remarks: The smallest and most common conventional German bomb. Nearly 70% of bombs dropped on the UK were 50kg.

SC50 found on site

In May 2015, an SC50 was found at a building site on Empire Way, Wembley, London. (*Image source: The Guardian*)







Sprengbombe Cylindrisch 250

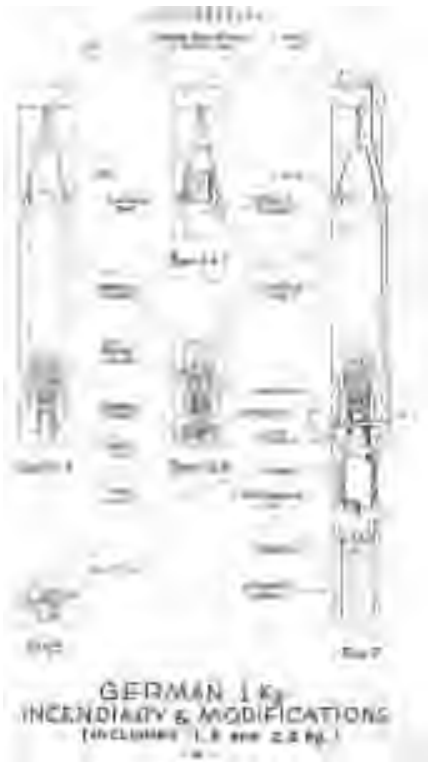
Bomb weight: 245-256k
Explosive Weight: 125-130kg
Fuze Type: Electrical impact / mechanical time delay fuze
Bomb Dimensions: 1640x512mm
Body Diameter: 368mm
Use: Used against railway installations, embankments, flyovers, underpasses, large buildings and below-ground installations.

SC250 found on site

In the year 2000, SafeLane Global discovered an SC250 whilst supervising construction work at Hawkinge, Kent.









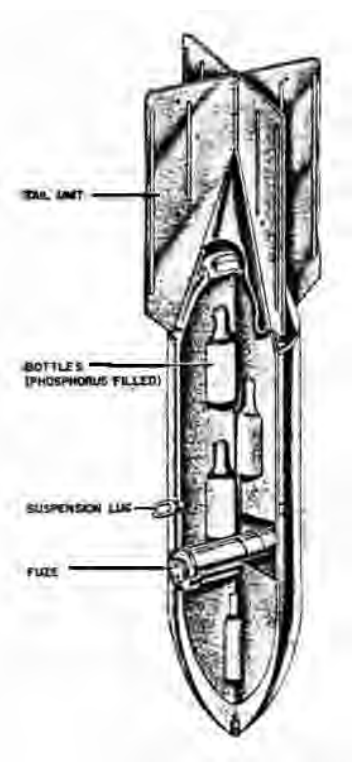
Above: Left – ordinary scaffold pipe, centre - 1kg incendiary bomb, right - incendiary bomb recently found on site in UK

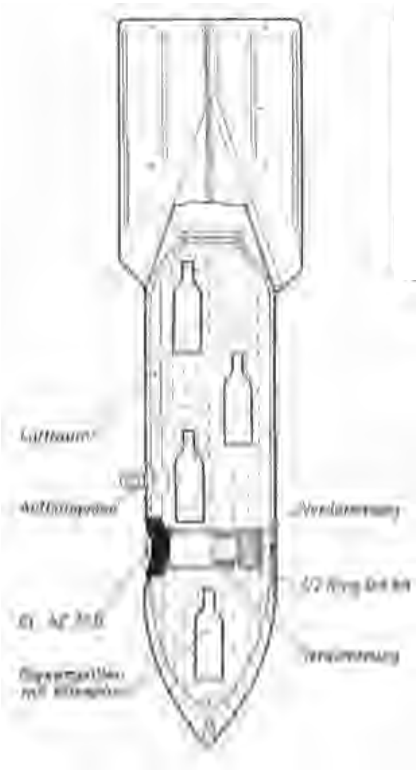
1kg Incendiary Bomb (IB)

Bomb weight: 1.0 & 1.3kg
Filling: 680g Thermite
Fuze Type: Impact fuze
Body Dimensions: 350x50mm
Body Diameter: 50mm
Use: As incendiary – dropped in clusters against towns and industrial complexes
Remarks: Jettisoned from air-dropped containers. Magnesium alloy case. Sometimes filled with high explosive charge.



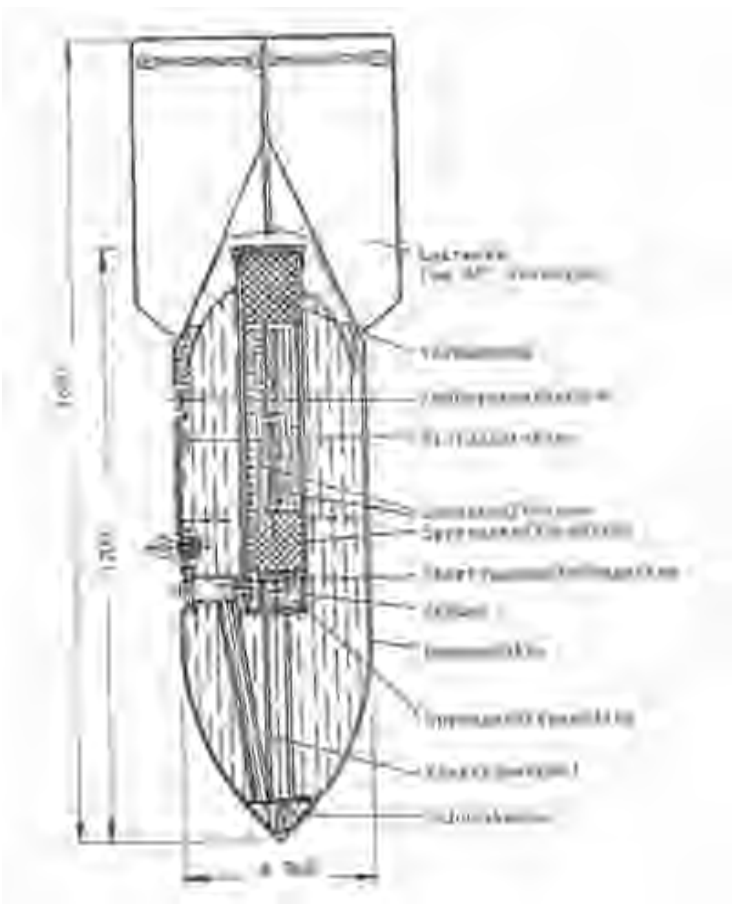






C-50 A Phosphorus Bomb

Bomb Weight: c.41kg
Explosive Weight: 0.03kg
Incendiary Filling: 12kg liquid filling with phosphor igniters in glass phials
Fuze Type: Electrical impact fuze
Bomb Dimensions: 1100x2800mm
Body Diameter: 200mm
Use: Against all targets where an incendiary effect is to be expected
Remarks: Early fill was a phosphorus / carbon disulphide incendiary mixture

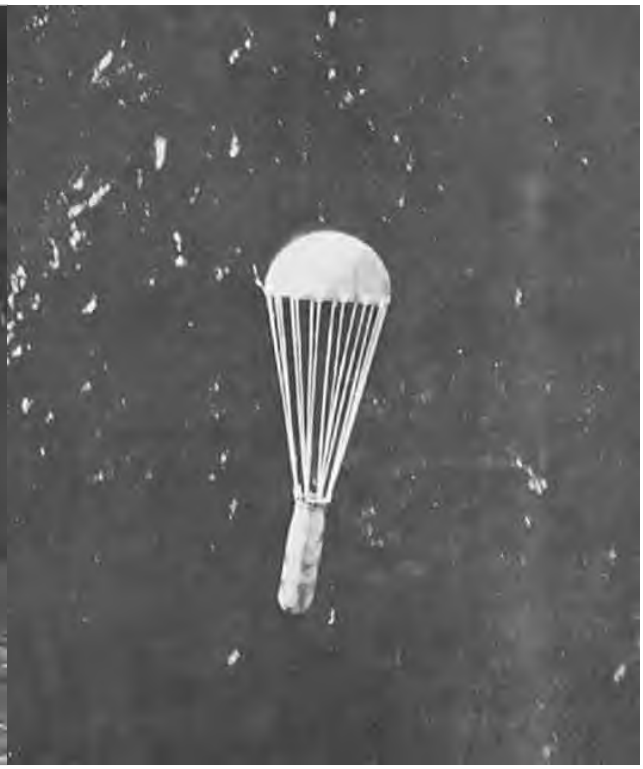




Flam C-250 'Oil Bomb'

Bomb Weight: 125kg
Explosive Weight: 1kg
Flammable Weight: 74kg
Filling: Mixture of 30% petrol and 70% crude oil
Fuze Type: Super-fast electrical impact fuze
Bomb Dimensions: 1650 x 512.2mm
Body Diameter: 368mm
Use: Often used for surprise attacks on living targets, against troop barracks and industrial installations
Remarks: Thin casing – not designed for ground penetration

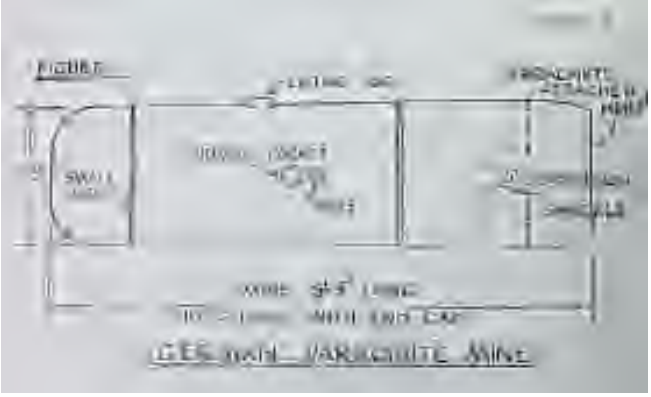


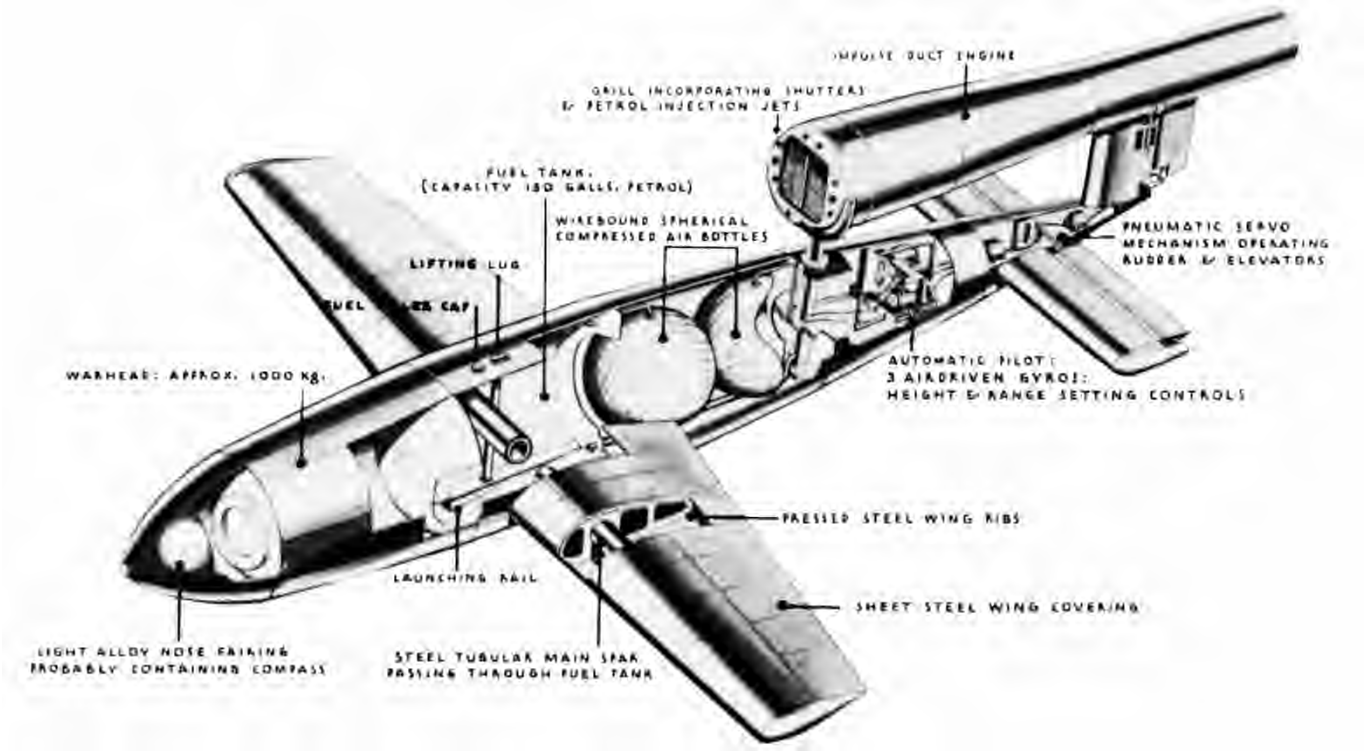


Luftmine A/B 'Parachute Mine'

Bomb Weight: A- 500kg, B – 1000kg
Fuze Type: Mechanical clockwork fuze
Bomb Dimensions: A – 1768mm, B – 2682mm
Use: Capable of creating severe blast damage in built-up areas.
Remarks: Parachute mines were standard German sea mines fitted with a suitable detonator. They were widely used against British cities.





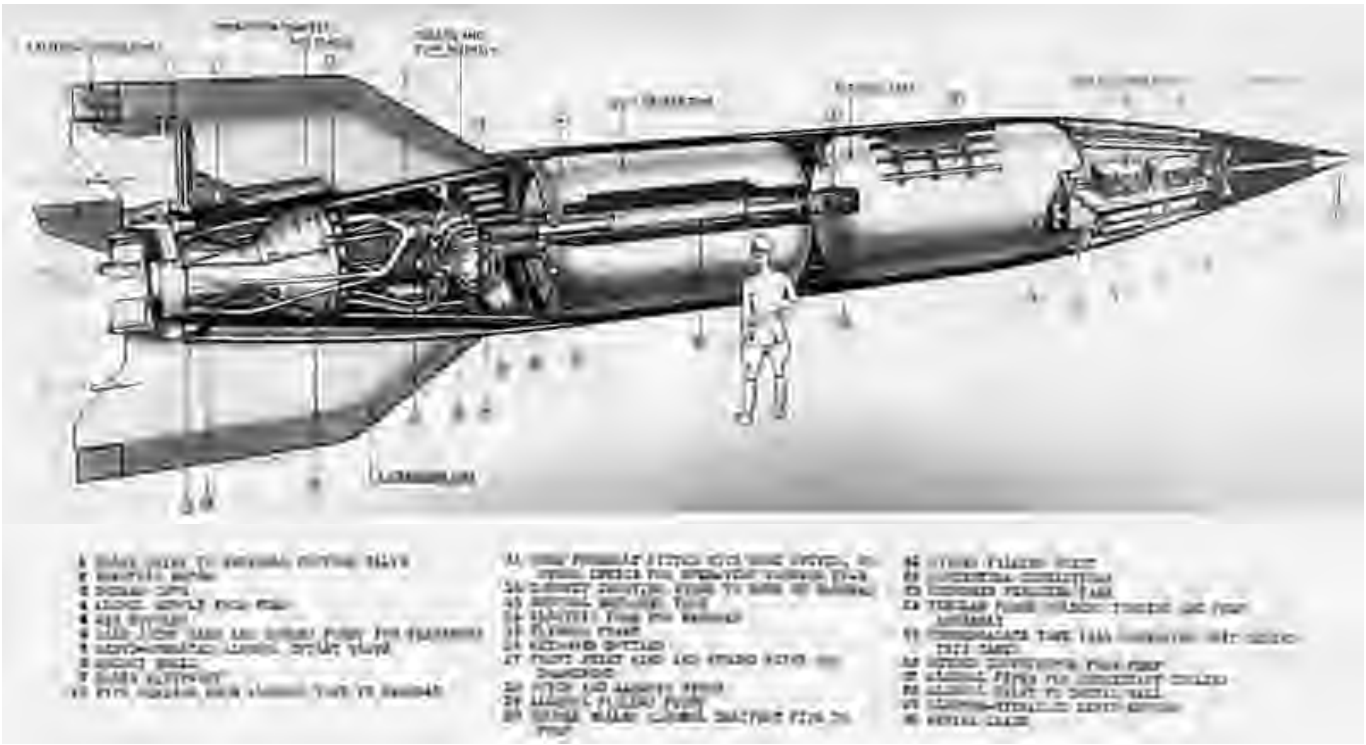


Vergeltungswaffe 1 (V-1) 'Fly' Bomb

Missile Weight: 2,150kg
Fuze Type: Electric Impact Fuze
Missile Length: 8.32m
Width: 5.37m
Range: 250km
Use: Pulsejet-powered guided cruise missile, designed to attack Allied cities.
Remarks: Armed with an 850kg warhead, around 10,000 V-1 flying bombs were fired at England, causing significant damage and killing approximately 6,000 people . There is a negligible risk from unexploded V-1s today, since the remains would have left incontrovertible evidence of the impact.



A V-1 'Fly' Bomb, captured over London seconds before impacting



Vergeltungswaffe 2 (V-2) Rocket

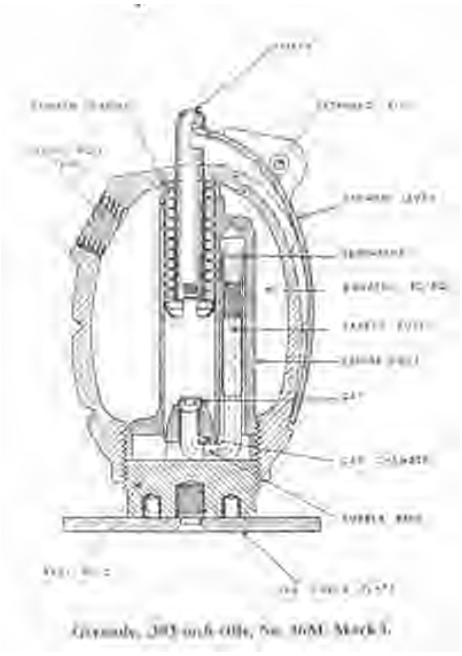
Rocket Weight: 12,500kg
Fuze Type: Electric Impact Fuze
Rocket Length: 14m
Body Diameter: 1.65m
Range: 320km
Use: Long-range ballistic missile, designed to attack Allied cities.
Remarks: Armed with a 975kg warhead and travelling at three times the speed of sound, the V-2 could cause widespread destruction. There is a negligible risk from unexploded V-2s today, since the remains would have left incontrovertible evidence of the impact.





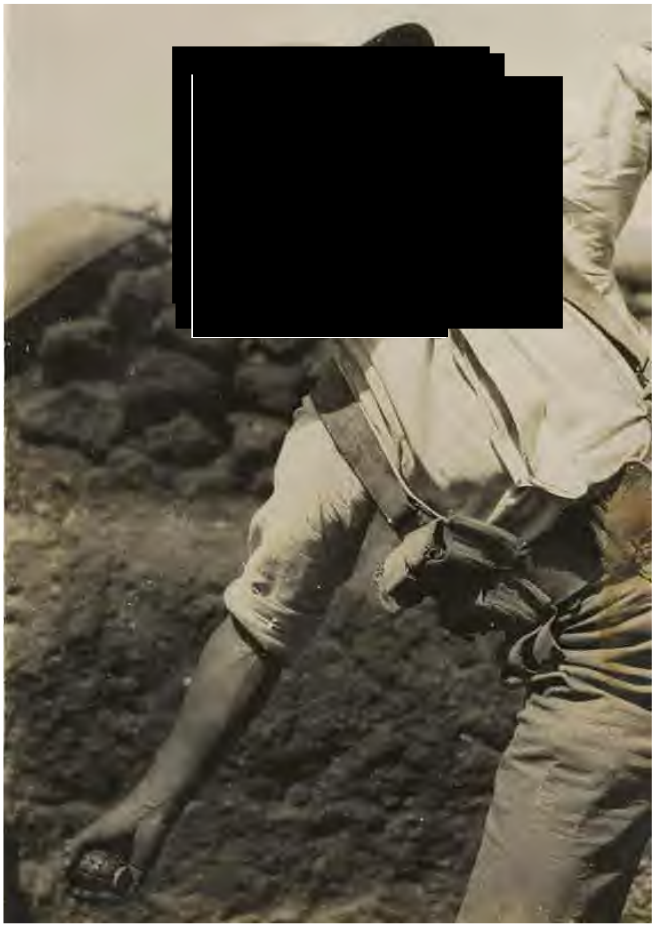
British & Allied Ordnance

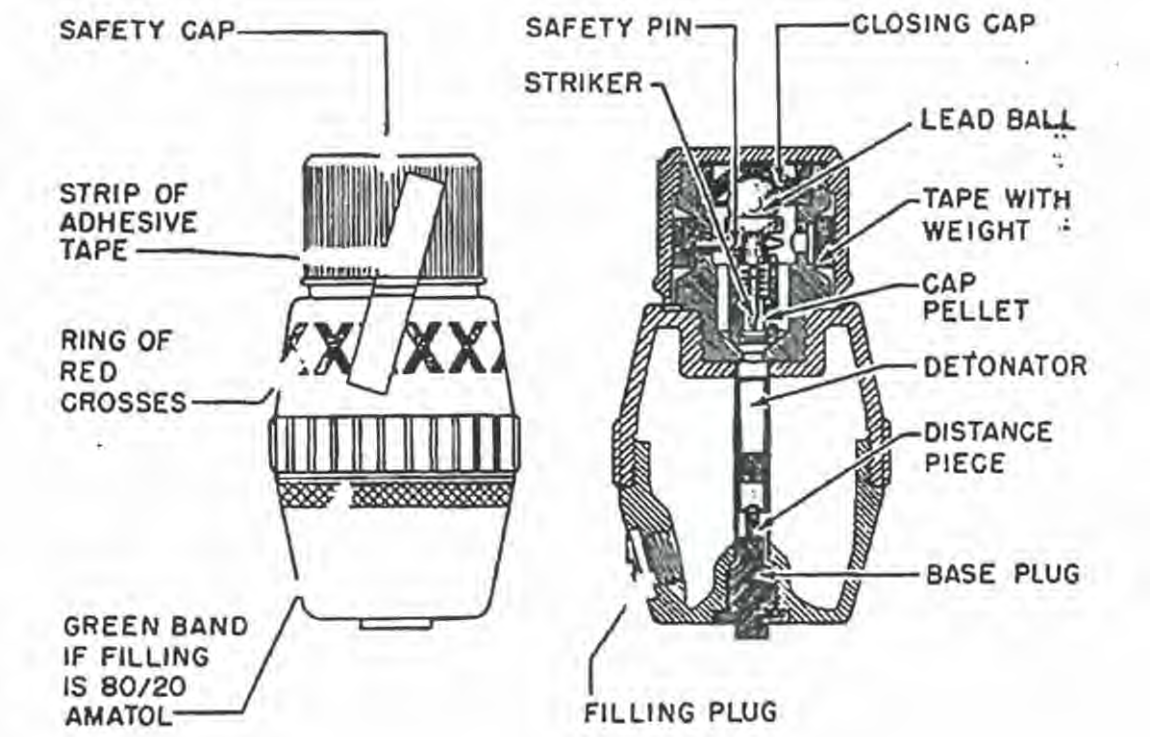




No. 36 “Mills” Grenade

Weight: 0.7kg filled
Type: Hand or discharger, fragmentation
Dimensions: 95 x 61mm
Filling: Alumatol, Amatol 2 or TNT
Remarks: 4 second hand-throwing fuze with approximate range of 30m. First introduced May 1918.



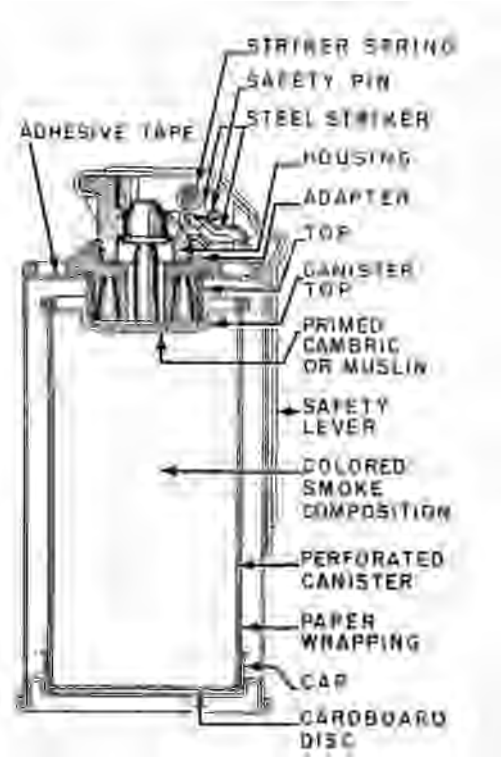


No. 69 Grenade

Weight: 038kg filled
Type: Percussion / Blast
Date Introduced: December 1940
Remarks: Black Bakelite body. Blast rather than fragmentation type. After unscrewing the safety cap, a tape is held when throwing the grenade releasing the safety bolt in the throwing motion. Detection is problematic due to its very low metal content.







Typical Smoke Grenade

Dimensions: Approx. 65 x 115mm
Type: Smoke
Date Introduced: Current MoD issue
Remarks: Smoke grenades are used as ground-to-ground or ground-to-air signalling devices, target or landing zone marking devices, and screening devices for unit movement.





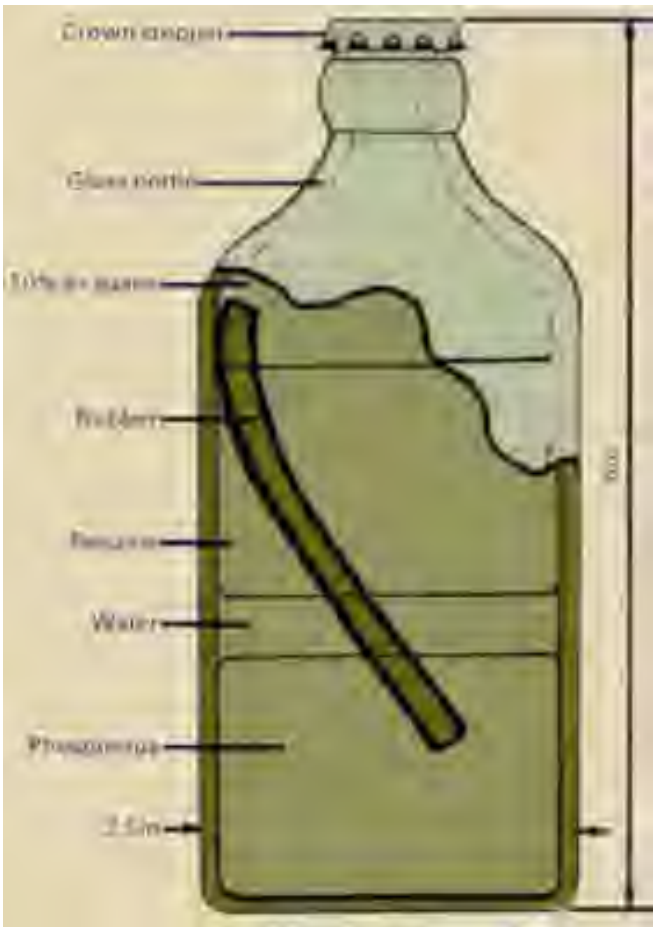


Self-Igniting Phosphorous (SIP) Grenade

Sometimes called the "A&W (Albright & Wilson)" grenade.

The grenade comprised a glass bottle with a total volume of approximately 1 pint. It was filled with white phosphorous, benzene, a piece of rubber and water. Over time, the rubber dissolved to create a sticky fluid which would self-ignite when the bottle broke.

Fired by hand or Northover Projector.

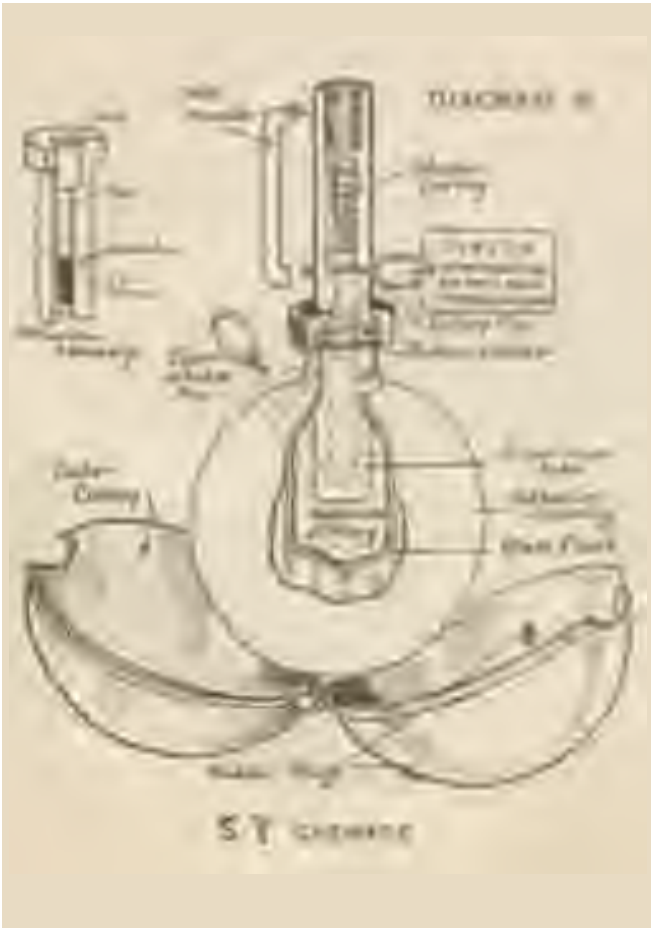






No. 74 Grenade (Sticky Bomb)

Designed as an anti-tank grenade and used by the Home Guard. The grenade consisted of a glass ball on the end of a Bakelite (plastic) handle. Inside the glass ball was an explosive filling whilst on the outside was a very sticky adhesive covering. Until used, this adhesive covering was encased in a metal outer casing.

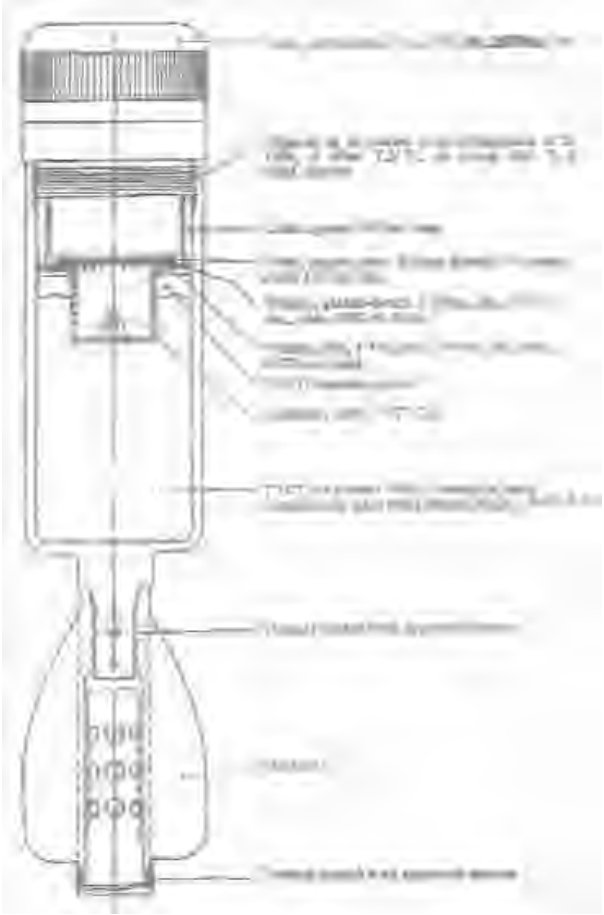






Typical 2" High Explosive Mortar

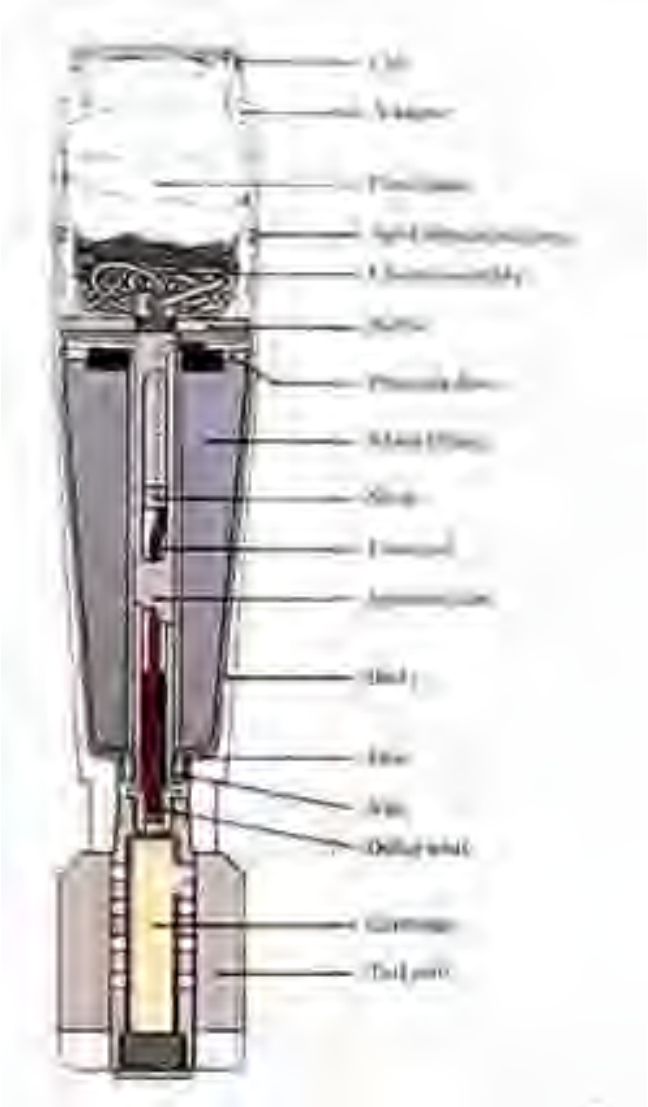
Bomb weight: 1.02kg
Fuze Type: High Explosive
Bomb Dimensions: 51 x 290mm
Filling: 200g RDX/TNT
Remarks: Fitted with an impact fuze which detonates the fuze booster charge (exploder) and, in turn, the high explosive charge. The main charge shatters the mortar bomb body, producing near optimum fragmentation and blast effect at the target.





Typical 2" Illuminating Mortar

Fuze Type: Illuminating
Bomb Dimensions: 51 x 290mm
Filling: Various
Remarks: The expulsion charge ignites and ejects the candle assembly. A spring ejects the parachute from the tail cone. The parachute opens, slowing the descent of the burning candle which illuminates the target.







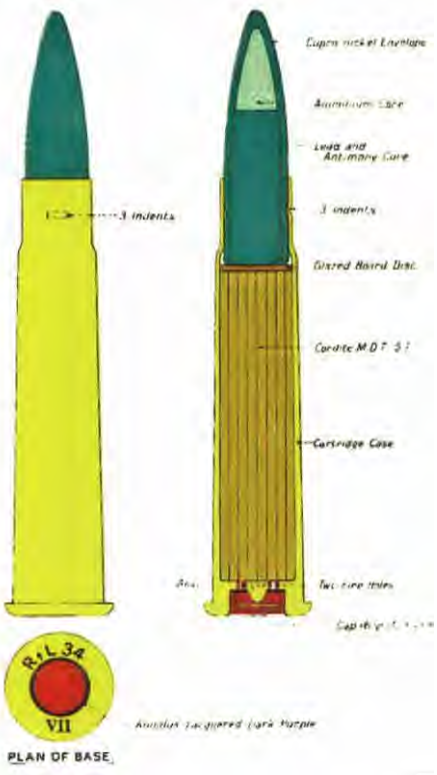


Typical 3" Smoke Mortar

Fuze Type: Smoke
Bomb Dimensions: c.490 x 76mm
Filling: Typically, white phosphorus
Remarks: On impact, the fuze functions and initiates the bursting charge. The bursting charge ruptures the mortar bomb body and disperses the white phosphorous filler. The white phosphorous produces smoke upon exposure to the air.



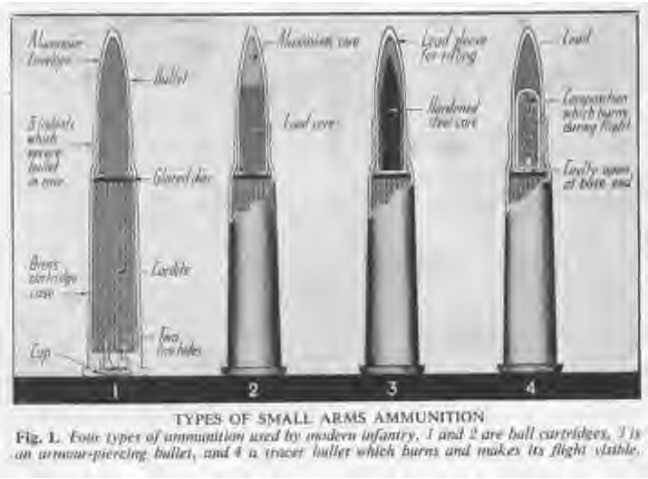




.303" Ammunition

Type: Rifle / machine gun round
Markings: Regular round – none. Tracer round – red primer
Bullet Weight: 150–180g
Dimensions: Total cartridge / projectile length – 182mm
Filling: Regular round – none. Tracer round – small incendiary fill
Threat: Explosive cordite within unspent cartridge
Deployment: Royal Navy, RAF and British Army Light Anti-Aircraft guns, machine guns and rifles. Standard British and Commonwealth military cartridge from 1889 until the end of the 1950s
Remarks: Cartridges are belted or supplied loose in cartons

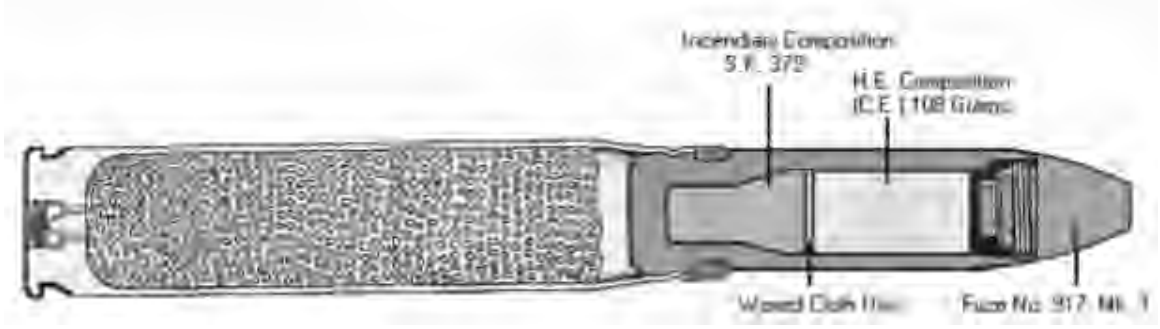




TYPES OF SMALL ARMS AMMUNITION
Fig. 1. Four types of ammunition used by modern infantry. 1 and 2 are ball cartridges, 3 is an armour-piercing bullet, and 4 a tracer bullet which burns and makes its flight visible.

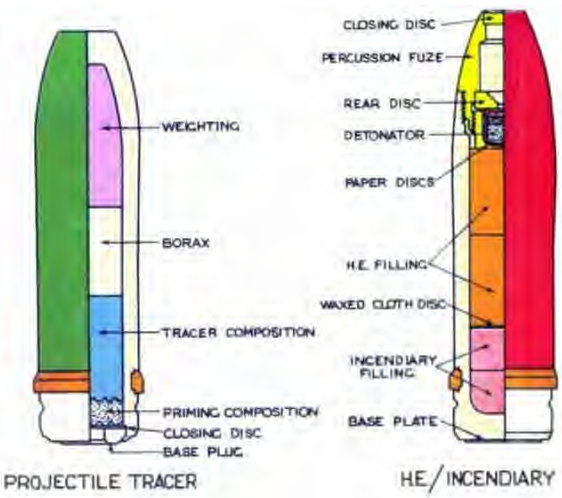






20mm Hispano HEI Ammunition

Type: Live cannon round
Markings: Upper half of projectile painted "buff" colour, lower half is red
Cartridge Weight: 256g
Dimensions: Total cartridge / projectile length – 182mm
Fuze: Contact fuze – No. 253, No. 254 or No. 917
Filling: 108g of contact explosive & 68g of SR. 379 incendiary composition
Threat: Explosives within unspent cartridge as well as the projectile
Deployment: Royal Navy, RAF and British Army Light Anti-Aircraft guns. Also RAF aircraft cannons.
Remarks: Cartridges are belted or supplied loose in cartons.



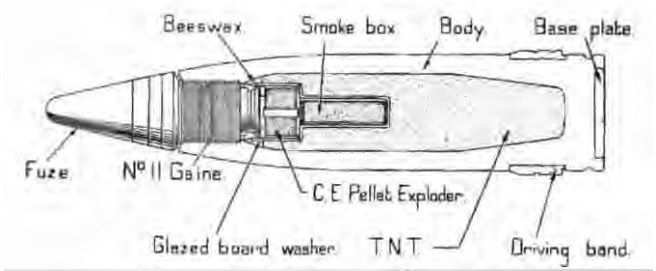
COLOUR IDENTIFICATION		
BRITISH		
NATURE OF SHELL	H.E. FILLING	COLOUR
H.E. TRACER	T.N.T.	
H.E.	T.N.T.	
PROJ. PRACTICE		
PROJ. TRACER		
H.E. INCENDIARY	T.N.T.	
H.E. INCENDIARY TRACER	T.N.T.	



3.7" Anti-Aircraft Projectile

Weight: 12.7kg
Bomb Dimensions: 94 x 360mm
Rate of Fire: 10-20 rounds per minute
Carriage: Typically, white phosphorus
Ceiling: 9,000-18,000m
Muzzle Velocity: 72m/s
Remarks: 4.5" projectiles were also commonly utilized.







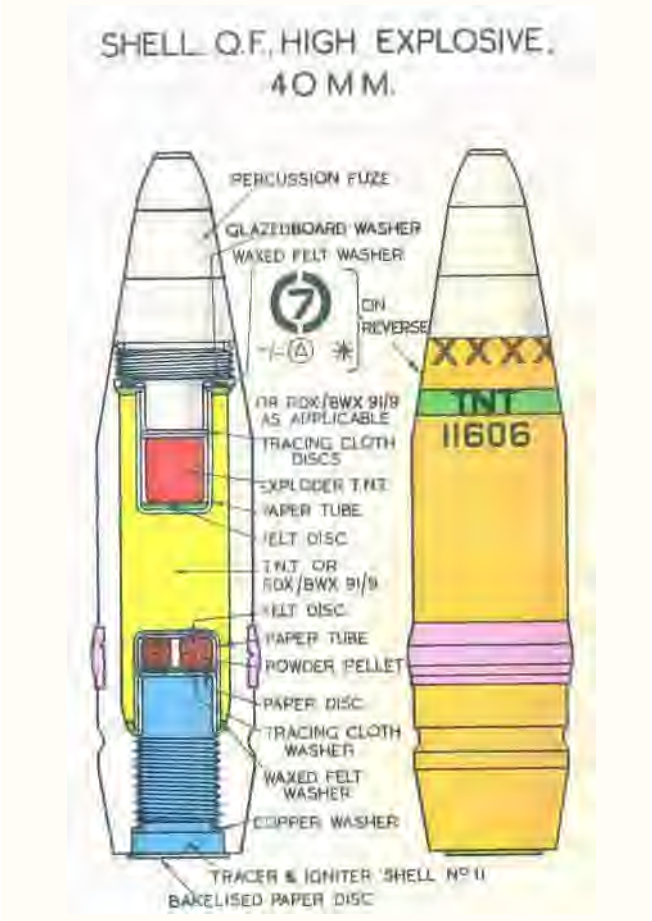




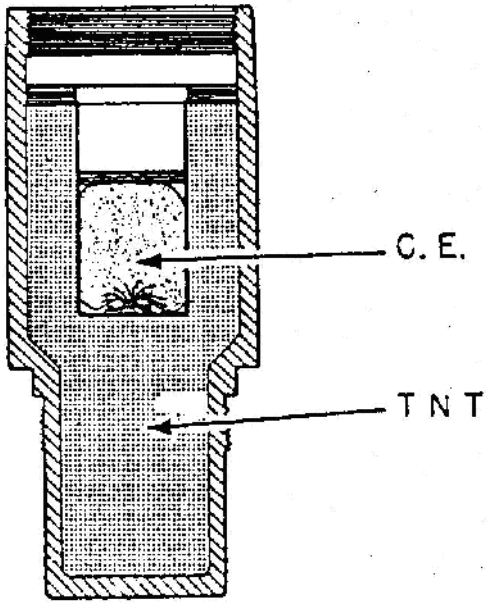


40mm Bofors Gun Projectile

Weight: 0.86kg
Bomb Dimensions: 40mm x 310mm
Rate of Fire: 120 rounds per minute
Ceiling: 7,000m
Muzzle Velocity: 881m/s
Remarks: Mobile batteries – normally few records of where these guns were located.

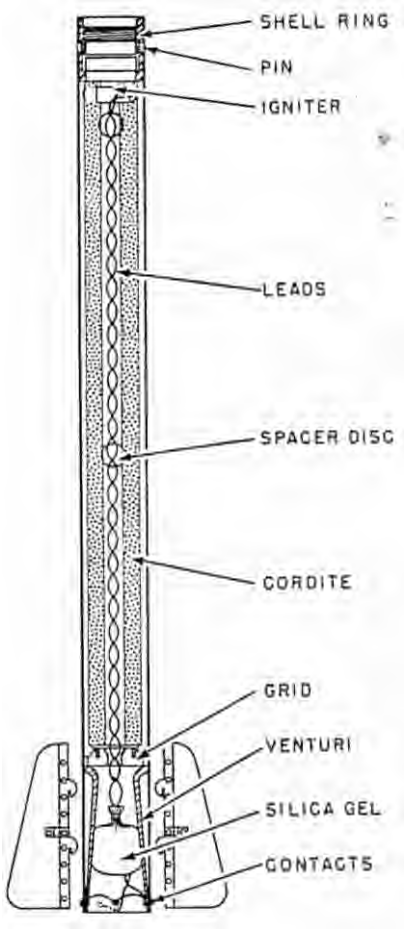






Rockets / Un-rotating Projectiles

Weight: 24.5kg
Bomb Dimensions: 94 x 360mm
Carriage: Typically, white phosphorus
Rate of Fire: 10-20 rounds per minute
Ceiling: 9,000-18,000m
Muzzle Velocity: 72m/s
Remarks: 4.5" projectiles were also commonly utilized.
Top-left image: Home Guard soldiers load an anti-aircraft rocket at a 'Z' Battery



SAFELANE
GLOBAL



Detailed Unexploded Ordnance
Risk Assessment

In Respect Of:
Richborough – Alternate Option No. 3 for Connection to OHL Richborough Revision

For:
Mott MacDonald

Report Reference:
9758-5 RA



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This Report has been produced in compliance with the Construction Industry Research and Information Association guidelines for the preparation of Detailed Unexploded Ordnance Risk Assessments in the management of UXO risks in the construction industry. This report has been compiled using all due diligence and expertise and having made all proper but reasonable enquiries within given time limitations. However, in accepting and implementing the recommendations contained in this report, the client does so strictly at his own risk.

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Executive Summary

The Site	
Address:	Minster Marshes, Minster, Ramsgate, CT12 4DD
OS National Grid Reference:	TR 31162 63307
Site Description:	The majority of the site comprises open ground, some of which forms Minster Marshes. A Sewage Works is located in the centre of the site, served by Marsh Farm Road from the north. A railway track crosses the eastern extent of the site while a section of the River Stour passes through the southern section. Extension area: Largely comprises open, agricultural ground, crossed by drainage ditches and a trackway.
Proposed Works	
The proposed ground investigation would include machine excavated trial pits to 4m bgl and cable percussion boreholes, maximum 35m bgl. Construction will comprise Horizontal Directional Drilling from offshore to onshore where the cable will be installed in an open cut trench to a max depth of 2m bgl. There will be some shallow earthworks carried out for temporary construction compounds and construction of the permanent substation/ convertor station platform. Piled foundations are also anticipated.	
Risk Assessment	
Risk Assessment Methodology: In accordance with CIRIA guidelines this assessment has carried out research, analysed the evidence and considered the likelihood that the site has been contaminated with unexploded ordnance; that such items remained on site; the risk that they could be encountered during any intrusive works and the consequences that could result. Appropriate risk mitigation measures have been proposed.	
UXO Risk Rating	**HIGH from the following UXO types:** • German Air-Delivered HE bombs
	MEDIUM from the following UXO types: • German Air-Delivered Incendiary Bombs • Anti-Aircraft Projectiles • Land Service Ammunition • Small Arms Ammunition
The full UXO Risk Assessment and a breakdown of the UXO Risk Level can be found in Section 11.	

Maximum Bomb Penetration Depth	It has been assessed that a 500kg bomb would have had an approximate maximum bomb penetration depth of between **10-12m** below WWII ground level. Penetration depth could potentially have been greater if the UXB was larger (though only 4% of German bombs used in WWII over Britain were of that size). Note that UXBs may be found at any depth between just below the WWII ground level and the maximum penetration depth.

Recommended Risk Mitigation

Risk Level	Planned Site Activity	Recommendations
High	**Shallow Intrusive Works eg excavations**	• UXO Safety & Awareness Briefing (Toolbox Brief, TBB) • Site Specific Safety Instructions (SSSIs) Training Course • Non-Intrusive (NI) Magnetometer Survey (Greenfield areas only) • Target Investigation (Required as a follow-on from NI magnetometer survey)
	Deep intrusive works (eg piling)	• UXO Safety & Awareness Briefing (Toolbox Brief, TBB) • Site Specific Safety Instructions (SSSIs) Training Course • Intrusive Magnetometer Survey of pile/borehole positions

In making this assessment and recommending these risk mitigation measures, the proposed works outlined in the 'Scope of the Proposed Works' section were considered. Should the planned works be modified, or additional intrusive engineering works be considered, SafeLane Global should be consulted to see if re-assessment of the risk or mitigation recommendations is necessary.

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Glossary of Terms

AAA	Anti-Aircraft Artillery
ARP	Air-raid Precautions
BDO	Bomb Disposal Officer
EOD	Explosive Ordnance Disposal (current term for "bomb" disposal)
HE	High Explosive
HG	Home Guard
IB	Incendiary Bomb
Kg	Kilogram
LM	Land Mine
LSA	Land Service Ammunition (includes grenades, mortars, etc.)
Luftwaffe	German Air Force
m bgl	Metres Below Ground Level
MoD	Ministry of Defence
OB	Oil Bomb
PM	Parachute Mine
RAF	Royal Air Force
SI	Site Investigation
SAA	Small Arms Ammunition (small calibre cartridges used in rifles & machine guns)
UXB	Unexploded Bomb
UXO	Unexploded Ordnance
V-1	"Doodlebug" the first cruise type missile, used against London from June 1944. Also known as 'Flying Bomb'
V-2	The first ballistic missile, used against London from September 1944
WWI	First World War (1914 -1918)
WWII	Second World War (1939 – 1945)

Detailed Unexploded Ordnance Risk Assessment

In Respect of

Richborough – Alternate Option No.3 for Connection to OHL Richborough Revision

1 Introduction

Groundsure Limited, on behalf of Mott MacDonald, has commissioned SafeLane Global to conduct a Detailed Unexploded Ordnance Risk Assessment of the Richborough - Alternative Option No.3 for Connection to OHL Richborough Revision site.

Unexploded Ordnance (UXO) presents a significant risk to construction projects in parts of the UK as a result of enemy actions during the two 20th Century World Wars and historic British and Allied military activity.

One of the legacies of this conflict is buried unexploded air-dropped bombs or anti-aircraft projectiles resulting from the failure of a proportion of the weapons to function as designed. It is commonly accepted that the failure rate of these munitions was approximately 10% and, depending on their shape, weight, velocity and ground conditions, many penetrated the ground and came to rest at depth.

In addition, it is estimated that over 20% of the UK landmass has been used by the military at some point and between 2006 and 2009, over 15,000 items of British / Allied ordnance (excluding small arms ammunition) were found on UK construction sites (CIRIA).

Intensive efforts were made during and after the war to locate and render safe all UXO but, unsurprisingly, not all were found and dealt with. This is evidenced by the regular, on-going discoveries of UXO during construction-related intrusive ground works.

As a result of a generally increased risk awareness amongst professionals involved in ground engineering works and proactive health and safety measures, the risk to life and limb from UXO has been minimised. However even the simple discovery of a suspected device during on-going works can cause considerable disruption to production and cause unwanted delays and expense.

Such risks can be more fully addressed by a better understanding of the site-specific risk and the implementation of appropriate risk mitigation measures.

2 Construction Industry Duties and Responsibilities

2.1 The UK Regulatory Environment

There is no legal requirement for the control and mitigation of UXO risk in the construction industry, but guidelines for good practice, information, and solutions with regards to UXO risk are detailed within CIRIA (C681): Unexploded Ordnance (UXO) A Guide for the Construction Industry.

These guidelines provide the construction industry with a set process for the management of risk associated with UXO, from preliminary risk assessment to implementation of site-specific risk mitigation strategies.

Specific legislation does however exist for health and safety, and is addressed under a number of regulatory instruments, as outlined below.

In practice, the regulations impose a responsibility on the construction industry to ensure that they discharge their obligations to protect those engaged in ground-intrusive operations (such as archaeology, site investigation, drilling, piling or excavations) from any reasonably foreseeable UXO risk.

2.2 The Health and Safety at Work Act, 1974

The Act places a duty of care on an employer to put in place safe systems of work to address, as far as is reasonably practicable, all risks (to employees and the general public) that are reasonably foreseeable.

2.3 Construction (Design and Management) Regulations 2015

CDM 2015 ensures that health and safety within the construction industry is continually improved:

- Works are sensibly planned and managed.
- Competent staff are engaged in the works.
- Risks are identified and managed.
- All parties cooperate and coordinate activities.
- Communication flows to those who require it.
- Workers are consulted and engaged about risks and how they are being managed.

In line with CDM 2015 legislation, SafeLane Global are able to assist parties in their discharge of CDM duties as follows:

- Assist Principal Designers with pre-construction information and risk assessments.
- Assist the Designer with the Designer's Risk Assessment.
- Issue UXO risks as have been identified and manage risks accordingly.
- Assist the Principal Contractor with the construction phase information, in particular risk assessments and mitigation strategies.
- Plan, manage and monitor survey and clearance works under SafeLane Global's control.

2.4 Other Legislation

Other relevant legislation includes the "Management of Health and Safety at Work Regulations 1999" and "The Corporate Manslaughter and Corporate Homicide Act 2007".

3 The Role of the Authorities and Commercial Contractors

3.1 The Authorities

The Police have the responsibilities for co-ordinating the emergency services in the case of an ordnance-related incident on a construction site. They will make an initial assessment (i.e. is there a risk that the find is ordnance or not?) and if they judge necessary impose a safety cordon and/or evacuation and call the military authorities (JSEODOC - Joint Services Explosive Ordnance Disposal Operations Centre) to arrange for investigation and/or disposal. In the absence of an EOD specialist on site many Police Officers will use the precautionary principle, impose cordon(s)/evacuation and await advice from the JSEODOC.

The priority given to the request by JSEODOC will depend on their judgement of the nature of the risk (ordnance, location, people and assets at risk) and the availability of resources. They will respond immediately or as resources are freed up. Depending on the on-site risk assessment the item of ordnance may be removed or demolished (by controlled explosion) in situ. In the latter case additional cordons and/or evacuations may be necessary.

Note, that the military authorities will only carry out further investigations or clearances in very high profile or high-risk situations. If there are regular ordnance finds on a site, the JSEODOC may not treat each occurrence as an emergency and will encourage the construction company to put in place alternative procedures (i.e. the appointment of a commercial contractor) to manage the situation and relieve pressure from the JSEOD disposal teams.

3.2 Commercial Contractors

In addition to pre-construction site surveys and follow-on clearance work, a commercial contractor is able to provide a reactive service on construction sites. The presence of a qualified EOD Engineer with ordnance recognition skills will avoid unnecessary call-outs to the authorities and the contractor will be able to arrange for the removal and disposal of low risk ordnance. If high risk ordnance is discovered actions will be co-ordinated with the authorities with the objective of causing the minimum possible disruption to site operations whilst putting immediate, safe and appropriate measures in place.

4 This Report

4.1 Aims and Objectives

The aim of this report is to examine the possibility of encountering any explosive ordnance during any intrusive works at the site. Risk mitigation measures will be recommended in line with the CIRIA C681 guidelines, to reduce the risk of initiating UXO, and the subsequent risk of harm / damage during the envisaged works to as low as reasonably practicable (ALARP).

4.2 Risk Assessment Methodology

The following issues will be addressed in the report:

- The likelihood that the site was contaminated with unexploded ordnance.

- The likelihood that unexploded ordnance remains on site.
- The likelihood that ordnance may be encountered during any intrusive works.
- The risk that ordnance may be initiated.
- The consequences of initiating or encountering ordnance.

Risk mitigation measures, appropriate to the assessed level of risk and site conditions, will be recommended.

4.3 Approach

In preparing this Unexploded Ordnance Risk assessment, SafeLane Global has considered general and, as far as possible, site specific factors including:

- Evidence of German bombing and delivery of UXBs.
- Site history, occupancy and conditions during WWII.
- The legacy of Allied military activity.
- Details of any known EOD clearance activity.
- The extent of any post war redevelopment.
- Scope of the current proposed works.

4.4 Sources of Information

SafeLane Global has carried out detailed historical research for this Unexploded Ordnance Risk Assessment including accessing military records and archived material held in the public domain and in the MoD.

Material from the following sources has been consulted:

- The National Archives.
- Kent Library and History Centre.
- Kent County Council.
- Kent Historic Environment Record.
- Groundsure Limited.
- Relevant information supplied by the client.
- Available material from 33 Engineer Regiment (EOD) Archive.
- SafeLane Global's extensive archives built up over many years of research and hands-on Explosive Ordnance Disposal activities in the UK.
- Open sources such as published books, local historical records and the internet.

4.5 Reliability of Historical Records

4.5.1 General Considerations

This report is based upon research of historical evidence. Whilst every effort has been made to locate all relevant material SafeLane Global cannot be held responsible for any changes to the assessed level of risk or risk mitigation measures based on documentation or other information that may come to light at a later date.

The accuracy and comprehensiveness of wartime records is frequently difficult or impossible to verify. As a result, conclusions as to the exact location, quantity and nature of the ordnance risk can never be definitive but must be based on the accumulation and careful analysis of all accessible evidence. SafeLane Global cannot be held responsible for inaccuracies or gaps in the available historical information.

4.5.2 Bombing Records

During WWII, considerable efforts were expended in recording enemy air raids. Air Raid Precautions (ARP) wardens were responsible for making records of bomb strikes either through direct observation or by post-raid surveys. However, their immediate priority was to deal with casualties and limit damage, so it is to be expected that records are often incomplete and sometimes contradictory. Record keeping in the early days of bombing was not comprehensive and details of bombing in the early part of the war were sometimes destroyed in subsequent attacks. Some reports may cover a single attack, others a period of months or the entire war.

Records of raids that took place on sparsely or uninhabited areas were often based upon third party or hearsay information and are not always reliable; records of attacks on military or strategic targets were often maintained separately from the general records and have not always survived.

5 The Site and Scope of Proposed Works

Site Address	Minster Marshes, Minster, Ramsgate, CT12 4DD	
OS National Grid Reference	TR 31162 63307	
Site Description	The majority of the site comprises open ground, some of which forms Minster Marshes. A Sewage Works is located in the centre of the site, served by Marsh Farm Road from the north. A railway track crosses the eastern extent of the site while a section of the River Stour passes through the southern section. Extension area: Largely comprises open, agricultural ground, crossed by drainage ditches and a trackway.	
Proposed Works	The proposed ground investigation would include machine excavated trial pits to 4m bgl and cable percussion boreholes, maximum 35m bgl. Construction will comprise Horizontal Directional Drilling from offshore to onshore where the cable will be installed in an open cut trench to a max depth of 2m bgl. There will be some shallow earthworks carried out for temporary construction compounds and construction of the permanent substation/ convertor station platform. Piled foundations are also anticipated.	
References	**Site Location Maps**	**Annex A**
	Recent Aerial Photograph	**Annex B**

6 Ground Conditions

Data Source		Description
British Geological Survey Borehole	Borehole Reference	TR36SW/7
	Location	On site
	Date	11/09/1959
	Recorded Shallow Geology	• 0.23m of Topsoil, Ballast, Roots and Ashes • 1.50m of firm Clay • 4.06m of soft Clay • 3.66m of sandy Clay • 1.17m of clayey Silt
British Geological Survey Mapping	Superficial Deposits	Tidal Flat Deposits – Clay and Silt
	Bedrock	Thanet Formation – Sand, Silt and Clay

7 Pre and Post-WWII OS Mapping

	Date	Observations	Reference	Source
Pre-WWII	1938	• The majority of the site comprises open ground labelled *Minster Marshes*. This includes a network of drainage ditches, footpaths and footbridges. • A number of small unlabelled structures are present across the site, likely for farming. • A *Sewage Works* is located in the southern half of the site. • A railway line crosses the eastern section of the site while the *River Stour* passes west to east through the southern extent. • The site also encompasses a *Sea Wall* and *Sluices*. • The surrounding area is rural in nature with *Minster Junction* located approximately 200m north. • Extension area: Comprises open ground and drainage ditches.	Annex C-1	Groundsure Limited

Post-WWII	**1948-57**	• Evidence of minor redevelopment, primarily on areas of farming infrastructure, are apparent across the site. Typically, evidence of ruins, clearance and redevelopment is often indicative of bomb damage on early post-WWII OS mapping. • The *Sewage Works* has expanded with the construction of additional *Tanks*. • An additional railway siding has been constructed to the north of the site. • No further changes are noted across the surrounding area. • Extension area: No changes are noted within the extension area.	**Annex C-2**	**Groundsure Limited**

8 The Threat from Aerial Bombing

8.1 General Bombing History of Kent

8.1.1 First World War

During WWI, Kent suffered extensive aerial bombardment from Zeppelin airships and fixed-wing aircraft. The first attack by the German Air Force was launched against Dover on the 21st December 1914 using naval seaplanes.

Bombing continued in Kent throughout the war; areas such as Ashford, Canterbury, Dover, Folkestone, Gravesend, Margate, Maidstone and Sheerness suffered particularly severe raids. The last raid on the county was on the night of the 19th May 1918 when a total of 14.55 tonnes of bombs were dropped on London, Faversham and Dover. Ramsgate, situated approximately 4km north-east of the site, gained the reputation as the most bombed seaside town in WWI. The town suffered from both aerial bombing and naval bombardment during WWI, with Zeppelin's scattering a number of bombs in all districts in the area.

WWI bombs were generally smaller than those used in WWII and were dropped from a lower altitude, resulting in limited UXB penetration depths. Aerial bombing was often such a novelty at the time that it attracted public interest and even spectators to watch the raids in progress. For these reasons, there is a limited risk that UXBs passed undiscovered. When combined with the relative infrequency of attacks and an overall low bombing density the risk from WWI UXBs is considered low and will not be further addressed in this report.

8.1.2 Second World War

At the start of WWII, the Luftwaffe planned to destroy key military installations, including RAF airfields and Royal Navy bases, during a series of daylight bombing raids. After the Battle of Britain these tactics were modified to include both economic and industrial sites. Targets included dock facilities, railway infrastructure, power stations, weapon manufacturing plants and gas works. As a result of aircraft losses, daylight raids were reduced in favour of attacking targets under the cover of darkness.

Kent played a key role in the defence of Britain in WWII. It was at the frontline during the Battle of Britain during which the Luftwaffe attempted to destroy the RAF and its airfields in order to gain air superiority over the south-east of England ahead of the planned German invasion. Bombing raids

began in July 1940 from German-occupied France and in the following months many of the towns and cities in Kent were subjected to bombing attacks.

Within Kent, Manston airfield, located 1.7km north of the site, was a key target for the Luftwaffe especially during the Battle of Britain, where RAF Manston sustained serious bomb damage. Most of the staff dispersed into the surrounding houses due to the destruction.

By May 1941, concentrated attacks were reduced as the Luftwaffe was diverted east to prepare for 'Operation Barbarossa', the invasion of Russia. Note however, that Canterbury, 14.5km south-west, was heavily bombed in mid-1942 as part of the Baedeker Blitz.

During 1942 and 1943, there were a number of minor raids carried out by small formations of fighter bombers and then between January and May 1944 the Luftwaffe returned to London en masse, for Operation Steinbock. These raids were executed by inexperienced Luftwaffe crews and were less frequent when compared to the original Blitz of 1940/41. Poor navigation and improved defences resulted in unsustainable Luftwaffe losses and many raids were unsuccessful.

Minster was situated within 'Hellfire Corner'; an area of Kent where aerial 'dog fights' and 'tip and run' bombing incidents were frequent during the Battle of Britain. The region was also under artillery bombardment from the coastal batteries located at Calais and Cap-Gris-Nez in occupied France. These batteries, including the *Lindemann* and *Todt Batteries*, bombarded the south coast until they were captured after the Allied D-Day Landings in 1944. The batteries covered an arc stretching from Ramsgate to Hythe and fired shells weighing approximately 1 ton each.

From mid-1944 the "V-weapon" (for Vengeance) campaign, using unmanned cruise missiles and rockets, represented Hitler's final attempt to reverse Germany's imminent defeat. The V1 (Flying Bomb or Doodlebug) and the V2 (Long Range Rocket) were launched from bases in Germany and occupied Europe.

Although these weapons caused considerable destruction, their relatively low numbers allowed accurate records of strikes to be maintained and these records have mostly survived. There is a negligible risk from unexploded V-weapons on land today since, even if an unexploded 1,000kg warhead had survived impact, the remains of the munition's body would have left incontrovertible evidence of the strike and would have been dealt with at the time.

8.2 Generic Types of WWII German Air-delivered Ordnance

The nature and characteristics of the ordnance used by the Luftwaffe allows an informed assessment of the hazards posed by any unexploded items that may remain today.

- HE Bombs: In terms of weight of ordnance dropped, HE bombs were the most frequent weapon deployed. Most bombs were 50kg, 250kg or 500kg (overall weight, about half of which was the high explosive) though large bombs of up to 2,000kg were also used. HE bombs had the weight, velocity and shape to easily penetrate the ground intact if they failed to explode. Post-raid surveys would not always have spotted the entry hole or other indications that a bomb penetrated the ground and failed to explode, and contemporary ARP documents describe the danger of assuming that damage, actually caused by a large UXB, was due to an exploded 50kg bomb. Unexploded HE bombs therefore present the greatest risk to present–day intrusive works.
- Blast Bombs/Parachute Mines: Blast bombs generally had a slow rate of descent and were extremely unlikely to have penetrated the ground. Non-retarded mines would have shattered on most ground types, if they had failed to explode. There have been extreme cases when these items have been found unexploded, but this was where the ground was either very soft or where standing water had reduced the impact. SafeLane Global does not consider there to be a significant risk from this type of munition on land.

- Large incendiary bombs: This type of bomb ranged in size from 36kg to 255kg and had a number of inflammable fill materials (including oil and white phosphorus), and a small explosive charge. They were designed to explode and burn close to the surface, but their shape and weight meant that they did have penetration capability. If they penetrated the ground, complete combustion did not always occur, and, in such cases, they remain a risk to intrusive works.
- 1kg Incendiary Bombs (IB): These bombs, which were jettisoned from air-dropped containers, were just over 30cm in size and therefore highly likely to go unnoticed. They had the potential to penetrate soft ground and left a very small entry hole. Furthermore, if bombs did not initiate and fell in water or dense vegetation or became mixed with rubble in bomb damaged areas, they could have remained hidden to this day. Some variants had explosive heads, and these present a risk of detonation during intrusive works, particularly due to their shape, which leads them to often be misidentified.
- Anti-personnel (AP) Bomblets: AP bombs had little ground penetration ability and should have been located by the post-raid survey unless they fell into water, dense vegetation or bomb rubble.
- Specialist Bombs (smoke, flare, etc): These types do not contain high explosive and therefore a detonation consequence is unlikely. They were not designed to penetrate the ground.

Examples of the most commonly deployed German bombs are presented in the *Ordnance Specifications and Information* appendices at the end of this document.

8.3 Second World War Bombing Statistics

The following table summarises the quantity of German bombs (excluding 1kg incendiaries and anti-personnel bombs) falling on the Rural District of Eastry between 1940 and 1945.

Record of German Ordnance Dropped on the Rural District Eastry	
Area Acreage	54,276
High Explosive Bombs (all types)	646
Parachute Mines	14
Oil Bombs	11
Phosphorus Bombs	8
Fire Pots	38
Pilotless Missile (V1)	8
Long Range Rocket (V2)	1
Total	726
Items Per 1,000 Acres	**13.4**

Source: Home Office Statistics

Detailed records of the quantity and locations of the 1kg incendiary and anti-personnel bombs were not routinely maintained by the authorities as they were frequently too numerous to record.

Although the incendiaries are not particularly significant in the risk they pose, they nevertheless are items of ordnance that were designed to cause damage and inflict injury and should not be overlooked in assessing the general risk to personnel and equipment. The anti-personnel bombs were used in much smaller quantities and are rarely found today but are potentially more dangerous. This table does not include UXO found during or after WWII.

8.4 Site Specific WWII Bombing Records

8.4.1 Kent Bomb Census Maps

A review was conducted of the Kent Bomb Census Maps. Those showing incidents on or close to the site are listed below. Note, the maps are small in scale and lack any clear geographical indicators, therefore the site and distance(s) listed below can be considered an approximate.

Date	Weapon	Details
09/07/1940	HE bombs Incendiary bombs	650m east
06/11/1940	2 x HE bombs	500m east
05/12/1940	1 x Incendiary bomb 1 x Aerial mine	Incendiary bomb 500m south-east
Reference		**Annex D**

8.4.2 Kent V1 Bomb Census Map

Following the beginning of the V1 campaign in mid-1944, a series of maps showing where these weapons fell was produced for the London Civil Defence region and these were updated as the war progressed.

V1 Strike Recorded on Site (or in Vicinity)	**✘**
Distance from Site	None recorded in Minster Parish
Reference	**Not annexed**

8.4.3 Original ARP Bombing Incident Records

Throughout WWII, records of bombing incidents were kept by the ARP and Civil Defence Office. These records were kept in the form of typed or hand-written notes and/or presented on bomb plot maps. Some other organisations, such as port authorities and railways, maintained separate records.

Records which include Map References have been plotted onto a map presented in **Annex E**.

Written ARP records were reviewed for	Rural District of Eastry	
Source	Kent History & Library Centre	
Records of bombing on / near the site were found		✓

Date	Weapon	Map Reference	Details
08-09/04/1940	4 x HEs	n/a	Minster.
19-20/07/1940	13 x HEs 1 x UX HE	n/a	Minster.
14/08/1940	5 x HEs	n/a	Minster.
22/08/1940	1 x HE	n/a	Minster.
22-23/08/1940	10 x HEs 2 x UX HEs	n/a	Minster and Ash.
26/08/1940	17 x HEs 1 x UX HE	752814	Minster and Ash – Between Iron Rly Bridge and Sewage Works and South Side of Stour. On site.
16-17/09/1940	1 x HE	n/a	Minster.
18-19/09/1940	2 x HEs 1 x UX HE	n/a	Minster.
	14 x HEs		Ash.
24/09/1940	1 x UX HE	761818	Minster – South of Brook Cottages. 120m north.
26/09/1940	1 x Oil bomb	750812	Minster – Marsh Farm. On site.
	2 x HEs	750810	Minster – south of Marsh Farm, north of River Stour. On site.
	1 x HE	750806	Minster – south of River Stour. On western boundary of extension area.

	1 x UX HE	767819	Minster – 500yrds south of Brook Cottages. 320m north-east.
13/11/1940	1 x HE	n/a	Ash.
04-05/12/1940	1 x UX PM	n/a	Ash.
28/01/1941	40 x IBs	750811	Minster – east of Marsh Farm. On site.
	7 x HEs	739809	Ash – Goldstone Marshes. 380m south-west.
21/03/1941	1 x UX HE	n/a	Minster.
10/04/1941	1 x HE	760820	West of Brook Crossing, Minster. 390m north.
	1 x Oil bomb	759822	Minster – east of Durlock. 610m north.
05/05/1941	3 x HEs	n/a	Minster.
10-11/06/1941	1 x UX HE	n/a	Ash.
31/10/1942	1 x Firepot	756794	Fleet Farm, Ash. 740m south.
	1 x 50kg UX HE	765799	Ash – 10" hole. Marshland. On / immediately adjacent to site.
	1 x 50kg HE	765799	Ash – Camouflet at least 10ft deep. 26 feet from above entry. This may be the result of the bomb of the above entry having "jinked" in exceptionally soft ground. On / immediately adjacent to site.
	1 x UX HE	753795	Bride Farm, Ash. Discovered 01/12/1942. 730m south.
	1 x UX HE	765799	Whitehouse Marsh, Ash. Discovered 02/11/1942.

			On / immediately adjacent to site.
18/01/1943	1 x 250kg HE	758821	Minster – North of Ramsgate, Margate Line. 610m north
06/09/1943	1 x HE	761812	Minster – Exploded in air near signal box. On site.
04/02/1944	1 x 50kg Phosphorus IB	745819	Minster – Marshland at Eden Hall Farm. Land water reaches within 2′ 6″ of surface. Phosphorus remains in hole of entry but no trace can be found after digging to a depth of 6′ 6″. On site.

8.4.4 Secondary Source / Anecdotal Evidence

Anecdotal evidence of local bombing incidents was sought from publications and web resources. No references to incidents on site were found.

8.4.5 WWII-era RAF Aerial Photography

The following WWII-era aerial photography was reviewed for the site:

Date	Circa 1946
Source	Kent County Council
Image Type	Aerial
Image quality	Moderate resolution and small scale
Observations	• The aerial image confirms the site predominantly comprised open ground separated by a series of drainage ditches. • A group of over 20 crater-like features, consistent with HE bomb strikes, has been highlighted in the southern half of the site, to the south and east of the Sewage Works. • More craters are also present in the northern section of the site. • The structures on site have survived WWII largely intact. However, due to the small scale and resolution of the image an accurate assessment for any possible structural damage is not possible. • Extension area: The image confirms the extension area comprised undeveloped fields and drainage ditches. No evidence of bomb damage is apparent within its boundary.

Reference	Annex F

8.4.6 Decoy Bombing Sites

A national decoy authority headed by Colonel John Fisher Turner was set up in July 1940, and following earlier experiments in Glasgow and Sheffield, a system of urban lighting decoys was set up. These were known as "Civil" sites; Civil 'QL' for urban lighting simulation, and Civil 'QF' for dummy fires. "Q" – sites were equipped with assorted electrical and pyrotechnical apparatus to simulate the flare given from furnace doors, steel-making, railway marshalling yards, and light given off by inefficient blackout precautions.

Other sites simulated small fires started by incendiary bombs, with oil-storage area fire simulation being developed near large oil installations. A further variation on fire decoy sites was the "SF", or "Special Fires" sites. A larger, longer-burning type of fire was provided at these sites - known as "Starfish" sites - to draw incendiary bombs, and hopefully as a consequence the full enemy payload, from falling on the larger conurbations and defence installations during heavy air raids. Decoy sites had a good level of success – airfield decoy sites across Britain for example had received 359 attacks by the end of 1941. The real airfields were bombed 358 times.

A bombing decoy site was established in close proximity to the site	✓
Distance from site	1.1km south-west
Additional Comments	• A 'Q' type decoy was constructed 1.1km south-west of the site. This night decoy was established to draw Luftwaffe bombing away from RAF Manston, 1.9km north of the site. • This night decoy, which simulated an active airfield, was in operation from 1st August 1941 to 12th August 1942. However, no records could be found to suggest the decoys level of success.

8.4.7 Abandoned Bombs

A post-air raid survey of buildings, facilities and installations would have included a search for evidence of bomb entry holes. If evidence was encountered, Bomb Disposal Officer teams would normally have been requested to attempt to locate, render safe and dispose of the bomb. Occasionally evidence of UXBs was discovered but due to a relatively benign position, access problems or a shortage of resources the UXB could not be exposed and rendered safe. Such an incident may have been recorded and noted as an Abandoned Bomb.

Given the inaccuracy of WWII records and the fact that these bombs were 'abandoned', their locations cannot be considered definitive, nor the lists exhaustive. The MoD states that 'action to make the devices safe would be taken only if it was thought they were unstable'. It should be noted that other than the 'officially' abandoned bombs, there will inevitably be UXBs that were never recorded.

SafeLane Global holds records of officially registered abandoned bombs at or near the site	✓
Additional Comments	• 2 x 50kg HE bombs – Located on or near Eden Hall Farm, Minster. These are recorded in the north-western extent of the site.

	• 2 x unknown UXBs – Located in field near railway, south-east of Minster Station on Minster Marshes (eastern section of the site).

8.5 UXB Ground Penetration

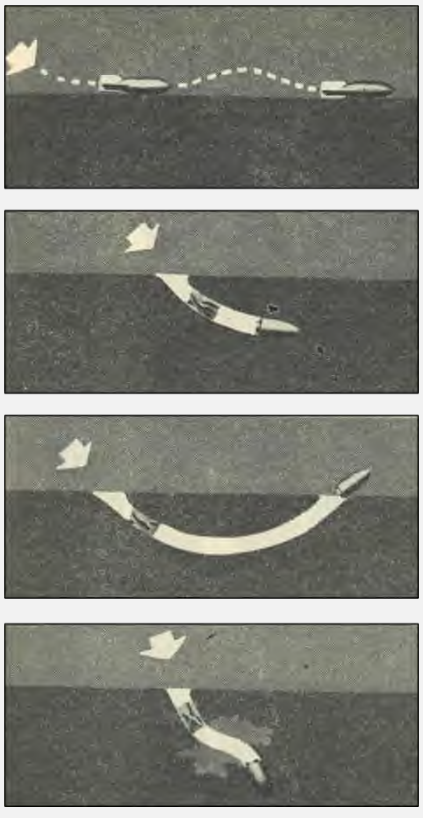
8.5.1 General Considerations

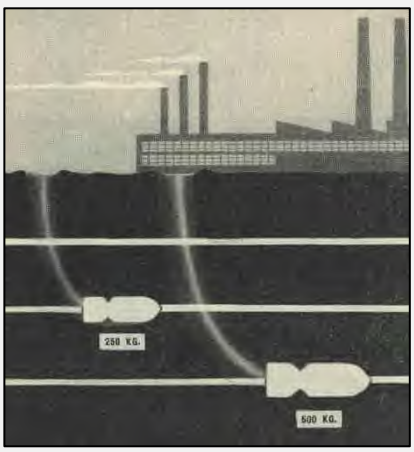
The actual penetration depth of aerial delivered bombs into the ground will have been determined by the mass and shape of the bomb, the velocity and angle of the bomb on impact (dependent on the height of release) and the nature of the ground and ground cover; the softer the ground, the greater the potential penetration. Peat, alluvium and soft clays are easier to penetrate than gravel and sand. Bombs are brought to rest or are commonly deflected by bedrock or large boulders.

8.5.2 The "j" Curve Effect

An air-dropped bomb released from normal bombing altitude (approx. 5,000m) on its curved trajectory can reach a terminal velocity of between 350-400 ms-1. In this case of high-level bombing, the angle of which the bomb enters the earth is approx. 15° from the perpendicular and its exact path is difficult to trace. The bomb is being driven by its kinetic energy can unless deflected, will continue its line of flight and can turn in an upwards curve towards the ground surface as it comes to rest. The upwards curve is caused by the transfer of energy as the bomb travels through the ground. The nose of the bomb travels slower than the rear of the bomb due to the drag/friction of it passing through the ground. The rear of the bomb, having more energy due to less drag/friction is travelling much quicker.

The location of the bomb is thus ''offset'' from the hole of entry. This ''offset'' from vertical is generally understood to be about one third of the penetration depth but can reach up to (and have been found at) 15m/50 ft from point of entry, dependent on ground conditions and the bomb's angle of impact. The figure below depicts the various paths of UXB through homogenous ground, showing how the J-curve effect can lead to a UXB coming to rest beneath undamaged buildings.





A UXB can come to rest beneath undamaged buildings due to the J-Curve effect if it lands in nearby soft ground.

Image source: Field Manual for Unexploded Bombs: Organisation and Operation For Disposal, United States War Department 1943

Left: Path of UXB in soft ground:

1. Ricochet resulting from low level attack: UXB stays perpendicular to ground and rests at surface.
2. Buried UXB with J-Curve: Bomb curves horizontally and rests perpendicular to surface.
3. UXB returning to surface due to J-Curve: Bomb points towards surface but may remain partially or completely below ground level.
4. UXB deflected by buried objects: Results in unpredictable path and unusual shift.

8.5.3 Second World War Bomb Penetration Studies

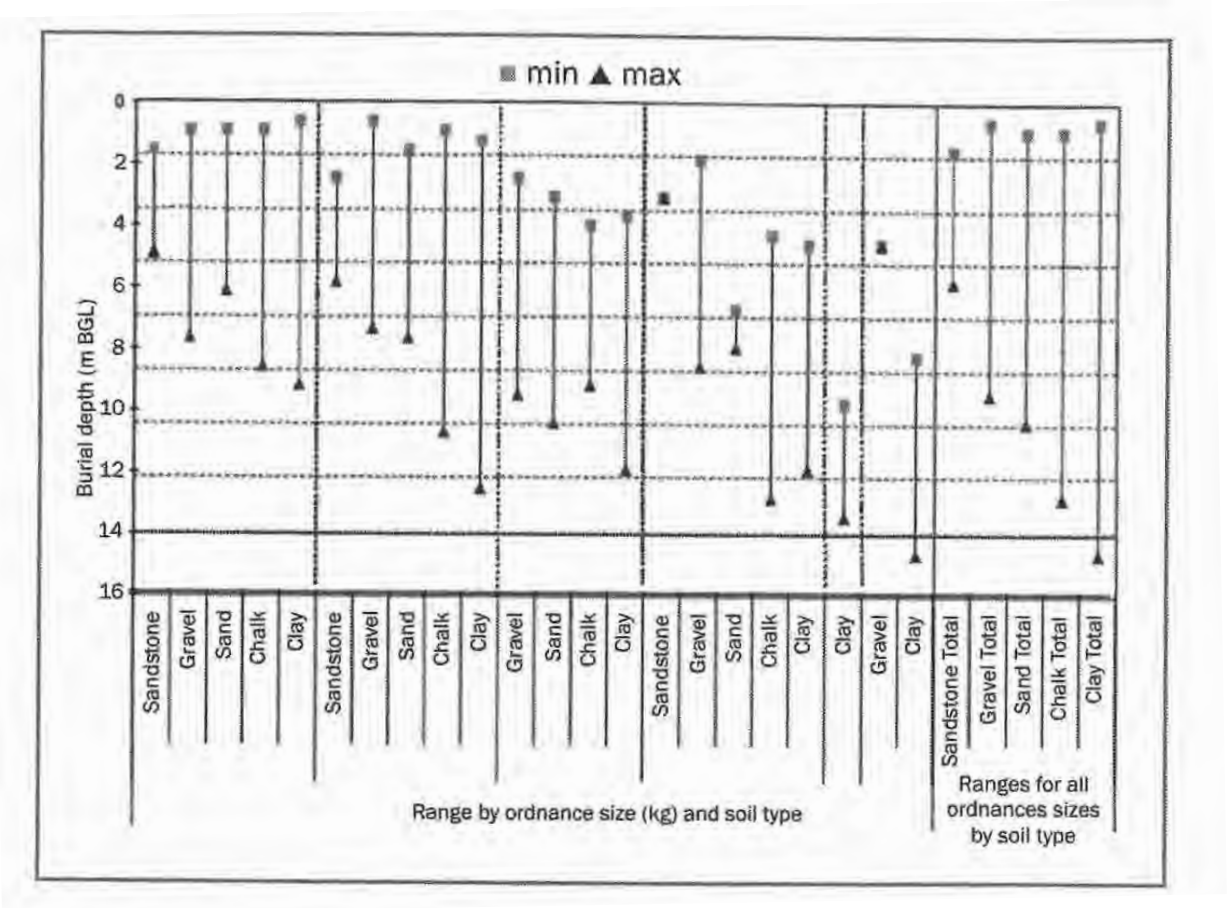
During WWII, the Ministry of Home Security undertook a major study on actual bomb penetration depths, carrying out statistical analysis on the measured depths of 1,328 bombs as reported by Bomb Disposal, mostly in the London area. They then came to conclusions as to the likely average and maximum depths of penetration of different sized bombs in different geological strata.

The median penetration of 430 x 50kg German bombs in London Clay was 4.6m and the maximum penetration observed for the SC50 bomb was 9m.

They concluded that the largest common German bomb, 500kg, had a likely penetration depth of 6m in sand or gravel but 8.7m in clay. The maximum observed depth for a 500kg bomb was 10.2m and for a 1,000kg bomb 12.7m. Theoretical calculations suggested that significantly greater penetration depths were probable.

8.5.4 CIRIA Bomb Penetration Depth Specifications

As stated within C681, the ground conditions at any individual site are likely to be highly variable and this results in a large range of burial depths for each different size bomb. The below chart shows the observed variation in burial depths of various sizes of air-delivered UXO for different ground conditions.



8.5.5 Site Specific Bomb Penetration Considerations

When considering an assessment of the bomb penetration at the site, the following parameters would be used:

- Geology – 0.23m of Topsoil, Ballast, Roots and Ashes, 1.50m of firm Clay, 4.06m of soft Clay, 3.66m of sandy Clay and 1.17m of clayey Silt
- Impact Angle and Velocity – 80-90° from horizontal and 267 metres per second.
- Bomb Mass and Configuration – The 500kg SC (General Purpose) HE bomb, without retarder units or armour piercing nose. This was the largest of the common bombs used against Britain.

Taking into account the above-mentioned factors it has been assessed that a 500kg bomb would have had an approximate maximum bomb penetration depth of between 10-12m below WWII ground level. Penetration depth could potentially have been greater if the UXB was larger (though only 4% of German bombs used in WWII over Britain were of that size). Note that UXBs may be found at any depth between just below the WWII ground level and the maximum penetration depth.

8.6 Likelihood of Post-raid UXO Detection

Utilising the available historical bombing records as reviewed in Section 8.4, it is possible to make an assessment of the likelihood that evidence of UXO would have been noted on a site during the war and the incident dealt with or recorded at the time. Factors such as bombing density, frequency of access, ground cover, damage and failure rate have been taken into consideration.

8.6.1 Density of Bombing

Bombing density is an important consideration for assessing the possibility that UXBs remain in an area. A very high density of bombs will have increased the likelihood of errors in record keeping at the time, as civil defence personnel and emergency services may have been overwhelmed. A higher density of bombing also increases the number of UXBs actually occurring in a given area.

The type and specific location of recorded bomb strikes is also an important consideration. If a stick of bombs (one individual aircraft's bomb load) is plotted in line with a site or is shown to straddle a site, then this raises the possibility that an unrecorded UXB from the same stick struck that site.

8.6.2 Bomb Damage

In Blitzed cities / towns throughout Britain, bomb sites were often not cleared of rubble until after the war and mid-war repairs to buildings were only carried out on the most vital facilities (power stations, gas works, weapons factories etc.). However, if a building only sustained bomb damage to its upper floors, any subsequent UXB strike to the structure will still have caused obvious damage, at ground floor level, which would have been reported and dealt with at the time.

HE bomb strikes to open ground will have resulted in a large crater and local soil disturbance. Any subsequent UXB strike will not have resulted in an easily identifiable entry hole and as such is likely to have gone unnoticed amongst the disturbed ground.

In London and south-east England, the German V1 Flying Bomb and V2 Long Range Rocket campaigns caused widespread devastation. However, as these weapons began to be utilised after the final significant Luftwaffe air raids had occurred, any serious damage caused by such weapons does not necessarily indicate an increased risk of Luftwaffe freefall UXB contamination. However, it is quite possible that serious damage inflicted during the 1940-1944 campaigns by Luftwaffe freefall bombs could have been erased by a subsequent V Weapon strike.

8.6.3 Frequency of Access

A UXB strike at a site where human access was infrequent would have had a lower chance of being observed, reported and recorded compared to a site which was developed and subject to regular access. UXB strikes during night time raids (when German planes could more easily evade anti-aircraft defences) are also more likely to have fallen unobserved than ones dropped during a daylight attack.

In frequently bombed cities / towns, ARP Wardens were tasked with carrying out searches for UXBs within recently bombed residential areas and schools. Similarly, many important home front facilities (factories, gas works, power stations, docks etc.) had their own dedicated ARP teams or Fire Watchers tasked with observing local air raids. Fire Watchers were mainly responsible for extinguishing 1kg incendiary bombs as well as reporting any UXB strikes. Anecdotal evidence however indicates that Fire Watchers did not always turn up for their shifts and therefore such UXB mitigating activities should not be assumed in the absence of site-specific evidence. Less important buildings sustaining bomb damage would have been abandoned until after the German bombing campaign in that area had ceased and repairs could be made, greatly decreasing the level of access to that site.

Schools closed due to the evacuation of children were often requisitioned by the Civil Defence authorities to be utilised as night time First Aid posts and reception centres (providing emergency accommodation for bombed out civilians). Therefore, an increased level of access is likely at these locations.

8.6.4 Ground Cover

The entry hole of a 50kg UXB (the most commonly deployed German HE bomb) could have been as little as 20cm in diameter. Wartime records also confirm that small German Incendiary Bombs, weighing just 1kg, were capable of significant penetration into soil, resulting in very small entry holes (5cm) or complete burial.

The quantity and type of ground cover present on a site during WWII would have had a significant effect, at ground level, on the visual evidence of buried UXO.

Evidence of UXO could be obscured in dense vegetation, soft ground, rubble, railway ballast or amongst stockpiled material (such as aggregate, coal or refuse heaps). A UXB strike to waterlogged ground or open water would have been immediately obscured from view beneath the waterline. Had such an incident occurred within a tidal mudflat or river bank, the resulting entry hole will have remained only temporarily, before becoming in-filled by water and sediment. Any HE UXB strike to elevated risk ground cover could potentially have come to rest beneath neighbouring undamaged buildings or hard-standing due to the 'J-Curve' Effect.

UXB strikes to undamaged/superficially damaged buildings and hard-surfaced ground will still have caused substantial damage or an easily identifiable and persistent entry hole. Similarly, it is unlikely that an HE UXB entry hole on well-maintained / manicured lawns (tennis courts, bowling greens, golf course fairways / greens, gardens in affluent areas etc), would have been overlooked. Such incidents would have been reported and the UXB subsequently removed.

8.6.5 German Air-Delivered Ordnance Failure Rate

Based on empirical evidence, it is generally accepted that 10% of the German HE bombs dropped during WWII failed to explode as designed. This estimate is probably based on the statistics of wartime recovered UXBs and therefore will not have taken account of the unknown numbers of UXBs that were not recorded at the time and is probably an underestimate.

The reasons for failures include:

- Fuze or gaine malfunction due to manufacturing fault, sabotage (by forced labour) or faulty installation.
- Clockwork mechanism failure in delayed action bombs.
- Failure of the bomber aircraft to arm the bombs (charge the electrical condensers which supplied the energy to initiate the detonation sequence) due to human error or equipment defect.
- Jettison of the bomb before it was armed or from a very low altitude. Most likely if the bomber was under attack or crashing.

War Office Statistics document that a daily average of 84 bombs which failed to function were dropped on civilian targets in Great Britain between 21st September 1940 and 5th July 1941. 1 in 12 of these (probably mostly fitted with time delay fuzes) exploded sometime after they fell; the remainder were unintentional failures.

From 1940 to 1945 bomb disposal teams dealt with a total of 50,000 explosive items of 50kg and over (i.e. German bombs), 7,000 AAA shells and 300,000 beach mines. These operations resulted in the deaths of 394 officers and men. However, UXO is still regularly encountered across the UK.

Note, due to manufacturing fault or failure of the bomber crew to correctly arm their munitions, whole bomb loads often failed to detonate. Therefore, the presence of reported UXBs increases the likelihood of an additional unrecorded UXB in the vicinity.

8.6.6 Site Specific Analysis

The following table will place the site in context with these factors, in order to assess the likelihood of post-raid UXO detection within the project site.

Likelihood of Post Raid UXO Detection on Site			
Site-Specific Factors			**Additional Comments**
Density of Bombing Assessment	Based on wartime records or secondary source information, what was the bombing density over the site?	Moderate	While the overall bombing density of the Rural District of Eastry was low, the Parish of Minster sustained a comparatively higher density of bombing due to the presence of RAF Manston.
	Was the site ever subjected to one or more large-scale (>100 tons of ordnance) night time Blitz raids?	✘	
	Were any HE bomb strikes recorded on site?	✓	The following were recorded on site: 20 x HE bombs, 1 x UXB, 1 x Oil bomb and 41 x IBs
	What is the distance between the site boundary and the closest recorded large bomb strike?	On site	The following were recorded on site/immediately adjacent with its boundary: 1 x HE bomb and 2 x UXBs

	How many HE, Parachute Mine, Oil Incendiary, Phosphorus Incendiary or Fire Pot bombs (large bombs) were recorded within a 300m radius of the site?	2	
	Were any nearby sticks of large bombs recorded in line with the site?	✓	
	Were any 1kg incendiary bomb showers recorded over the site?	✓	41 x IBs recorded on site.
Bomb Damage Assessment	A comparison of the historical records confirms that buildings within the site boundary sustained serious bomb damage.	✗	
	Direct or indirect evidence of HE bomb craters in open ground (within the site boundary) has been found.	✓	
	Buildings on site were seriously damaged by a V1 and / or V2 strike.	✗	
	Buildings on site could have been seriously damaged prior to the nearby V1 or V2 strike?	n/a	
Frequency of Access Assessment	The site was situated in a densely populated urban area during WWII and therefore would have been accessed at the outbreak of WWII.	✗	
	The site was exclusively or partially developed during WWII.	✓	A number of small farm buildings and a Sewage Works was present on site.
	Buildings on site survived WWII intact and therefore likely remained inhabited or in use, suggesting these localities and their immediate environs were accessed throughout the war.	✓	
	The site was crossed by roads / pavements or footpaths which would have been regularly used / subject to daily footfall.	✓	Note however, while the site was occupied by a roadway and footpaths, the site was situated in a rural location. Therefore it is considered unlikely these routes would have been as frequently used as those in urban areas.
	The site was occupied by small residential back yards / gardens, likely to have been put to use for cultivation as a result of the government's Dig for Victory Campaign.	✗	

	The site was occupied by a school during WWII.	✖	
	Part of the site is likely to have been subject to post-raid searches for UXO.	✓	It is possible the Sewage Works was subjected to post-raid searches for UXO.
	Buildings on site sustained serious bomb damage and as a result were likely abandoned (along with any associated gardens / open ground) for the remainder of the war.	✖	
	The site was occupied by peripheral open ground / wasteland, with no apparent use, which may have been neglected.	✓	
	The site may have been occupied by recreational land / sports fields which may have only experienced seasonal access.	✖	
	The site was occupied by a graveyard which would have experienced limited access.	✖	
	The site was occupied by agricultural land, rural countryside or woodland which would not have been accessed in full, either regularly or frequently.	✓	
	The site was occupied by railway sidings which may not have been as regularly checked for buckling as mainline railway tracks.	✖	
	The site was occupied by soft railway embankments which are likely to have been neglected during the war.	✓	
Ground Cover Assessment	The site was partially or entirely abandoned, due to bomb damage, resulting in associated open ground likely becoming overgrown.	✖	
	The site was occupied by dense, inaccessible vegetation during WWII.	Possibly	
	The site may have been susceptible to waterlogged conditions during WWII.	✓	
	The site was occupied by (possibly) unmaintained grass field during WWII.	✓	
	The site was part occupied by a canal, river, dock basin, lake or reservoir during WWII.	✓	

	The site was occupied by tidal mud or marshland during WWII.	✓	
	The site was occupied by railway tracks crossing soft ground during WWII.	✓	
	The site was occupied by stockpiled material during WWII.	✗	
	The site was occupied by buildings, hard-standing or other manmade structures that did not sustain any degree of bomb damage.	✓	
	A comparison of the historical records confirms that buildings on site sustained inconsequential minor / moderate damage.	✗	
	The site was occupied by well-maintained, manicured lawn during WWII.	✗	
	Undamaged, developed parts of the site would have been vulnerable to the J-Curve Effect.	✓	
Bomb Failure Rate	Evidence has been found which suggests that the bomb failure rate in the vicinity of the site would have been different from the "approximately 10%" figure normally used.	✗	

9 The Threat from Allied Military Ordnance

The following potential historical and modern sources of UXO contamination on site or in the surrounding area have been considered:

Potential Source of Contamination on Site	
Army, Navy and RAF Bases / Installations	✗
Military Training Areas / Weapons Ranges	✗
Ordnance / Explosives Factories and Storage Depots	✗
Sites Requisitioned for Military Use	✓
Sites Used or Occupied by the Home Guard	✓
Military Fortifications and Coastal Defences	✓
Locations of Army Explosive Ordnance Clearance Tasks	✗
WWII Anti-Aircraft Batteries	✓
WWII Pipe Mined Locations and Beach Minefields	✗

The risk of contamination from Allied UXO on site is discussed below.

9.1 Port Richborough

Port Richborough, nicknamed port "Q", was established in 1914 on the banks of the River Stour, was kept a secret and served as a significant military outpost. Throughout WWI, the port was used for manning and arming barges being sent to Dover and subsequently France.[1] The port became militarised during WWI, multiple stores for equipment used for supplying the barges were erected in and around the banks. Moreover, defensive positions were established around the Port especially on the flats towards the mouth of the River Stour.

During WWII the port served as a military outpost for the Royal Marines in 1942, named H.M.S Robertson. The Port was considered "a hive of industry" in preparation for D-Day, with many troops were stationed in the nearby Richborough Camp and factory workers working throughout the blackout in the port factory.[2] The port was located approximately 840m south-east of the site.

9.2 Home Guard Activity

The Home Guard (HG) was a defence organisation of the British Army, operational between 1940 and 1944. It comprised 1.5 million local volunteers, otherwise ineligible for military service and acted as a secondary defence force in case of enemy invasion. The HG guarded the coastal areas

[1] *https://blog.railwaymuseum.org.uk/port-of-richborough-and-the-birth-of-the-cross-channel-train-ferry/*
[2] *http://www.open-sandwich.co.uk/town_history/richborough_port.htm*

of Britain and other important facilities such as airfields, factories and explosives stores. They were also active in county towns and cities.

Official records were rarely kept by the HG and therefore any present-day evidence is usually anecdotal. However, it is known that HG personnel often carried out training (including weapons training) in open countryside on the outskirts of cities / towns. Today, items of ordnance related to the HG are occasionally encountered by members of the public and the construction industry in the British countryside. This suggests a culture of ill-discipline regarding live ammunition within HG units.

HG personnel are known to have purposefully buried caches of ammunition and weapons in tactical positions, to be exhumed and used in case of invasion. Records of such caches were not rigorously kept, and some were therefore forgotten about. This is substantiated by several HG UXO finds over recent years. The below table shows just a handful of examples:[3]

Home Guard UXO Finds:	
	Unexploded Spigot Mortar Round, used by the Home Guard in WWII, found and disposed of in Hayle, Cornwall – January 2021
	24 x WWII grenades found buried in a field in Sibton, Suffolk – May 2019
	A cache of 80 phosphorous grenades buried by the Home Guard found in Eastbourne – September 2015

[3] Various News Sources

	Home Guard Phosphorous Grenades found buried beneath a bridge in Herne Bay – July 2015

9.3 Anti-Aircraft Gun Batteries

At the start of the war two types of AAA guns were deployed: Heavy Anti-Aircraft Artillery (HAA) and Light Anti-Aircraft Artillery (LAA). The LAA batteries were intended to engage fast low flying aircraft and were typically deployed around airfields or strategic installations. These batteries were mobile and could be moved to new positions with relative ease when required. With four guns per battery firing several rounds per minute, AA batteries could expel numerous shells in even the shortest engagements. Numerous unexploded AAA shells were recovered during and following WWII and are still occasionally encountered on sites today.

The maximum ceiling height of fire at that time was around 11,000m however, as the war progressed, improved variants of the 3.7" gun were introduced and, from 1942, large 5.25-inch weapons were brought into service. These had significantly improved ceiling heights of fire reaching over 18,000m.

When the supply of clockwork fuses from Switzerland was cut off, Britain was forced to make its own. After four years of war, the country still lacked the engineering skills to produce a reliable fuse. This resulted in a considerable number of AA projectiles exploding prematurely, killing the gunners or failing to explode at all and falling to the ground as UXBs. In January 1944, more people in London were killed by HAA shells than by German bombs.

9.4 Site-Specific Threat from Allied Military Ordnance

The following table identifies the potential threat to the site of contamination from British / Allied UXO.

Potential Source	Details
Nearest Home Guard Battalion to the site	6th Kent (Thanet) Home Guard Battalion
Home Guard Activity on site	• The Thanet Battalion primarily operated out of Margate, approximately 7km north-east from the site. However, the exact locations of their HQ or training areas were not found.

	• Anecdotal evidence suggests the Minster Platoon of the Thanet HG used a building in the High Street, approximately 700m north of the site, for training purposes[4].
	• Monkton HG Platoon also operated in the area, utilising a chalk pit, approximately 2.9km north-west of the site, for rifle and spigot mortar practice[5].
	• Further military activity in the area included:
	  o The requisition of Walters Hall, 1.3km north-west, by the military.
	  o A camp, built for the construction of Richborough Port, was located approximately 600m south-east[6].
	  o A stores depot for Richborough Port 500m east of the site[7].
	• Typically, HG soldiers would take part in training exercises in areas occupied by open countryside. Furthermore, HG personnel are known to have purposefully buried caches of ammunition and weapons in tactical positions, to be exhumed and used in case of invasion.
	• Marshy land between Minster and Pegwell Bay was used as a mortar training range during WWII, however no details regarding the full extent of the training area could be located. Therefore the possibility of such training taking place on site cannot be discounted.
	• Note, a mortar was discovered approximately 220m north of the site (see Section 10.2.2), confirming local training activity.
	• Given the strong military / HG presence in the area and the site comprising undeveloped ground, the possibility the site was used for training purposes cannot be discounted.

Defensive features within the vicinity	• WWII road block established across Ebsfleet Lane, approximately 1.1km east[8]. • 3 x anti-tank ditches within 1km. • A WWII-era structure, possibly a lookout post, located 790m east of the site[9]. • A WWI/WWII gun pit located 1.1km south[10]. • Incomplete pillbox 550m east[11]. • Gun emplacement 660m east[12].
Number of HAA batteries within 5km of the site	6

[4] http://sussexhistoryforum.co.uk/index.php?topic=4146.0
[5] http://sussexhistoryforum.co.uk/index.php?topic=7549.0
[6] https://webapps.kent.gov.uk/KCC.ExploringKentsPast.Web.Sites.Public/SingleResult.aspx?uid=MKE42005
[7] https://webapps.kent.gov.uk/KCC.ExploringKentsPast.Web.Sites.Public/SingleResult.aspx?uid=Mke42007
[8] https://webapps.kent.gov.uk/KCC.ExploringKentsPast.Web.Sites.Public/SingleResult.aspx?uid=MWX43194
[9] https://webapps.kent.gov.uk/KCC.ExploringKentsPast.Web.Sites.Public/SingleResult.aspx?uid=MWX43260
[10] https://webapps.kent.gov.uk/KCC.ExploringKentsPast.Web.Sites.Public/SingleResult.aspx?uid=MWX43481
[11] https://webapps.kent.gov.uk/KCC.ExploringKentsPast.Web.Sites.Public/SingleResult.aspx?uid=MWX43258
[12] https://webapps.kent.gov.uk/KCC.ExploringKentsPast.Web.Sites.Public/SingleResult.aspx?uid=MWX43259

Threat to the site from unexploded AA shells	• The nearest HAA battery was approximately 2.7km north from the site, situated close to RAF Manston. • Furthermore, a number of light AA batteries were established across the area. This includes a Bofors AA battery 1.5km east, LAA battery 1.6km east, and a machine gun post 2km east[13]. • RAF Manston and the surrounding area was targeted and attacked by the Luftwaffe several times during WWII. During such attacks, it is likely that a significant degree of AA fire would have occurred over the site. • The site was occupied by undeveloped marshy ground / a river / ditches during WWII. In such ground conditions, an unexploded AA shell could go unnoticed.

9.5 Generic Types of WWII British / Allied Unexploded Ordnance

9.5.1 Land Service Ammunition (LSA)

9.5.1.1 General

The term Land Service Ammunition covers all items of ordnance that are propelled, placed or thrown during land warfare. They may be filled or charged with explosives, smoke, incendiary or pyrotechnics. They can be broken into five main groups:

a. Mortars

b. Grenades

c. Projectiles

d. Rockets

e. Landmines

Unexploded or partially unexploded Mortars and Grenades are among the most common items of UXO encountered in the UK. They are commonly encountered in areas used by the military for training and are often found discarded on or near historic military bases.

Examples of the most commonly used British / Allied Land Service Ammunition types are presented in the *Ordnance Specifications and Information* appendices, at the end of this document.

9.5.1.2 Mortars

A mortar bomb is a fin-stabilised munition, normally nose-fuzed and fitted with its own propelling charge (primary cartridge). Range is increased by adding extra propellant (augmenting charges). They are either HE or Carrier and generally identified by their tear-dropped shape (older variants however are parallel sided) and a finned 'spigot tube' screwed or welded to the rear end of the body housing the propellant charge.

A mortar relies on a striker hitting a detonator for explosion to occur. It is possible that the striker may already be in contact with the detonator and that only a slight increase in pressure would be required for initiation. Discarded augmenting charges are often encountered around mortar firing areas/bases.

[13] *https://webapps.kent.gov.uk/KCC.ExploringKentsPast.Web.Sites.Public/SingleResult.aspx?uid=MWX43191*

9.5.1.3 Grenades

A grenade is a short-range weapon which may be thrown by hand, fired from the end of a rifle or projected/propelled from a special purpose grenade launcher. They are divided into two categories; HE and Carrier (generally smoke). As with mortars, a grenade striker may either be in contact with the detonator or still be retained by a spring under tension, and therefore shock may cause it to function. A grenade can have an explosive range of 15-20m. Common older variants have a classic 'pineapple' shape; modern grenades tend to be smooth-sided.

9.5.2 Small Arms Ammunition (SAA)

The most likely type of ordnance to be encountered on site are items of SAA (bullets), especially .303" ammunition which was the standard British and Commonwealth military cartridge from 1889 until the 1950s.

However even if an item such as this functioned, the explosion would not be contained within a barrel and detonation would only result in local overpressure and very minor fragmentation from the cartridge case.

Some LAA guns and RAF fighter cannons in use with British forces during WWII utilised the 20mm round. These bullets had a small fuse and a ~4gram HE or incendiary charge. Although small, this fill quantity still has the potential to cause serious injury.

Examples of the most commonly used British / Allied Small Arms Ammunition types are presented in the *Ordnance Specifications and Information* appendices, at the end of this document.

9.5.3 Anti-Aircraft Shells

At the start of the war two types of AAA guns were deployed: Heavy Anti-Aircraft Artillery (HAA) using large calibre weapons such as the 3.7" QF (Quick Firing) gun and Light Anti-Aircraft Artillery (LAA) using smaller calibre weapons such as 40mm Bofors gun which could fire up to 120 x 40mm HE shells per minute to over 1,800m. During the early war period there was a severe shortage of AAA so older WWI 3" and modified naval 4.5" guns were also deployed.

These shells are frequently mistakenly identified as small German air-delivered bombs but are differentiated by the copper driving band found in front of the base. Although the larger unexploded projectiles could enter the ground, they did not have great penetration ability and are therefore likely to be found close to WWII ground level. With a HE fill and fragmentation hazard these items of UXO also present a significant risk if encountered.

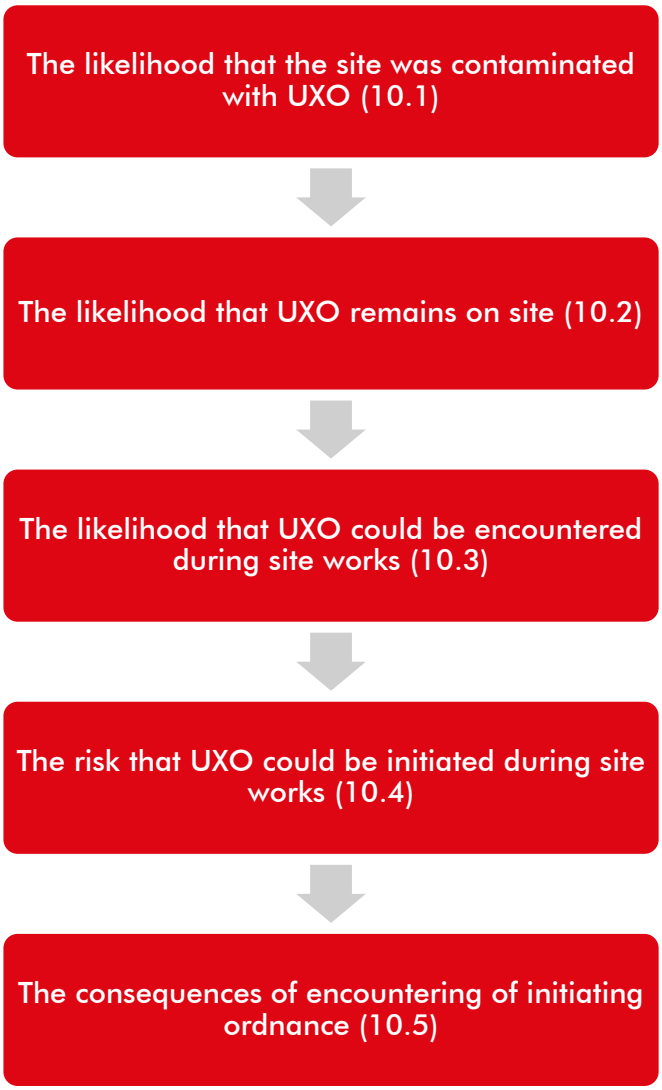
The smaller 40mm projectiles are similar in appearance and effect to small arms ammunition and, although still dangerous, present a lower risk. Details of the most commonly deployed WWII AAA projectiles are shown below:

Gun type	Calibre	Shell Dimensions	Shell Weight	HE Fill Weight
3.7 Inch	94mm	94mm x 438mm	12.7kg	1.1kg
4.5 Inch	114mm	114mm x 578mm	24.7kg	1.7kg
40mm	40mm	40mm x 311mm	0.84kg	70g

Examples of the most commonly used British / Allied Anti-Aircraft Ammunition types are presented in the *Ordnance Specifications and Information* appendices, at the end of this document.

10 The Overall Unexploded Ordnance Risk Assessment Methodology

Taking into account the quality of the historical evidence, the assessment of the overall risk to any intrusive works from UXO must evaluate the following factors:



Each of these steps will be evaluated in the following sections in order to conclude the total risk from UXO to the proposed works to be undertaken within the project site.

10.1 The Likelihood that the Site was Contaminated with Unexploded Ordnance

10.1.1 General

The below is a generalised table of factors used to determine the likelihood that the site was contaminated with unexploded ordnance. Note that additional site-specific information can adjust UXO risk beyond these criteria:

Low Likelihood	Medium Likelihood	High Likelihood
German Air-Delivered Ordnance / Allied Anti-Aircraft Shells		
No evidence of bombing / bomb damage on site coupled with low local bombing density.	Moderate to High local bombing density or evidence of bombing / bomb damage on or close to the site.	High local bombing density or evidence of bombing /bomb damage on or adjacent to the site. Confirmed finds of WWII UXB.
Ground conditions that would prevent UXB penetration or lead to easily identifiable entry holes.	Ground conditions that allow for bomb penetration.	Ground conditions that would have immediately and completely obscured the existence of UXB.
Site was occupied and accessed fully throughout the bombing campaign.	Site located in an area that was infrequently observed or accessed, with a low likelihood that a UXB strike would have been noticed.	Site may be completely obscured from view or subject to very infrequent access.
British / Allied Ordnance		
No evidence of Allied military activity on or near the site. Or Military sites which have been cleared / redeveloped since their use Or Military-owned sites which have not been used for training with live munitions.	Clear evidence of military training activity on site involving live ammunition / munitions. Military sites which have not undergone clearance operations or redevelopment since use. Evidence of weapons storage on site.	Evidence of weapons testing or disposal on or adjacent to the site.
Developed areas that are unlikely to have been used for military exercises.	Open or unmaintained ground that may have been used for disposal or caching of munitions.	Evidence of UXO finds on or in the vicinity of the site.

The following sections assess the likelihood of contamination from German UXO and British / Allied UXO, based on the evidence discussed in the previous sections.

10.1.2 Likelihood of Contamination from German UXO

The following table discusses the overall likelihood of contamination from German UXO, based on the evidence discussed in Section 8.

Overview of the Potential Sources of German Air-Delivered UXO	
Bombing density	• 20 x HE bombs plotted on site • 1 x UXB plotted on site • 1 x Oil bomb plotted on site • 41 x IBs plotted on site • 4 x officially recorded abandoned bombs on site
Bomb Damage	• Over 20 bomb craters present within the site boundary
Ground Conditions	• Majority of the site comprised marshland • A sewage works and multiple small farm buildings on site • Railway line present in the eastern section • River crossing the southern extent
Frequency of Access	• Likely infrequent access to marshland • Likely seasonal access to remote farm structures • Sewage Works likely more frequently accessed
J-Curve Effect	• Had any UXB landed within the soft ground / waterways on site, it could have come to rest beneath the adjacent undamaged areas.
Other considerations	• Bombing decoy site 1.1km south-west
Overall Likelihood of Contamination	**High**

10.1.3 Likelihood of Contamination from British / Allied UXO

The following table discusses the overall likelihood of contamination from British / Allied UXO, based on the evidence discussed in Section 9.

Overview of the Potential Sources of British / Allied UXO	
Land Service Ammunition / Small Arms Ammunition	• Several Platoons of the Thanet Home Guard Battalion operated in the area. • Additional military activity in the area included: a military camp 600m south-east and a stores depot 500m east.

	• At least seven defensive features within 1.1km of the site. • Marshy land between Minster and Pegwell Bay used as a mortar training range during WWII. • A mortar was discovered approximately 220m north of the site, confirming local training activity. • Given the strong military / HG presence in the area and the site comprising undeveloped ground, the possibility the site was used for training purposes cannot be discounted.
Anti-Aircraft Projectiles	• Six HAA batteries were situated within a 5km radius of the site during WWII. The closest of which was approximately 2.7km north from the site. • A number of light AA batteries were established across the area including a Bofors AA battery 1.5km east, LAA battery 1.6km east, and a machine gun post 2km east. • The site was occupied by undeveloped marshy ground / a river / ditches during WWII. In such ground conditions, an unexploded AA shell could go unnoticed.
Overall Likelihood of Contamination	**Medium**

10.2 The Likelihood that Unexploded Ordnance Remains on Site

10.2.1 General

The extent to which any ordnance clearance activities have taken place on site or extensive ground works have occurred is relevant since they may indicate previous ordnance contamination but also may have reduced the risk that ordnance remains undiscovered.

10.2.2 EOD Bomb Disposal and Clearance Tasks

SafeLane Global holds a number of official records of explosive ordnance disposal operations during and following WWII, obtained from the Explosive Ordnance Disposal (EOD) Archive Information Office at 33 Engineer Regiment (EOD), British Army.

Potential Source	Details
Records of Army EOD tasks having taken place on site or in the vicinity	None
Local ordnance finds	• 1st November 1967 – A WWII mortar was recovered from the roadway in close proximity to Minster Railway Station. It was removed and subsequently

	destroyed[14]. Minster Railway Station is located approximately 220m to the north of the site. • 14th November 1962 – A UXB was found at Hoo Farm, Minster[15]. Hoo Farm is located approximately 970m north. • 20th July 1962 – A mortar was discovered at Wayborough Farm, Minster, in a field at the junction of Canterbury Road[16]. Wayborough Farm is located approximately 1.3km north of the site. • 13th October 1954 – A suspected UXB was found in a field adjoining the road leading from Monkton roundabout to Birchington (1.9km north-west)[17].
Local tasks undertaken by SafeLane Global	None

10.2.3 Post War Redevelopment

The nature of post-WWII ground works, redevelopment and construction has been considered. Significant structural redevelopment on site can, in some cases, provide a level of mitigation, particularly from shallow buried items. However, if a site has not undergone any extent of redevelopment, the likelihood of UXO remaining within its boundaries can remain.

The site has been redeveloped post-WWII	✖
Further Details	No significant redevelopment works have taken place on site in the post-war period.

10.2.4 Site-Specific Analysis

The following table discusses the likelihood that UXO could remain on site, following any post-WWII activity.

Mitigating factors during post-WWII period	No known redevelopment has been undertaken on site.
Further comments	Within the footprints of the post-war redevelopment / ground works, the risk of shallow buried UXO (especially German 1kg incendiaries) remaining will have been partially mitigated since any such items could have been encountered and removed during soil stripping and levelling. As no such works appear to have taken place post-WWII, this is considered unlikely. Only within the volume of any post-war basement level bulk excavations and at the precise locations of any post-war pile foundations / boreholes, will the risk from deeper buried German HE UXBs have been completely mitigated. As no

[14] https://www.britishnewspaperarchive.co.uk/viewer/bl/0003350/19671101/001/0001

[15] https://www.britishnewspaperarchive.co.uk/viewer/bl/0003350/19621114/012/0001
[16] https://www.britishnewspaperarchive.co.uk/viewer/bl/0003350/19620720/003/0001
[17] https://www.britishnewspaperarchive.co.uk/viewer/bl/0003350/19541013/195/0010

	known bulk excavations have been carried out onsite, the risk from deep buried UXO remains unmitigated to the maximum bomb penetration depth

10.3 The Likelihood that Ordnance may be Encountered during the Works

The following table discusses the likelihood that UXO could be encountered on site during the proposed works.

At-Risk Scenarios	The most likely scenarios under which a UXO could be encountered during construction works is during piling, drilling operations or bulk excavations for basement levels. The overall risk will depend on the extent of the works, such as the numbers of boreholes/piles (if required) and the volume of the excavations. Since an air-dropped bomb may come to rest at any depth between just below ground level and its approximate penetration depth there is also a chance that such an item could be encountered during shallow excavations (for services or site investigations) into the original WWII ground level. If the proposed works are due to be undertaken within post war fill material / made ground, the risk of encountering WWII UXBs is low. However, if works are to be undertaken below WWII ground level this risk is significantly higher.
Likelihood of UXO being encountered during the proposed works	The proposed works comprise ground investigations including machine excavated trial bits and cable percussion boreholes. here is an elevated likelihood of UXO being encountered during these works.

10.4 The Risk that Ordnance may be Initiated

Items of ordnance do not become inert or lose their effectiveness with age. Time can indeed cause items to become more sensitive and less stable. This applies equally to items submerged in water or embedded in silts, clays or similar materials. The greatest risk occurs when an item of ordnance is struck or interfered with. This is likely to occur when mechanical equipment is used or when unqualified personnel pick up munitions.

10.4.1 Initiation of Unexploded Bombs

In the case of unexploded German bombs discovered within the construction site environment, there are a number of potential initiation mechanisms:

Direct Impact onto the main body of the bomb	Unless the fuze or fuze pocket is struck, there needs to be a significant impact to initiate a buried iron bomb.
Re-starting the clock timer in the fuze	Only a small proportion of German WWII bombs employed clockwork fuzes. It is probable that significant corrosion has taken place within the fuze since the end of WWII that would prevent clockwork mechanisms from functioning, nevertheless it was reported that the fuze in a UXB dealt with by 33 EOD Regiment in Surrey in 2002 did recommence.

Induction of a static charge, causing a current in an electric fuze	The majority of German WWII bombs employed electric fuzes. It is probable that significant corrosion has taken place within the fuze mechanism since the end of WWII such that the fuze circuit could not be activated.
Friction impact initiating the (shock-sensitive) fuze explosive	This is the most likely scenario resulting in the bomb detonating.

10.4.2 Activities that may Result in the Initiation of Unexploded Ordnance

Unexploded bombs do not spontaneously explode. All high explosive requires significant energy to create the conditions for detonation to occur. The risk that UXO could be initiated if encountered will depend on its condition, how it is found and the energy with which it is struck. However certain activities pose a greater risk than others.

Percussive piling or deep mechanical excavations	The most violent activity on most construction sites is percussive piling or deep mechanical excavations. If an item is struck with a significant enough impact, be it direct or through friction/vibration, it risks detonation.
Shallow excavation	Soil levelling and shallow excavation such as trial pits can pose a similar risk to deeper excavations, since UXO can be found at any depth between ground level and the maximum bomb penetration depth. In addition to risk of initiation by violent impact or vibration, detonation can also occur if discovered items are mishandled by unqualified personnel. This is particularly common when onsite personnel are not trained in the recognition of ordnance.
Non-intrusive works	In the case of non-intrusive planned works, little risk is posed by items of UXO that are buried beneath the ground. However, risk can arise from unburied munitions, particularly items of ordnance discarded in periphery areas of military sites. These items are frequently discovered by onsite personnel and remain live and liable to activate if mishandled.

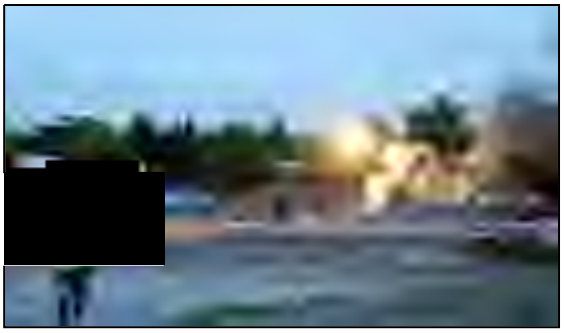
10.5 The Consequences of Encountering or Initiating Ordnance

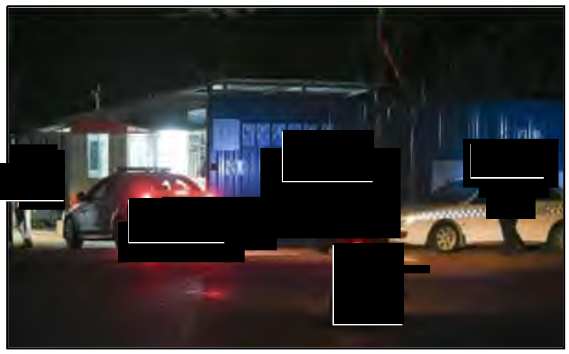
Clearly the consequences of an inadvertent detonation of UXO during construction operations would be catastrophic with a serious risk to life, damage to plant and a total site shutdown during follow-up investigations.

Since the risk of initiating ordnance is significantly reduced if appropriate mitigation measures are undertaken, the most important consequence of the discovery of ordnance will be economic. This would be particularly so in the case of high-profile locations and could involve the evacuation of the public.

The unexpected discovery of ordnance may require the closing of the site for any time between a few hours and a week with a potentially significant cost in lost time. Note also that the suspected find of ordnance, if handled solely through the authorities, may also involve loss of production since the first action of the Police in most cases will be to isolate the locale whilst awaiting military assistance, even if this turns out to have been unnecessary.

The following tables review a number of finds over recent years both in the UK and overseas that have seen large-scale disruptions, damage and injury/death:

UXB Incidents where intrusive works have caused detonation, resulting in death, injury and damage to plant	
 RESCUE workers search for survivors after a Second World War bomb exploded at a building site in Berlin, killing three people and injuring at least eight others. A fire brigade spokesman said he feared the final death toll could be higher. One worker was still missing, believed to be trapped under a machine. "We've found human remains 100 metres away but we can't tell if they belong to the dead already found," the spokesman said. The blast, set off by drilling work on Frankfurter Allee, one of east Berlin's busiest avenues, trapped workers under building machinery and sent huge chunks of concrete tumbling through the air. A large office block was being built on the site of the explosion which sent shoppers scrambling for shelter and paralysed dense afternoon traffic. One eyewitness said: "There was a bang, then silence, and then it started raining stones and dirt." Dozens of cars within a 250-metre radius were wrecked and the top two floors of a nearby apartment block caved in. Radio reports claimed that the total number of injured stood at 14. **Blown up by history**	A WWII bomb killed 3 and injured 8 in Berlin - 1994
	WWII bomb killed 3 in Goettingen, Germany – 2010.
	Excavator operator killed by WWII bomb in Euskirchen, Germany – 2014. A WWII bomb exploded at a construction site near a west German town, killing a man and injuring 8 others. The explosion occurred with a digger accidently struck the device during excavation works.

UXB Incidents where intrusive works have caused detonation, resulting in death, injury and damage to plant	
	A highway construction worker in Germany accidentally struck a WWII bomb, killing himself and wrecking several passing cars – 2006.
	Destroyed piling rig and dump truck after detonation of WWII UXB in Austria – 2006.
	WWII bomb injures 17 at construction site in Hattingen, Germany – 2008.
	A buried WWII-era bomb exploded during construction works in Bandar Malaysia, Kuala Lumpur – 2017.

UXB Incidents in the UK, resulting in delays, site shutdowns, evacuations, and disruptions	
	London City Airport shut: Flights cancelled after WWII bomb found in River Thames dock. London City Airport was closed after the discovery of a 250kg WWII German bomb, affecting tens of thousands of passengers. All flights into and out of the airport were stopped after the device was found by SafeLane Global in the nearby King George V dock. A 700ft exclusion zone was put in place and people living nearby were evacuated.
	Unexploded WWII 1000kg HE bomb found in Exeter, causing a construction site and the surrounding area to be evacuated. The subsequent detonation caused substantial damage to nearby buildings.
	A WWII UXB was found near to the Aston Expressway, leading to the evacuation of around 200 residents and a 500m cordon. Following the discovery, the weapon was safely detonated by the Army. However, although the M6 was reopened after the blast, the key Aston Expressway stayed shut until 6pm, extending traffic disruption. All nearby rail services and other roads were also disrupted.
	Up to 1000 homes were evacuated and a 300m exclusion zone was put in place following the discovery of a WWII UXB in Lansdown Road, Bath. The 500lb bomb was found just a meter beneath a playground at the former Royal High Junior School.

11 SafeLane Global's Risk Assessment

The Risk Assessment made by SafeLane Global for the site is based upon the likelihood that the site was contaminated, the risk of the contaminant item remaining, and the likelihood of, and potential consequences, should the item be struck during the proposed works. The following section discusses the risk that each ordnance type presents to the scope of works for the project site.

11.1 Conclusions

Taking into consideration the findings of this study, SafeLane Global considers the UXO risk at the site to be **High**.

Type of Ordnance	Likelihood of Contamination	Likelihood of UXO remaining	Likelihood of encounter	Potential Consequence	Overall Risk level
German High Explosive Bombs	High	High	High	Severe	**High**
German 1kg Incendiary Bombs	Medium	Medium	Medium	Severe	**Medium**
Allied Anti-Aircraft Shells	Medium	Medium	Medium	Minor	**Medium**
British / Allied Small Arms	Medium	Medium	Medium	Not Significant	**Medium**
Land Service Ammunition	Medium	Medium	Medium	Moderate	**Medium**

12 Proposed Risk Mitigation Strategy

SafeLane Global recommends the following minimum risk mitigation measures be deployed to support the proposed ground works at the site.

12.1 Summary

Based on the findings of the report, the following mitigation measures have been recommended for the proposed works on the site. Further detail on each method is presented in **Section 12.2**.

Risk Level	Planned Site Activity	Recommendations
High	Shallow Intrusive Works eg. excavations	• UXO Safety & Awareness Briefing (Toolbox Brief, TBB) • Site Specific Safety Instructions (SSSIs) Training Course • Explosive Ordnance Disposal (EOD) Engineer to support Site Investigation (SI) • Non-Intrusive (NI) Magnetometer Survey (Greenfield areas only) • Target Investigation (Required as a follow-on from NI magnetometer survey)
	Deep intrusive works (eg. piling)	• UXO Safety & Awareness Briefing (Toolbox Brief, TBB) • Site Specific Safety Instructions (SSSIs) Training Course • Intrusive Magnetometer Survey of pile/borehole positions

12.2 Additional Notes

Risk Mitigation Measures – Further Detail	
Site Specific Explosive Ordnance Safety and Awareness Briefings (UXO Toolbox Briefing) to all personnel conducting intrusive works	These briefings are intended to make site operatives aware of the nature of explosive ordnance that may be encountered on their project site. • Delivered by a specialist Explosive Ordnance Disposal Engineer. • Provides information on the site-specific explosive ordnance risk • Basic ordnance identification. • What to do in the event of an encounter with a suspicious object. • Provide UXO response procedures.
Site Specific Safety Instruction (SSSI)	For longer term projects that require Explosive Ordnance Safety and Awareness Briefings as part of the Explosive Ordnance Risk Mitigation measures for the project, SSSIs can be provided to allow nominated site representatives to deliver these briefings after initial training. • 2/3-hour presentation and training course. • Delivered by a fully qualified senior EOD Engineer.

	• Suitable for Project Site Manager HSE representative and supervisors. • Includes briefing pack. This provides a cost-effective solution to ensure that the Explosive Ordnance Safety and Awareness Briefings can be delivered effectively and efficiently to the required standard.
Explosive Ordnance Disposal (EOD) Engineer On-Site Support	In areas where the risk posed by the potential presence of explosive ordnance is low or where the conditions are not suitable for pro-active survey, EOD On-Site Support can provide a reactive response to any suspicious object that may be encountered during open excavation works. The presence of the EOD Engineer (sometimes referred to as 'high risk dig wardens') on-site in support of shallow intrusive work allows for a direct monitoring of works using visual recognition and instrumentation and provides an immediate response to reports of suspicious objects or suspected items of ordnance that have been recovered by ground workers. SafeLane Global EOD personnel on-site also have the additional benefit of providing Explosive Ordnance Safety and Awareness briefings (UXO TBB) to any staff that have not received them earlier and can advise staff of the need to modify working practices to take account of the ordnance threat. The EOD Engineer will also aid potential incident management which would involve liaison with the local authorities and police should ordnance that presents an explosive hazard be identified. • Specialist Explosive Ordnance Disposal Engineer. • Maintains a watching brief over all excavations. • Provides safety and awareness briefings to construction personnel as required. • Provides immediate identification of any suspicious item that is encountered. • Identifies whether any UXO item is live or inert. • Provides liaison assistance with the relevant authorities when dealing with any live UXO. Avoids on site delays which can be caused by the incorrect identification of a suspect item being potential UXO.
Explosive Ordnance Disposal (EOD) Engineer to support site investigation works	For cost effective Explosive Ordnance Risk Mitigation for site investigation work, the EOD Engineer can survey ahead of trial pits, monitor excavations when the ground conditions are not suitable for a pro-active survey and conduct intrusive surveys for borehole and window sample locations working in conjunction with the site investigation team. The On-Site Support will also provide a reactive response to any suspicious object that may be encountered during open excavation works. SafeLane Global EOD personnel on-site also have the additional benefit of providing Explosive Ordnance Safety and Awareness briefings to any staff that have not received them earlier and can advise staff of the need to modify working practices to take account of the ordnance threat. The EOD Engineer will also aid potential Incident Management which would involve liaison with the local authorities and police should ordnance be identified and present an explosive hazard.

	• Specialist Explosive Ordnance Disposal Engineer. • Maintains a watching brief over all trial pit excavations. • Provides safety and awareness briefings to construction personnel as required. • Works in conjunction with the drilling team to survey all borehole and window sample locations in real-time using a staged drilling and magnetometer survey procedure. • Provides immediate identification of any suspicious item that is encountered. • Identifies whether any UXO item is live or inert. • Provides liaison assistance with the relevant authorities when dealing with any live UXO. • Avoids on site delays which can be caused by the incorrect identification of a suspect item being potential UXO. *Technical Information* 1. In optimum ground conditions each survey using the borehole technique will have a 1 metre look ahead capability. 2. Any steel casing used for borehole surveys will need to be retracted by 3 metres to allow the magnetometer survey to be conducted. Non-ferrous pipe will be required to support the borehole during the survey minimum diameter 60mm (to be supplied by the client).
Search & Clear	Where a non-intrusive magnetometer survey is not possible (e.g. wooded areas) SafeLane Global can deploy a two-man Explosive Ordnance Disposal Engineer team using handheld magnetometer equipment who will proactively survey either in search lanes or boxes, investigating each reading with the support of an operated excavator. The survey is suited to detecting suspicious ferro-magnetic buried objects that may be munitions and/or explosive ordnance related. All SafeLane Global personnel involved with the Search and Clearance Works will be former military personnel who have gained formal NATO Military Explosive Ordnance Disposal Qualifications, having completed training at the Defence Explosive Ordnance Disposal School (DEODS) Chattenden, Kent or similar establishment throughout their military service. The client will be responsible for: • Demarcating the areas to be searched. • Providing services clearance and permit to dig. • Providing operated excavator to access deeper targets if required (SafeLane Global can provide this service at additional cost). • Providing coordinates of positions where debris have been identified (if information required in report). • Providing storage for recovered debris. Output will depend upon terrain and contamination (number of readings to be investigated).

Non-Intrusive Magnetometer Survey and Target Investigation (greenfield land only)	**Non-Intrusive Survey** This survey type is designed for use on magnetically 'clean' land commonly referred to as 'greenfield'. Brownfield land is often described as that which has had previous industrial or commercial use. In this context it specifically encompasses sites with are underlain by 'made ground' which may contain metallic contamination. Non-intrusive magnetometry or electromagnetic equipment which is used in the search for buried UXO relies upon the detection of small changes between clear ground and that containing UXO. The technique operates very successfully in environments where there is minimal ground contamination from other sources such as fired bricks, reinforced concrete, discarded scrap metal and buried services. There are also man-made ambient effects on magnetic and electromagnetic non-intrusive survey systems which include moving plant vehicles, power cables, electric trains etc. Non-Intrusive survey is carried out using either total-field or gradiometer magnetometry, dependent upon site conditions. Data is recorded and then interpreted using advanced AGSPRoc software in order to map magnetic fields and model discrete magnetic anomalies (variations in the Earth's magnetic field caused by ferro-magnetic objects electrical fields or geology). The location of such anomalies is determined, and mathematical modelling used to estimate their mass and depth. The survey will also locate any buried services with a magnetic signature and indicate any areas of gross magnetic "contamination" which may indicate the presence of unknown obstructions. Additionally, the survey can provide information on archaeological features. The system can detect the magnetic field from a 50kg WWII air-dropped bomb at a depth of 4m and smaller items such as Land Service Ammunition to depths of up to 1.5m in ground with a low ambient magnetic field. In the case of soft geology, it should be noted that a 50kg high explosive bomb may be buried greater than 4 metres below ground level and therefore may not be detected by the survey. In this instance intrusive surveys may be required. The non-intrusive survey system will be deployed utilising the pedestrian survey frame. The output for the pedestrian frame is estimated at up to 2Ha per day. *Technical information:* • Client to clearly demarcate area to be surveyed prior to start and highlight any known services/underground obstructions. • Ground must be level, free of obstacles / obstructions and clear of undergrowth. Height of any crops should be no more than 400mm and where crops are present SafeLane Global would require written approval from the landowner or client to walk over the site area. • When working adjacent to existing infrastructure the survey may be ineffective due to the ferro magnetic interference caused by passing vehicles and the presence of underground buried services. A site visit may be recommended prior to commencement. • Note: the survey will be ineffective on Brownfield sites due to the magnetic nature of building rubble, which typically masks the weaker magnetic signatures of buried objects. If parts of the site are contaminated, then alternative risk mitigation measures may need to be considered. **Target Investigation**

	If a buried anomaly is detected that cannot be discounted as a potential UXO / UXB then the object will need to be investigated to positively identify the item. The process will include; • Specialist two-man Explosive Ordnance Disposal Team. • Combination of manual and mechanical excavation techniques. • Excavator shafting, shoring and dewatering equipment can be provided by SafeLane Global if required. • Excavation techniques will be defined and agreed prior to the commence. A factual report with clearance certificate will be issued on completion of the investigation.
Intrusive Magnetometer Survey of all pile locations down to the maximum bomb penetration depth	SafeLane Global can deploy a range of intrusive magnetometry techniques to clear ahead of all the pile locations. The appropriate technique is governed by a number of factors, but most importantly the site's ground conditions. The appropriate survey methodology would be confirmed once the enabling works have been completed. A site meeting would be required between SafeLane Global and the client to determine the methodology suitable for this site. Target investigation or avoidance will be recommended as appropriate.

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The key sources consulted during this assessment are listed below;

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iii. Fegan, T., *The Baby Killers': German Air raids on Britain in the First World War*, (Leo Cooper Ltd. 2002).

iv. Fleischer, W., *German Air-Dropped Weapons to 1945*, (Midland Publishing. 2004).

v. Jappy, M. J., *Danger UXB: The Remarkable Story of the Disposal of Unexploded Bombs during the Second World War*, (Channel 4 Books, 2001).

vi. Price, A., *Blitz on Britain, The Bomber Attacks on the United Kingdom 1939 – 1945*, (Purnell Book Services Ltd. 1977).

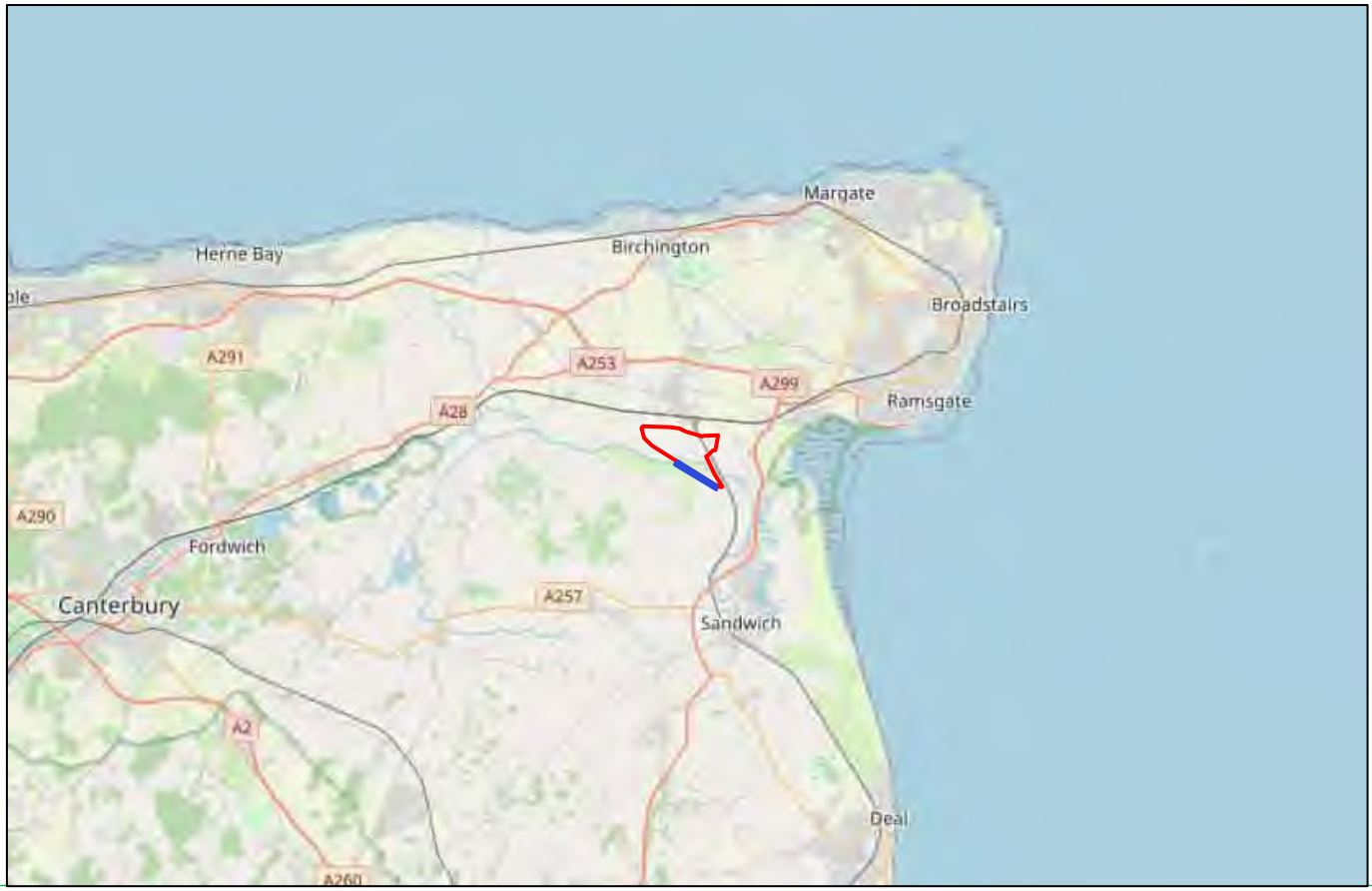
vii. Ramsey, W., *The Blitz Then and Now, Volume 1*, (Battle of Britain Prints International Limited. 1987).

viii. Ramsey, W., *The Blitz Then and Now, Volume 2*, (Battle of Britain Prints International Limited. 1988).

ix. Ramsey, W., *The Blitz Then and Now, Volume 3*, (Battle of Britain Prints International Limited. 1990).

x. Whiting, C., *Britain Under Fire: The Bombing of Britain's* Cities 1940-1945, (Pen & Sword Books Ltd. 1999).





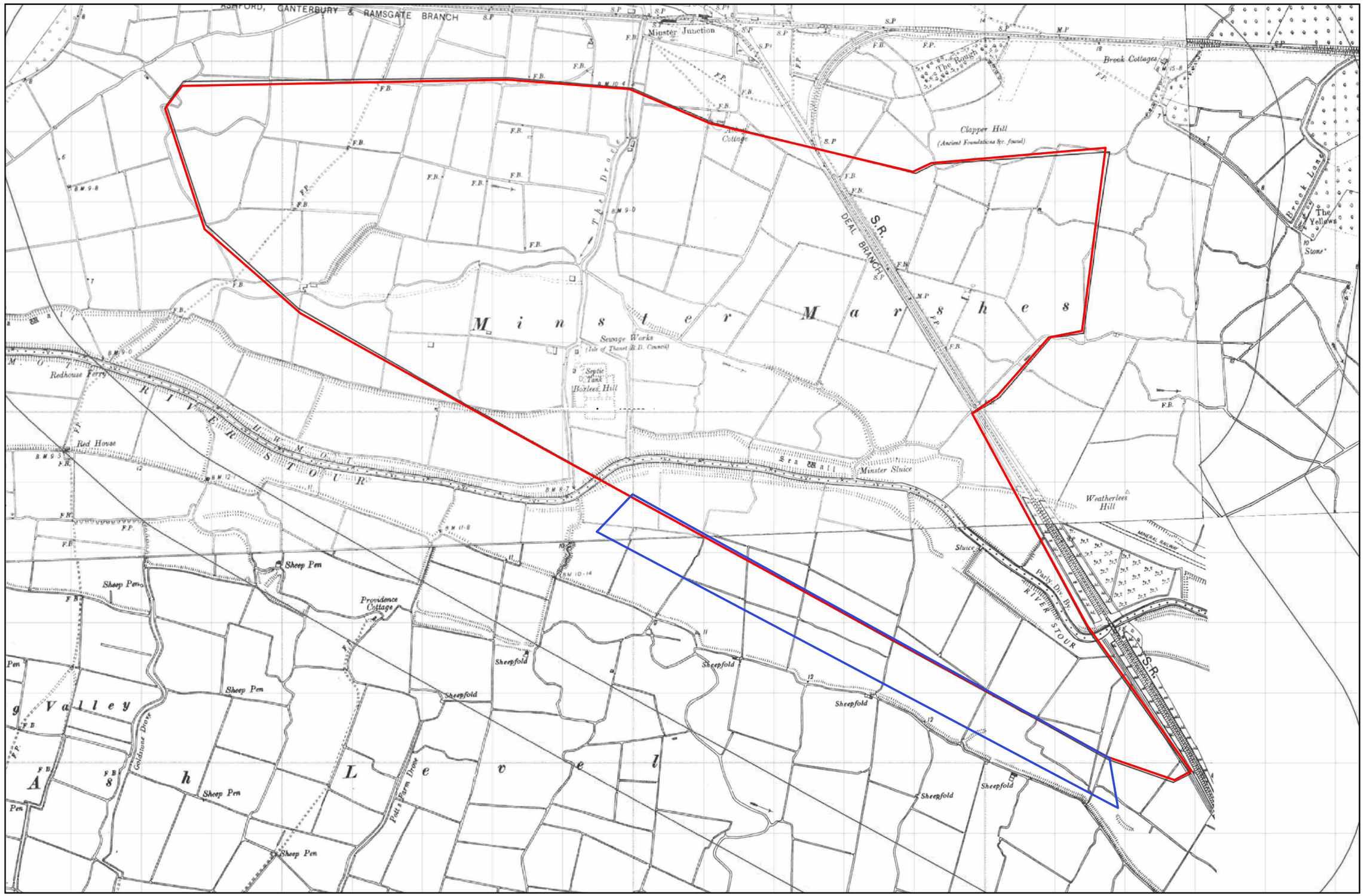
© OpenStreetMap contributors

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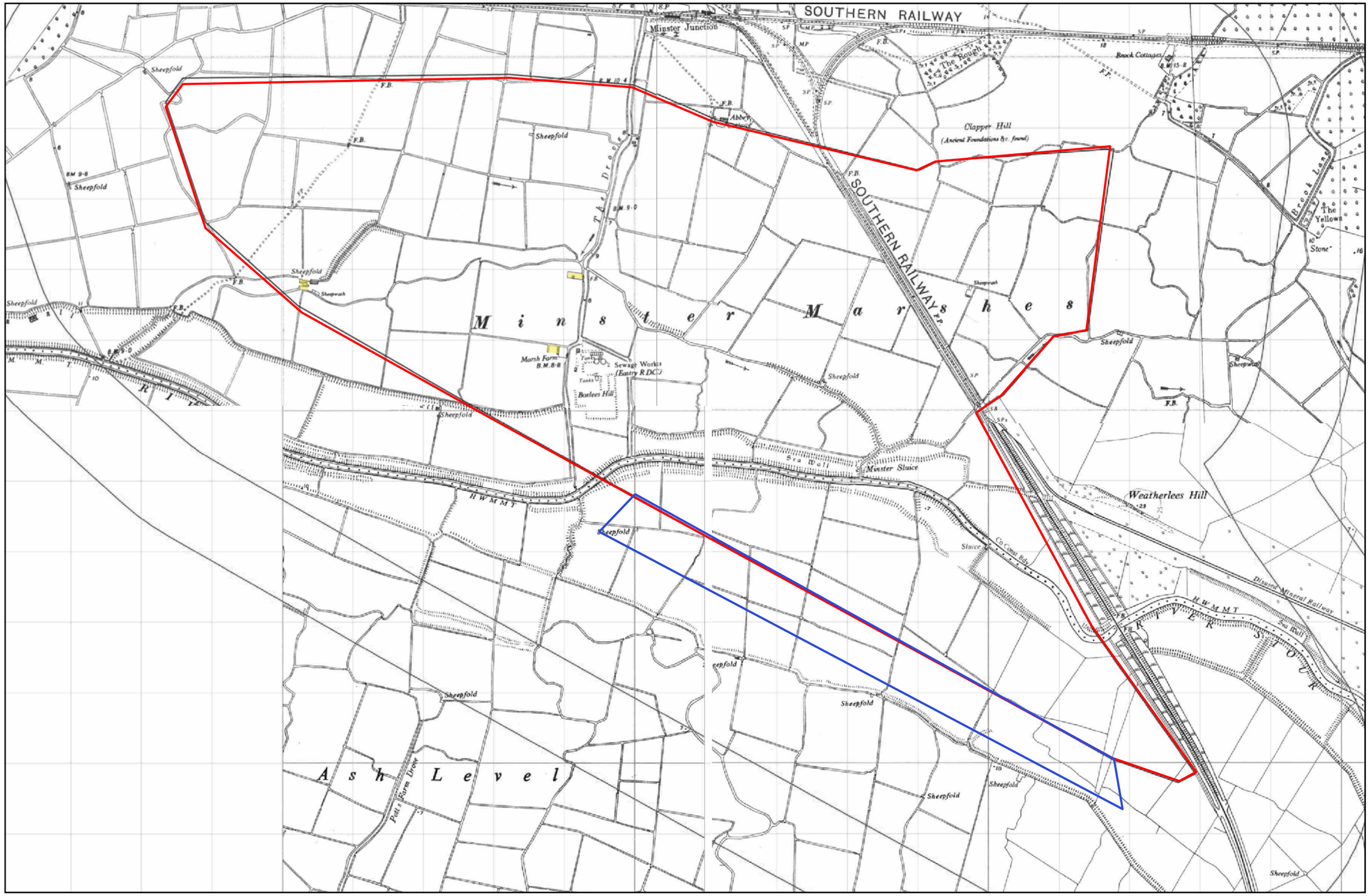


Approximate site boundary

Approximate extension area



Approximate site boundary Approximate extension area



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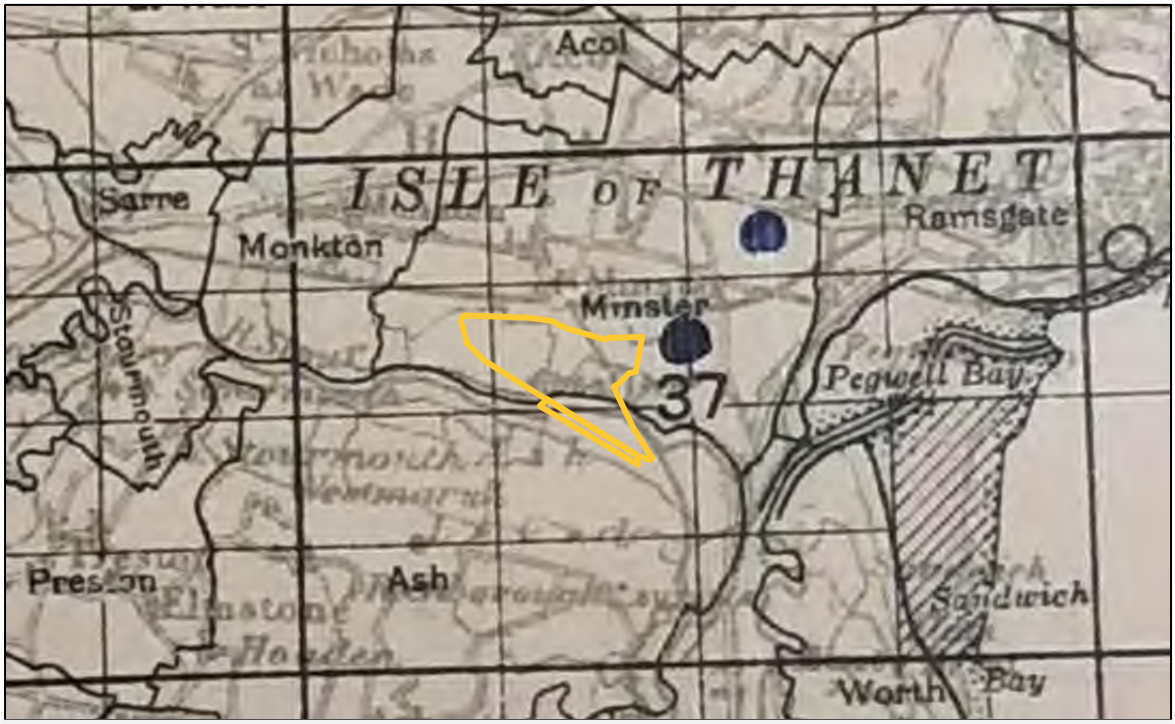
Approximate site boundary

Approximate extension area

Redevelopment



9th July 1940



6th November 1940

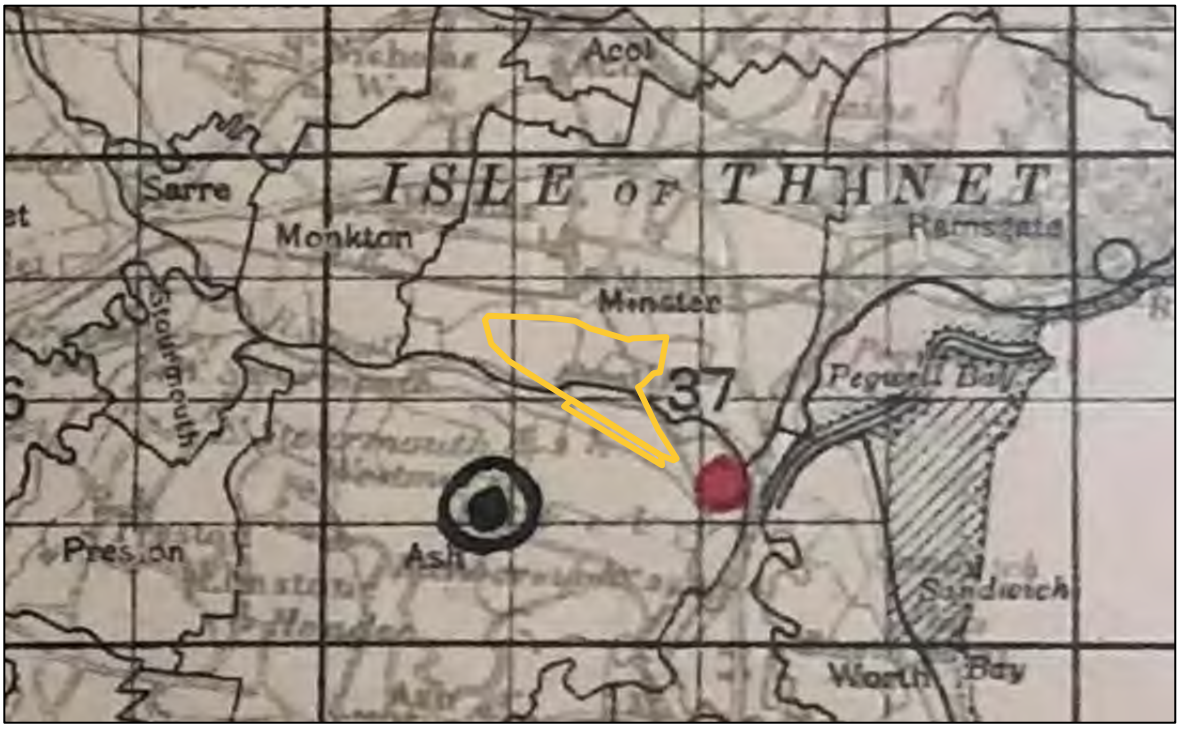
Approximate site boundary

HE bomb strike

Incendiary shower

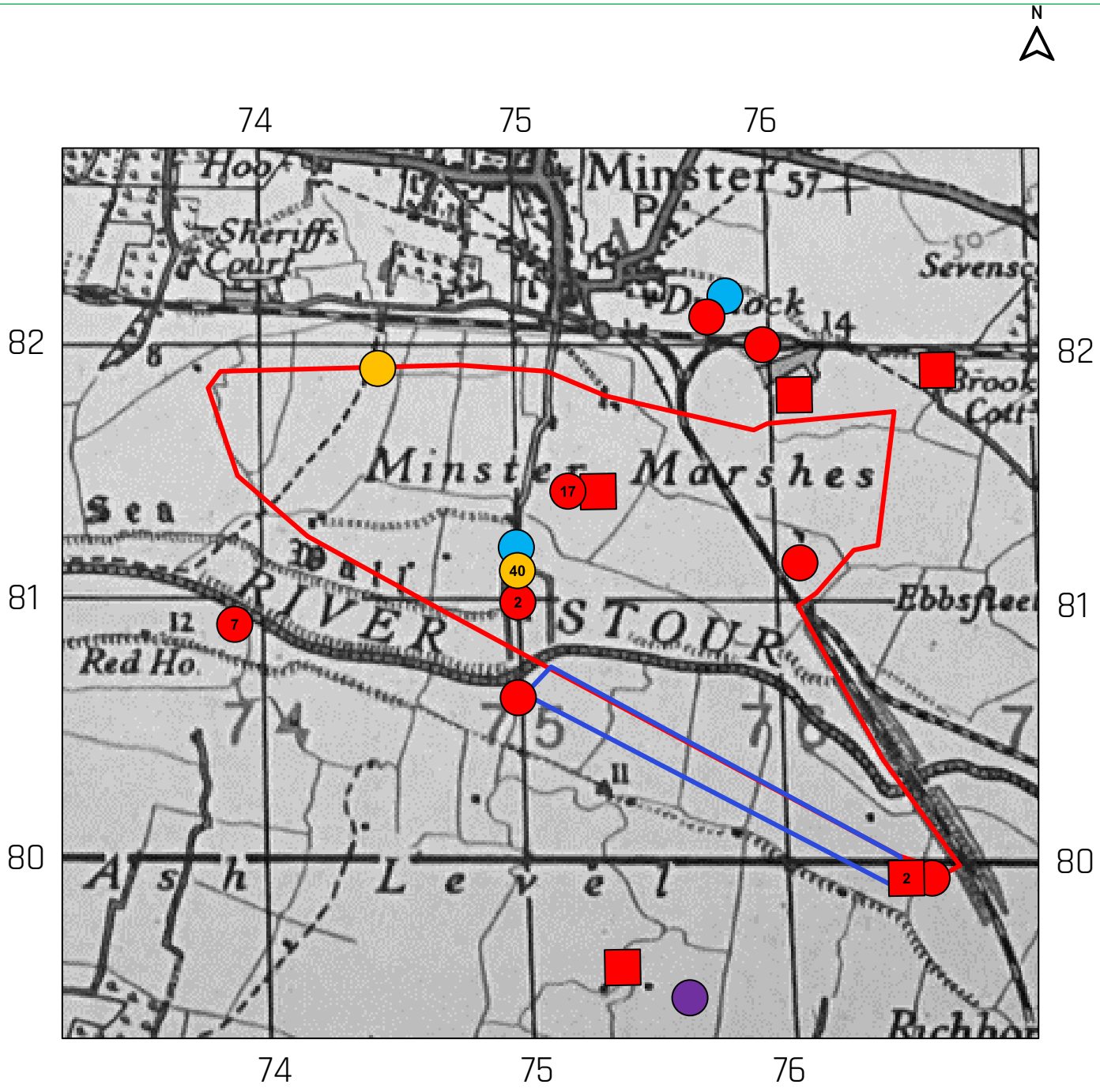
HE bomb area

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5th December 1940

Approximate site boundary Incendiary bomb Aerial mine



Approximate site boundary

HE bomb

Unexploded HE bomb

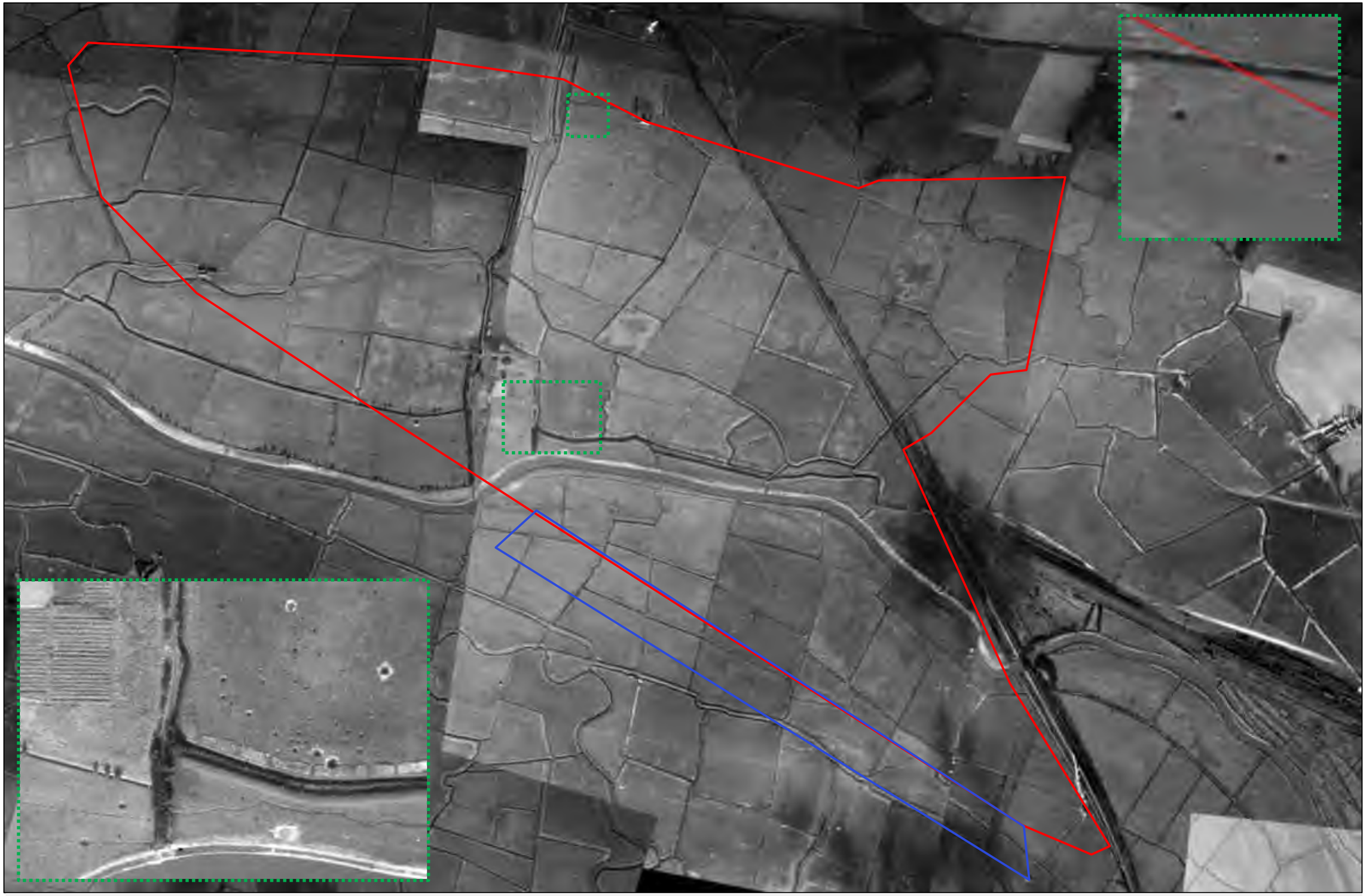
Incendiary bomb

Oil bomb

Firepot

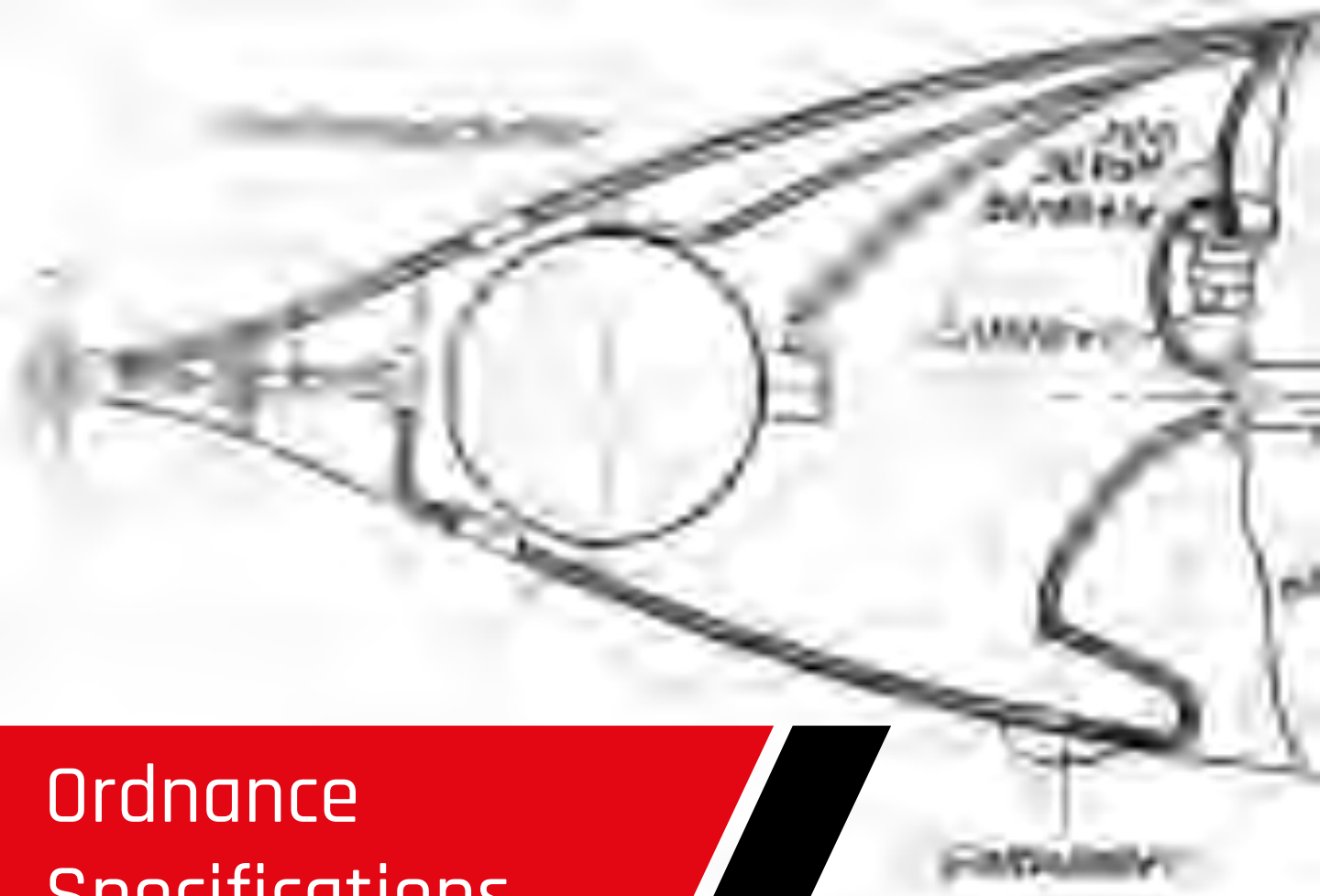
(Numbers in circles denote quantity of explosive ordnance recorded)

WWII-era RAF Aerial Photography – Circa 1946



Kent County Council

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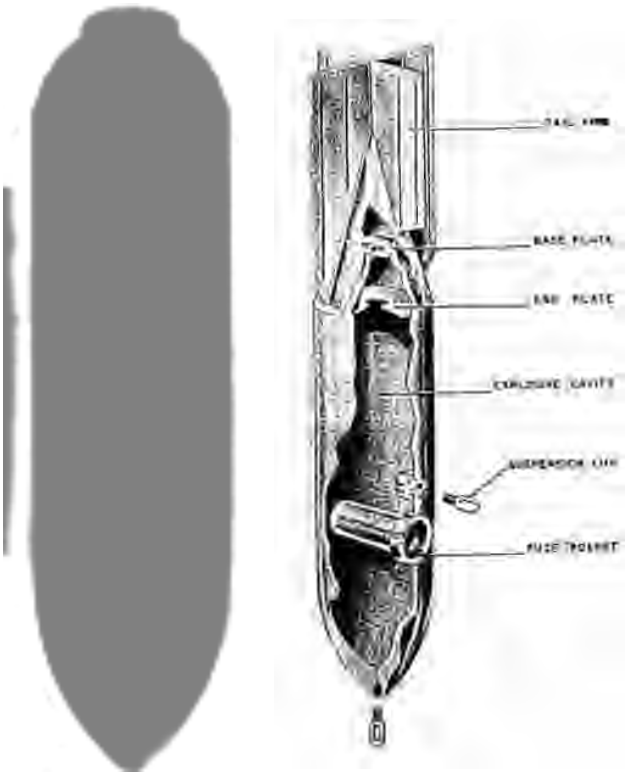


Ordnance Specifications and Information





German Ordnance





Sprengbombe Cylindrisch 50

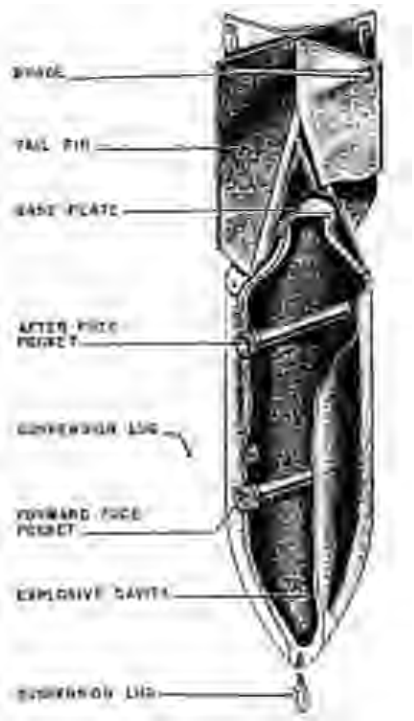
Bomb weight: 40-54kg
Fuze Type: Impact fuze / electro-mechanical time delay fuze
Bomb Dimensions: 1090 x 280mm
Body Diameter: 200mm
Use: Used against lightly damageable materials, hangars, railway rolling stock, ammunition depots, light bridges and buildings up to 3-storeys.
Remarks: The smallest and most common conventional German bomb. Nearly 70% of bombs dropped on the UK were 50kg.

SC50 found on site

In May 2015, an SC50 was found at a building site on Empire Way, Wembley, London. (*Image source: The Guardian*)







Sprengbombe Cylindrisch 250

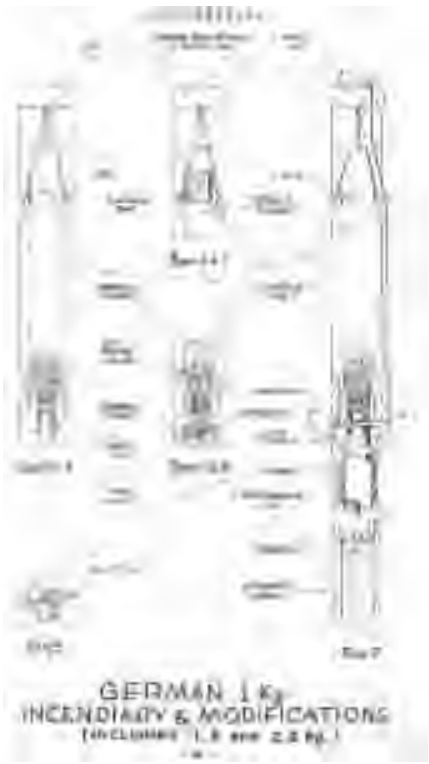
Bomb weight: 245-256k
Explosive Weight: 125-130kg
Fuze Type: Electrical impact / mechanical time delay fuze
Bomb Dimensions: 1640x512mm
Body Diameter: 368mm
Use: Used against railway installations, embankments, flyovers, underpasses, large buildings and below-ground installations.

SC250 found on site

In the year 2000, SafeLane Global discovered an SC250 whilst supervising construction work at Hawkinge, Kent.









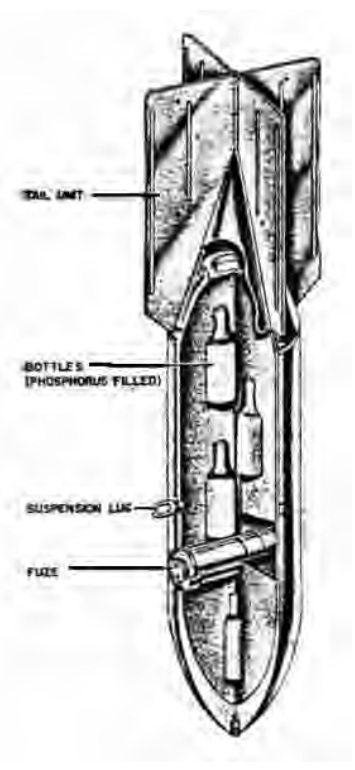
Above: Left – ordinary scaffold pipe, centre - 1kg incendiary bomb, right - incendiary bomb recently found on site in UK

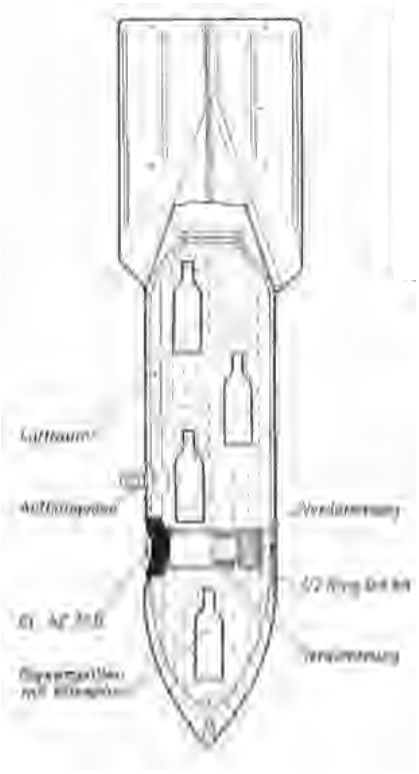
1kg Incendiary Bomb (IB)

Bomb weight: 1.0 & 1.3kg
Filling: 680g Thermite
Fuze Type: Impact fuze
Body Dimensions: 350x50mm
Body Diameter: 50mm
Use: As incendiary – dropped in clusters against towns and industrial complexes
Remarks: Jettisoned from air-dropped containers. Magnesium alloy case. Sometimes filled with high explosive charge.



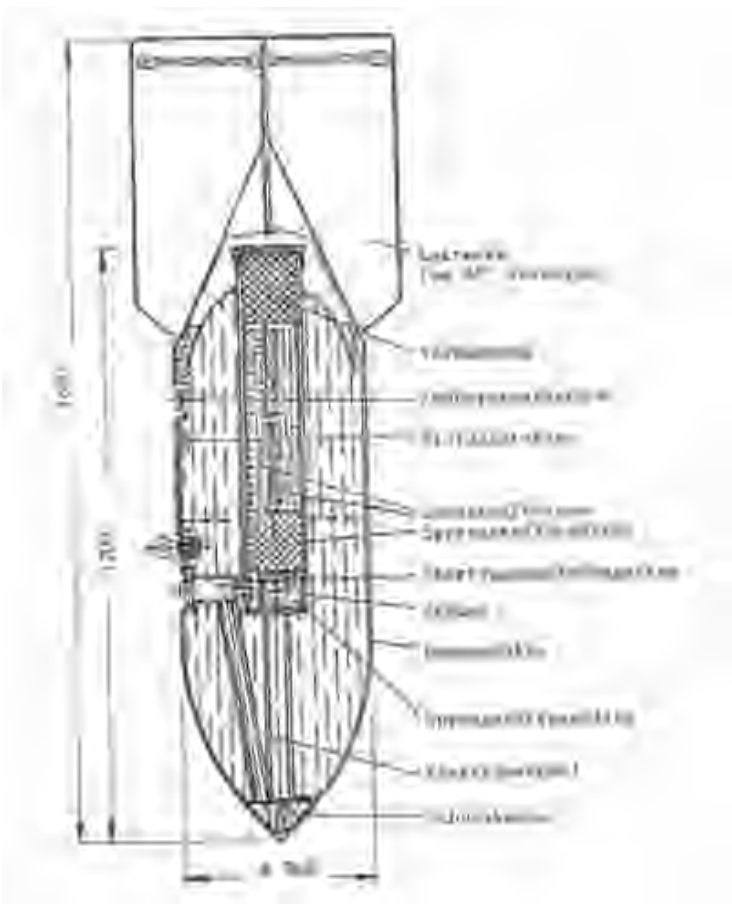






C-50 A Phosphorus Bomb

Bomb Weight: c.41kg
Explosive Weight: 0.03kg
Incendiary Filling: 12kg liquid filling with phosphor igniters in glass phials
Fuze Type: Electrical impact fuze
Bomb Dimensions: 1100x2800mm
Body Diameter: 200mm
Use: Against all targets where an incendiary effect is to be expected
Remarks: Early fill was a phosphorus / carbon disulphide incendiary mixture

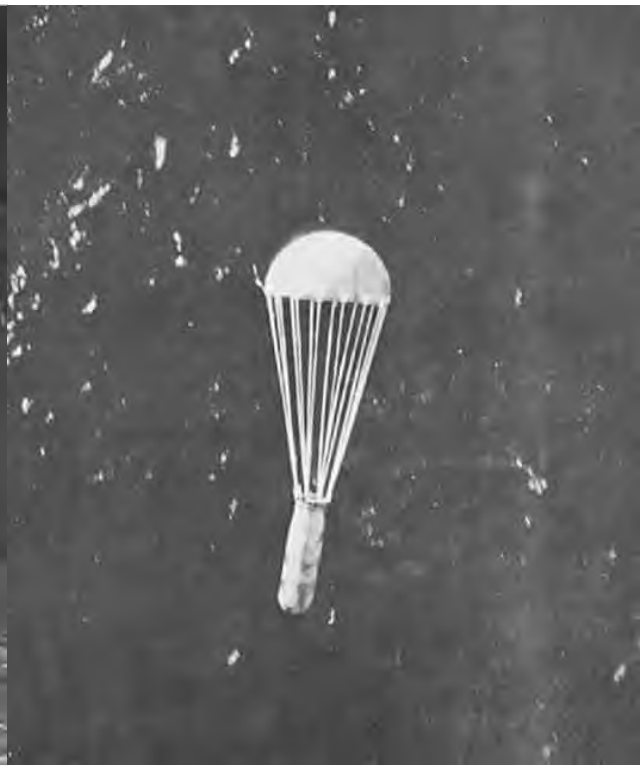




Flam C-250 'Oil Bomb'

Bomb Weight: 125kg
Explosive Weight: 1kg
Flammable Weight: 74kg
Filling: Mixture of 30% petrol and 70% crude oil
Fuze Type: Super-fast electrical impact fuze
Bomb Dimensions: 1650 x 512.2mm
Body Diameter: 368mm
Use: Often used for surprise attacks on living targets, against troop barracks and industrial installations
Remarks: Thin casing – not designed for ground penetration

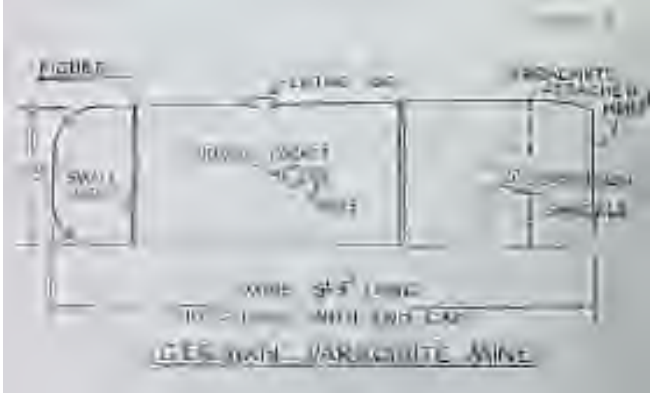


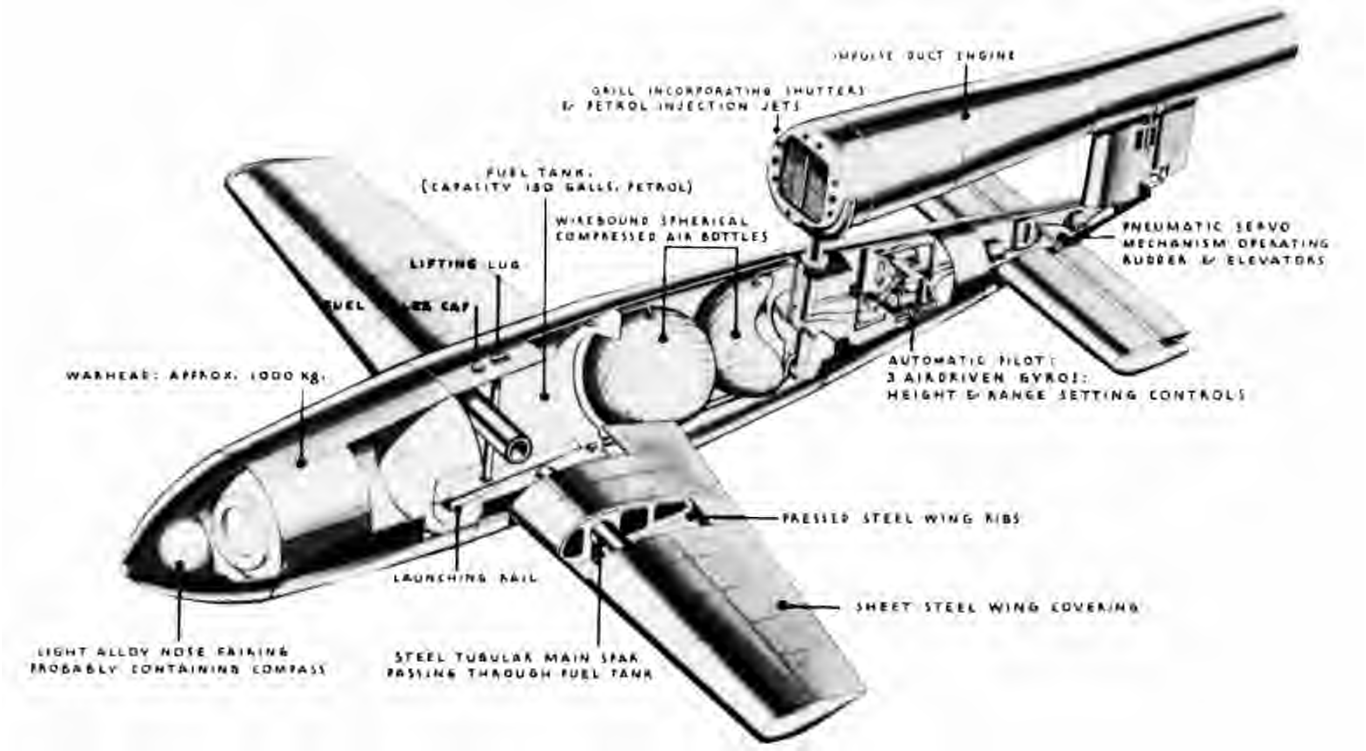


Luftmine A/B 'Parachute Mine'

Bomb Weight: A- 500kg, B – 1000kg
Fuze Type: Mechanical clockwork fuze
Bomb Dimensions: A – 1768mm, B – 2682mm
Use: Capable of creating severe blast damage in built-up areas.
Remarks: Parachute mines were standard German sea mines fitted with a suitable detonator. They were widely used against British cities.





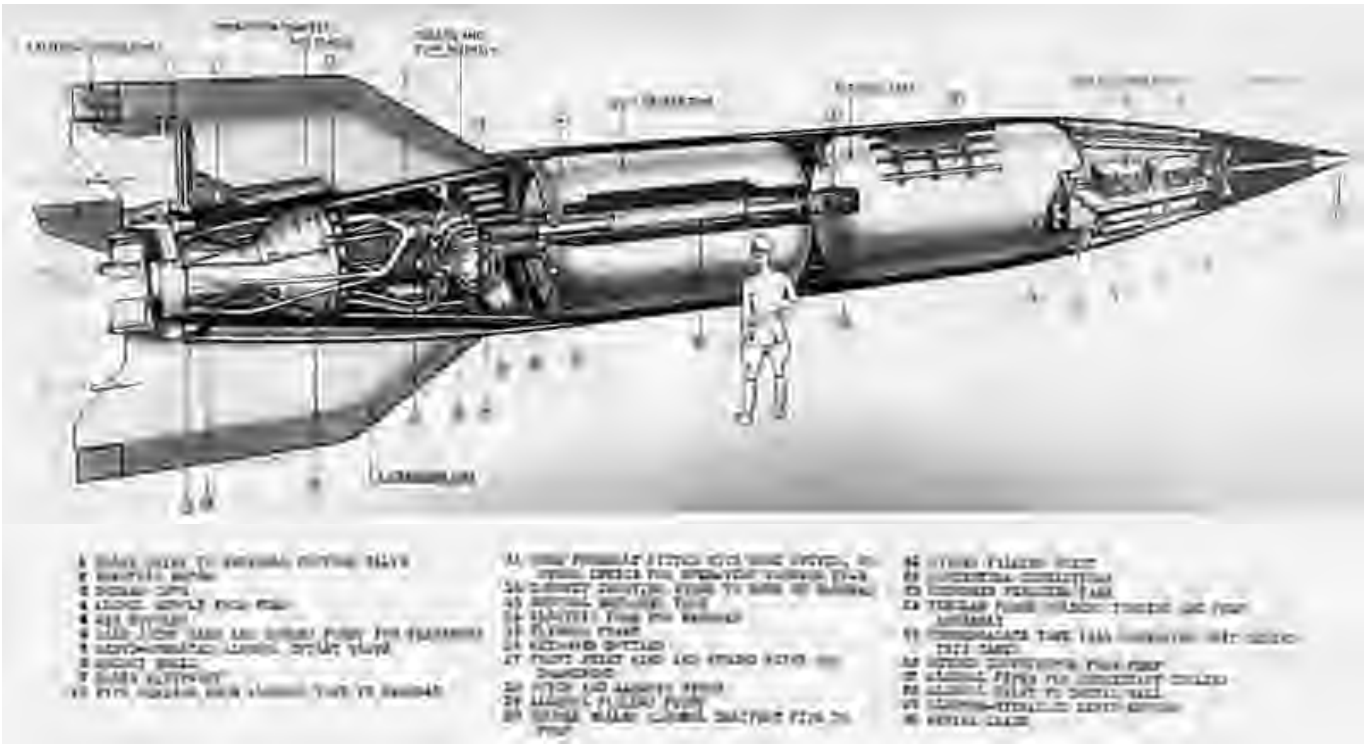


Vergeltungswaffe 1 (V-1) 'Fly' Bomb

Missile Weight: 2,150kg
Fuze Type: Electric Impact Fuze
Missile Length: 8.32m
Width: 5.37m
Range: 250km
Use: Pulsejet-powered guided cruise missile, designed to attack Allied cities.
Remarks: Armed with an 850kg warhead, around 10,000 V-1 flying bombs were fired at England, causing significant damage and killing approximately 6,000 people . There is a negligible risk from unexploded V-1s today, since the remains would have left incontrovertible evidence of the impact.



A V-1 'Fly' Bomb, captured over London seconds before impacting



Vergeltungswaffe 2 (V-2) Rocket

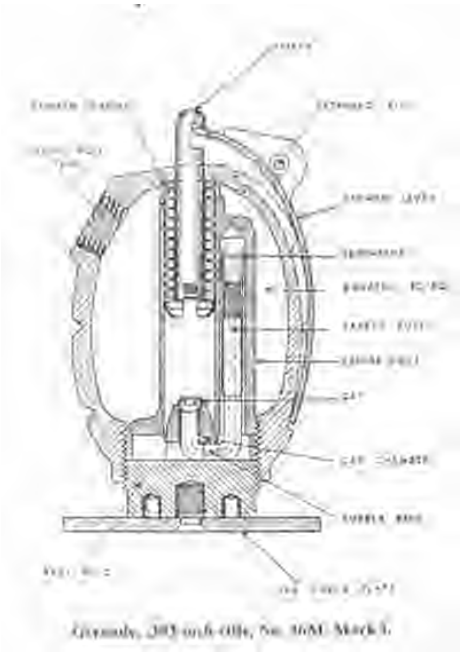
Rocket Weight: 12,500kg
Fuze Type: Electric Impact Fuze
Rocket Length: 14m
Body Diameter: 1.65m
Range: 320km
Use: Long-range ballistic missile, designed to attack Allied cities.
Remarks: Armed with a 975kg warhead and travelling at three times the speed of sound, the V-2 could cause widespread destruction. There is a negligible risk from unexploded V-2s today, since the remains would have left incontrovertible evidence of the impact.





British & Allied Ordnance

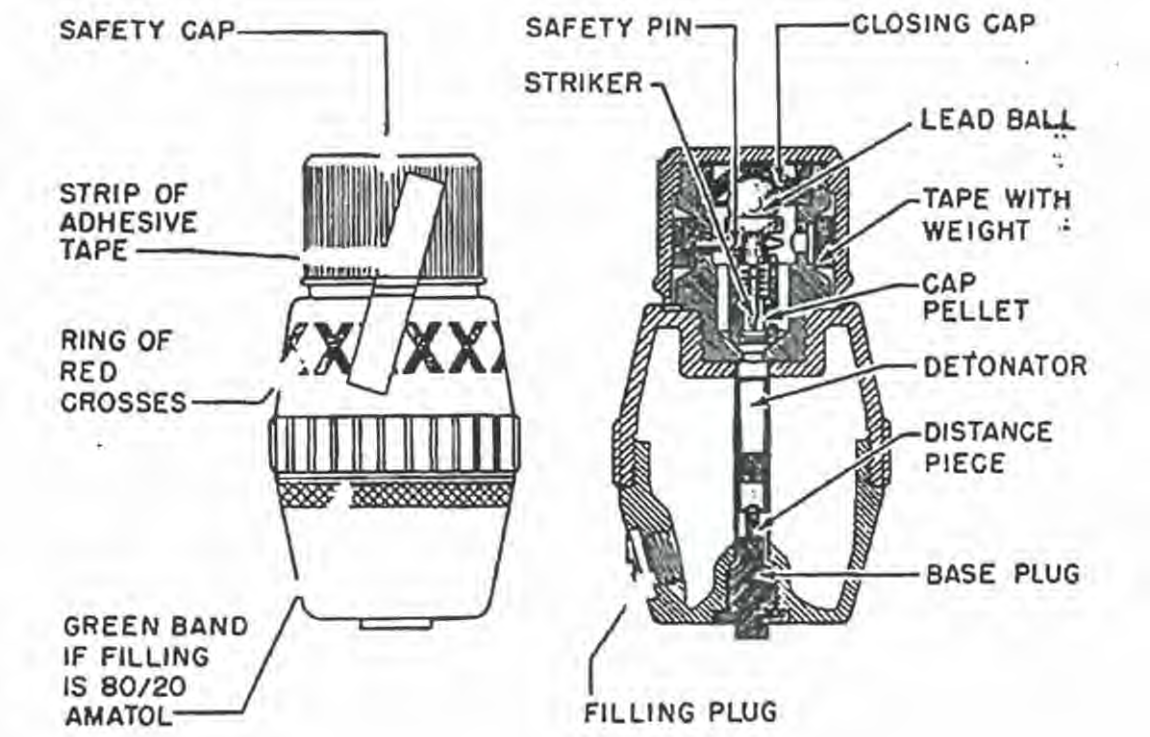




No. 36 “Mills” Grenade

Weight: 0.7kg filled
Type: Hand or discharger, fragmentation
Dimensions: 95 x 61mm
Filling: Alumatol, Amatol 2 or TNT
Remarks: 4 second hand-throwing fuze with approximate range of 30m. First introduced May 1918.



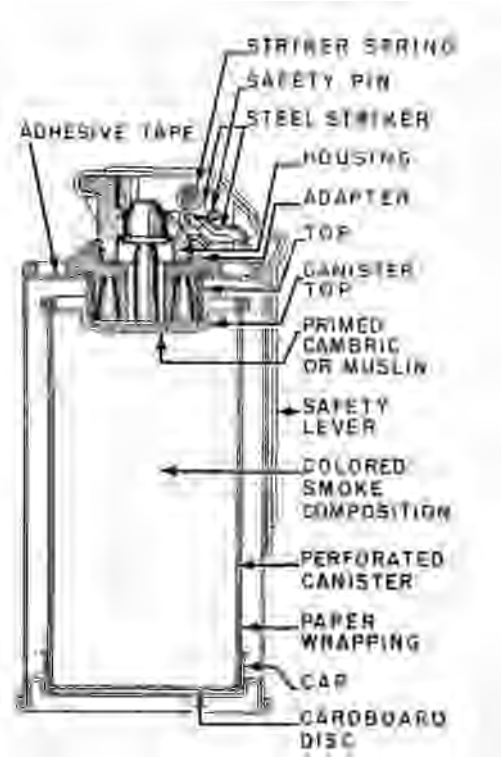


No. 69 Grenade

Weight: 038kg filled
Type: Percussion / Blast
Date Introduced: December 1940
Remarks: Black Bakelite body. Blast rather than fragmentation type. After unscrewing the safety cap, a tape is held when throwing the grenade releasing the safety bolt in the throwing motion. Detection is problematic due to its very low metal content.







Typical Smoke Grenade

Dimensions: Approx. 65 x 115mm
Type: Smoke
Date Introduced: Current MoD issue
Remarks: Smoke grenades are used as ground-to-ground or ground-to-air signalling devices, target or landing zone marking devices, and screening devices for unit movement.





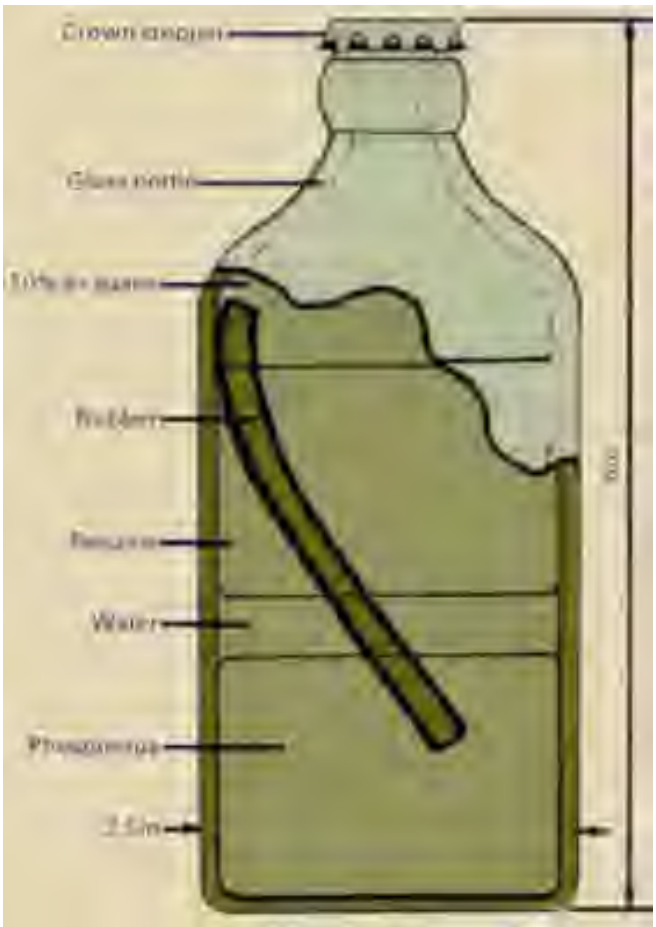


Self-Igniting Phosphorous (SIP) Grenade

Sometimes called the "A&W (Albright & Wilson)" grenade.

The grenade comprised a glass bottle with a total volume of approximately 1 pint. It was filled with white phosphorous, benzene, a piece of rubber and water. Over time, the rubber dissolved to create a sticky fluid which would self-ignite when the bottle broke.

Fired by hand or Northover Projector.

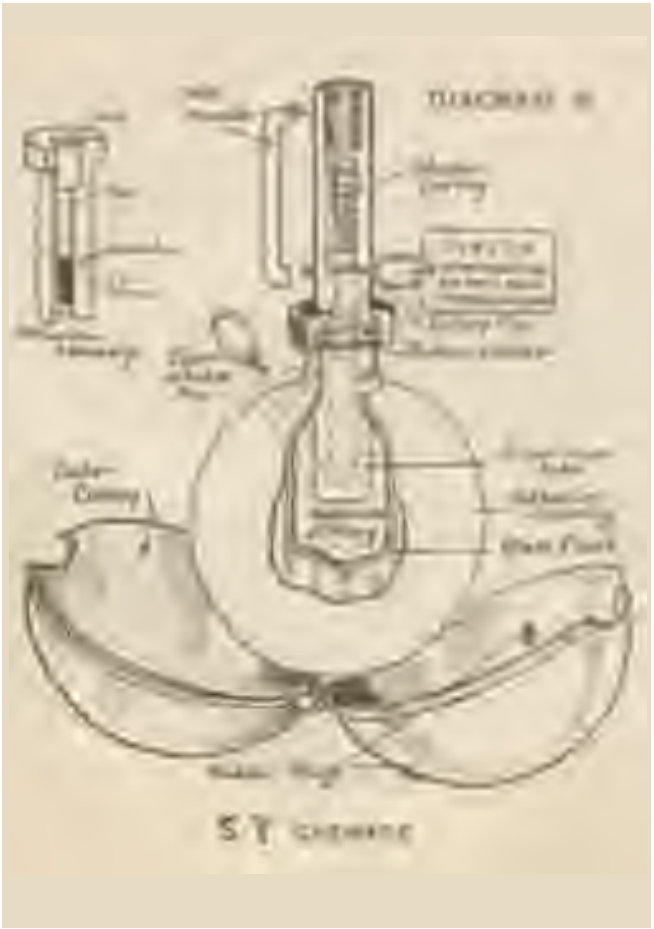






No. 74 Grenade (Sticky Bomb)

Designed as an anti-tank grenade and used by the Home Guard. The grenade consisted of a glass ball on the end of a Bakelite (plastic) handle. Inside the glass ball was an explosive filling whilst on the outside was a very sticky adhesive covering. Until used, this adhesive covering was encased in a metal outer casing.

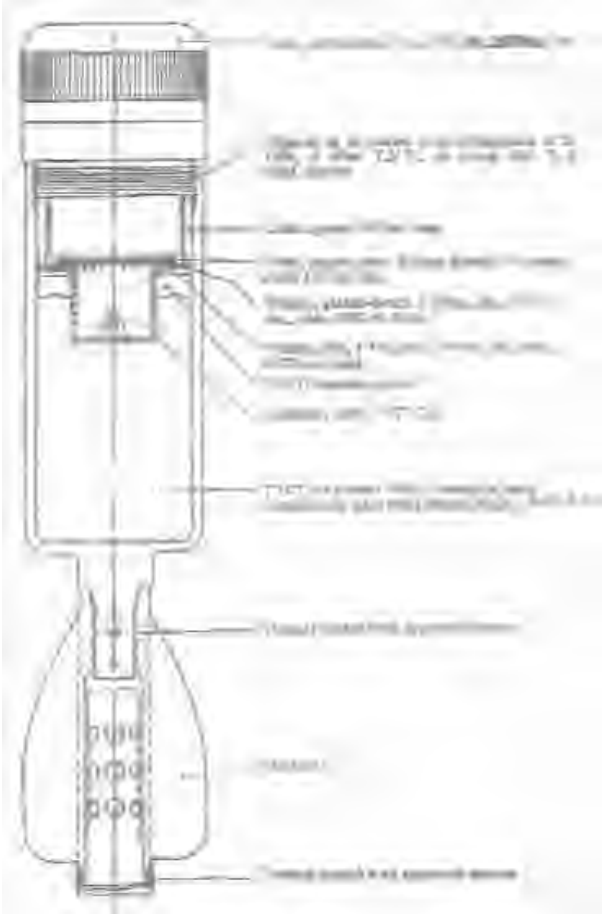






Typical 2" High Explosive Mortar

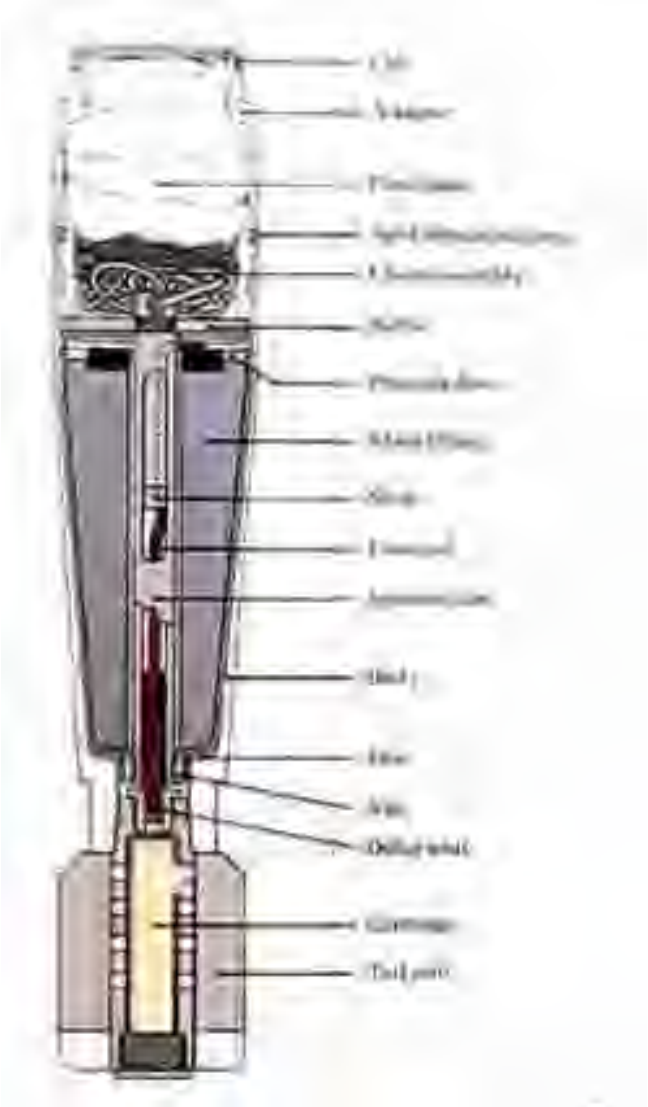
Bomb weight: 1.02kg
Fuze Type: High Explosive
Bomb Dimensions: 51 x 290mm
Filling: 200g RDX/TNT
Remarks: Fitted with an impact fuze which detonates the fuze booster charge (exploder) and, in turn, the high explosive charge. The main charge shatters the mortar bomb body, producing near optimum fragmentation and blast effect at the target.





Typical 2" Illuminating Mortar

Fuze Type: Illuminating
Bomb Dimensions: 51 x 290mm
Filling: Various
Remarks: The expulsion charge ignites and ejects the candle assembly. A spring ejects the parachute from the tail cone. The parachute opens, slowing the descent of the burning candle which illuminates the target.







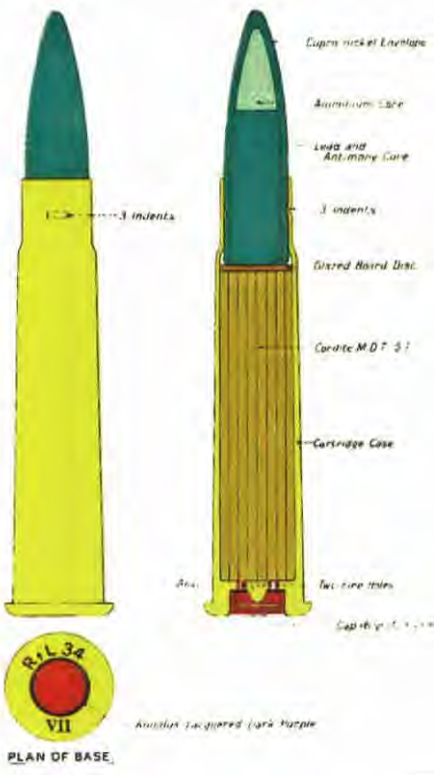


Typical 3" Smoke Mortar

Fuze Type: Smoke
Bomb Dimensions: c.490 x 76mm
Filling: Typically, white phosphorus
Remarks: On impact, the fuze functions and initiates the bursting charge. The bursting charge ruptures the mortar bomb body and disperses the white phosphorous filler. The white phosphorous produces smoke upon exposure to the air.



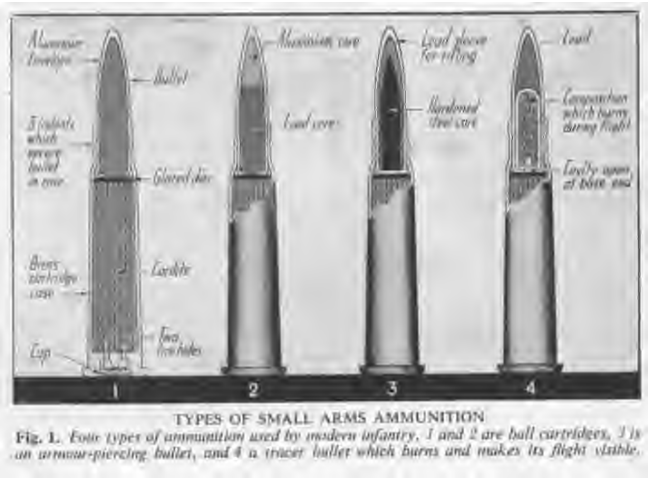




.303" Ammunition

Type: Rifle / machine gun round
Markings: Regular round – none. Tracer round – red primer
Bullet Weight: 150–180g
Dimensions: Total cartridge / projectile length – 182mm
Filling: Regular round – none. Tracer round – small incendiary fill
Threat: Explosive cordite within unspent cartridge
Deployment: Royal Navy, RAF and British Army Light Anti-Aircraft guns, machine guns and rifles. Standard British and Commonwealth military cartridge from 1889 until the end of the 1950s
Remarks: Cartridges are belted or supplied loose in cartons

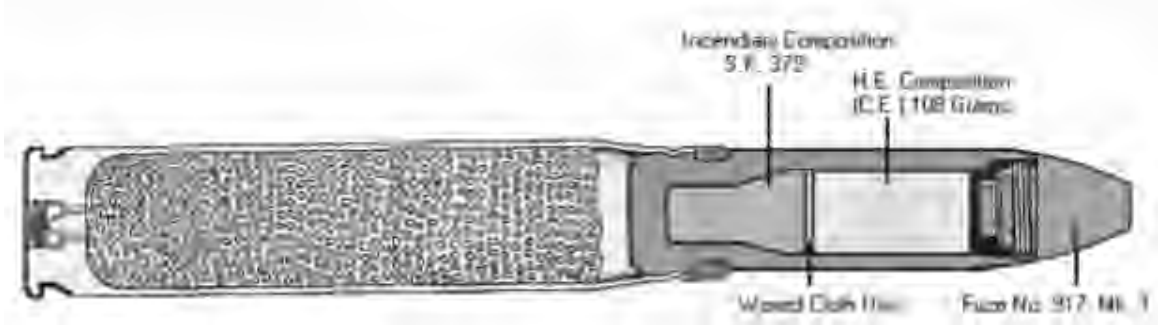




TYPES OF SMALL ARMS AMMUNITION
Fig. 1. Four types of ammunition used by modern infantry. 1 and 2 are ball cartridges, 3 is an armour-piercing bullet, and 4 a tracer bullet which burns and makes its flight visible.

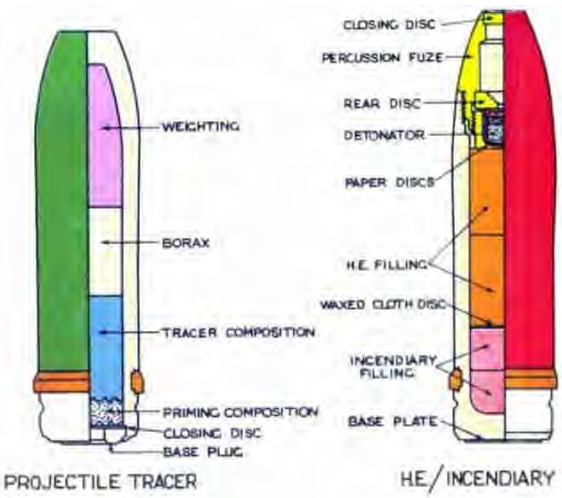






20mm Hispano HEI Ammunition

Type: Live cannon round
Markings: Upper half of projectile painted "buff" colour, lower half is red
Cartridge Weight: 256g
Dimensions: Total cartridge / projectile length – 182mm
Fuze: Contact fuze – No. 253, No. 254 or No. 917
Filling: 108g of contact explosive & 68g of SR. 379 incendiary composition
Threat: Explosives within unspent cartridge as well as the projectile
Deployment: Royal Navy, RAF and British Army Light Anti-Aircraft guns. Also RAF aircraft cannons.
Remarks: Cartridges are belted or supplied loose in cartons.



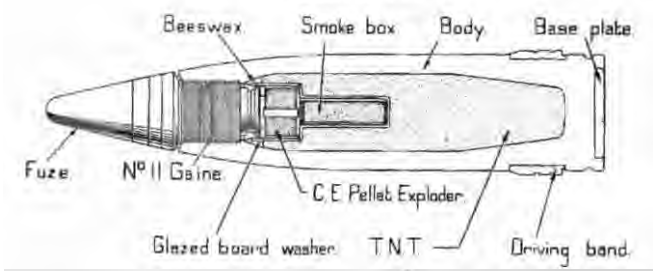
COLOUR IDENTIFICATION		
BRITISH		
NATURE OF SHELL	H.E. FILLING	COLOUR
H.E. TRACER	T.N.T.	
H.E.	T.N.T.	
PROJ. PRACTICE		
PROJ. TRACER		
H.E. INCENDIARY	T.N.T.	
H.E. INCENDIARY TRACER	T.N.T.	



3.7" Anti-Aircraft Projectile

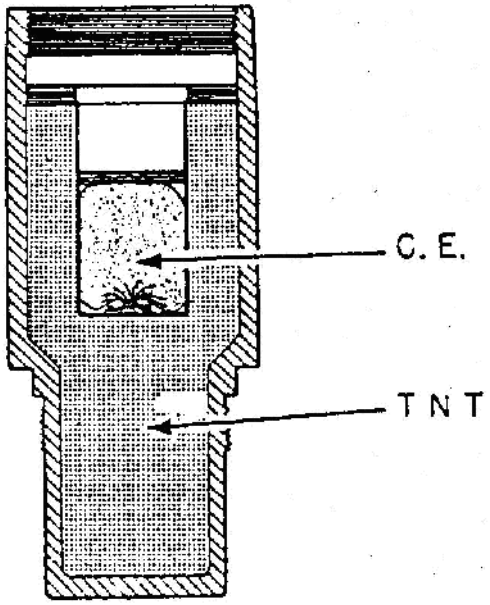
Weight: 12.7kg
Bomb Dimensions: 94 x 360mm
Rate of Fire: 10-20 rounds per minute
Carriage: Typically, white phosphorus
Ceiling: 9,000-18,000m
Muzzle Velocity: 72m/s
Remarks: 4.5" projectiles were also commonly utilized.





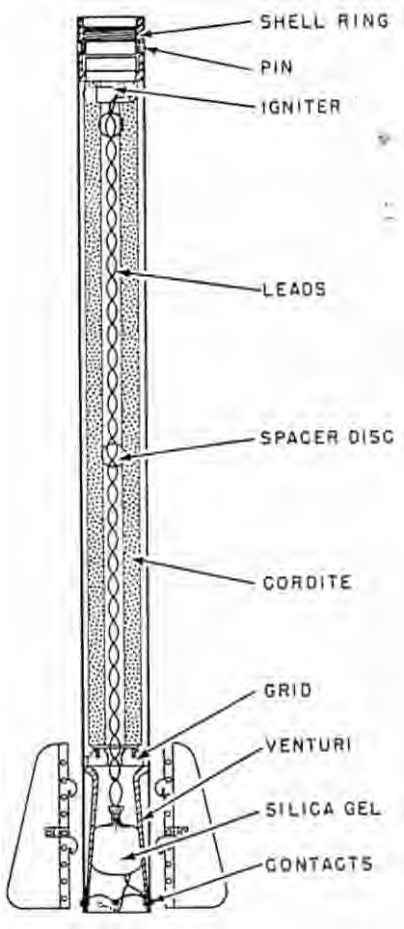






Rockets / Un-rotating Projectiles

Weight: 24.5kg
Bomb Dimensions: 94 x 360mm
Carriage: Typically, white phosphorus
Rate of Fire: 10-20 rounds per minute
Ceiling: 9,000-18,000m
Muzzle Velocity: 72m/s
Remarks: 4.5" projectiles were also commonly utilized.
Top-left image: Home Guard soldiers load an anti-aircraft rocket at a 'Z' Battery



Appendix L HK250t Drill Rig Specification Sheet

HK250T

ALLROUNDER RIG



Horizontal Directional Drilling – Allrounder Rig HK250T

- Trailer enables quick and easy transportation on the roads
- Fast positioning on jobsite with truck
- Build and designed together with experienced drillers
- Cost- and time-saving assembly on the jobsite
- Quick error detection using self-diagnostic routines and data loggers
- High-quality components
- Made in Germany
- Worldwide service and support

PIONEERING UNDERGROUND TECHNOLOGIES

HERRENKNECHT
Tunnelling Systems

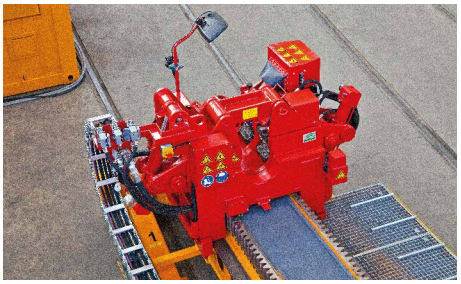
Horizontal Directional Drilling – Allrounder Rig HK250T
Technical specifications



Drilling: hydraulic supports for angle adjustment of the rig.



Transport: compact design to fulfill conditions for special transportations.



Breakout Unit: completely movable open wrench with energy chain and equipped with cameras for improved view.

HK250T

Rig
- Installed power: 70 kW (630 hp)
- Power transmission: Rack & Pinion
- Drilling angle: 7.5° – 15°
- Drill pipe length: 9,800 mm (~32 ft (range 2))
- Pipe support system on mast: 2

Carriage system
- Max. carriage pull force: 2,500 kN (560,000 lbs)
- Variable traveling speed: 0 m/min – 35 m/min (0 ft/min – 115 ft/min)
- Max. travel distance: 11,500 mm (37.7 ft)

Rotary drive
- Variable rotation speed left/right: 0 rpm – 69 rpm
- Max. torque: 90,000 Nm (66,380 ft-lb)
- Drive shaft adjustment: 150 mm (6 inch)

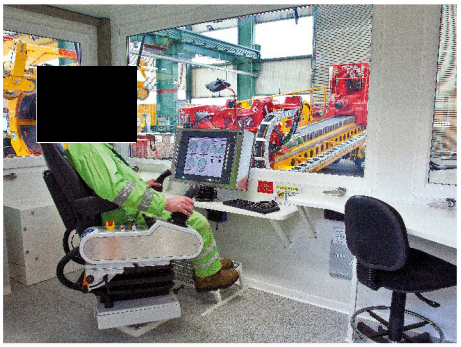
Breakout unit
- Self-adjusting clamp grip range: 114 mm – 305 mm (4.5 inch – 12 inch)
- Max. breakout torque: 190,000 Nm (140,135 ft-lb)
- Max. make up torque: 130,000 Nm (95,880 ft-lb)
- Traveling distance: 11,500 mm (37.7 ft)

Trailer
- Installed axles: 2
- King pin: 51 mm (2 inch)

Transport dimensions
- Dimension (l/w/h):15,800 mm/2,550 mm/3,650 mm (51.84 ft/8.34 ft/11.97 ft)
- Total weight of the equipment: 29,000 kg (63,930 lbs)

POWER PACK
- Installed power: 470 kW (630 hp)
- Nominal speed: 2,100 rpm
- Fuel tank: 1,200 l (317 US gallons)
- Hydraulic oil tank: 700 l (185 US gallons)
- Noise protection (7 m distance): 80 dB (A)
- Working environment: -10° C – 45° C (14° F – 113° F)
- Dimension (l/w/h): 6,060 mm/2,440 mm/2,590 mm 20 ft/8 ft/8.5 ft
- Gross shipping weight: 10,000 kg (22,046 lbs)
- Transport: 20 ft container

CONTROL CABIN
- Control system: Siemens Soft PLC/Profibus
- Vizualisation: 17" touch-screen monitor
- Data logger: yes
- Air condition: yes
- Heating: yes
- Dimension 10 ft container (l/w/h): 3,030 mm/2,440 mm/2,590 m (10 ft/8 ft/8.5 ft)
- Net shipping weight: 4,000 kg (8,818 lbs)
- Dimension 20 ft container (l/w/h): 6,060 mm/2,440 mm/2,590 m (20 ft/8 ft/8.5 ft)
- Net shipping weight: 5,000 kg (11,023 lbs)



Control Cabin: ergonomic rig operater seat with joysticks, touch screen monitor and more optional indicating instruments.



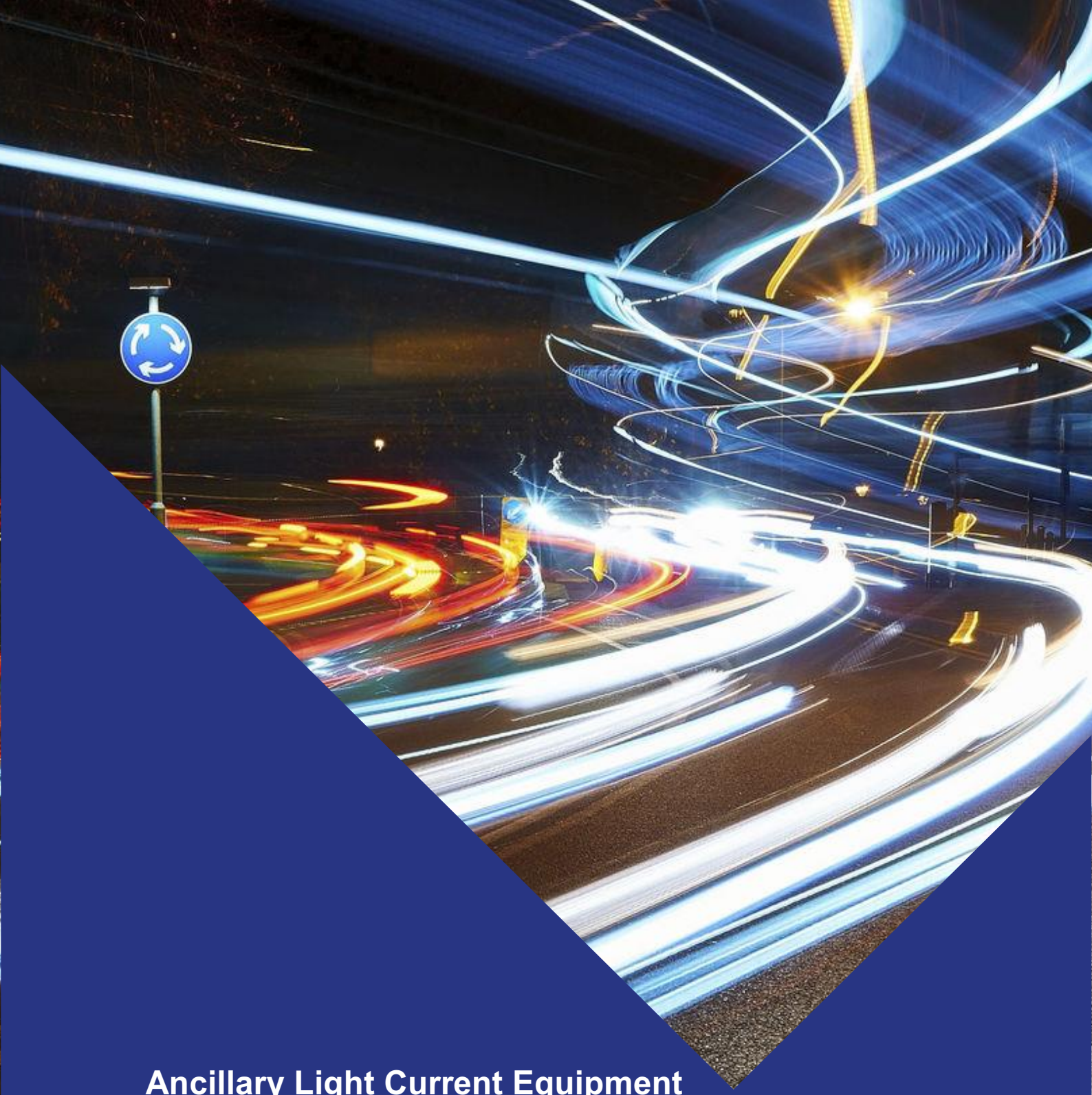
Power Pack: noise isolated 20 ft container with 3 doors for easy maintenance.

HERRENKNECHT AG
77963 Schwanau
Germany
[redacted]

HERRENKNECHT
Tunnelling Systems

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Subject to change without notice. We are not responsible for typographical errors.
All dimensions and data refer to customizable basic product features.

Appendix M Technical Specification TS2.19 Ancillary Light Current Equipment



Ancillary Light Current Equipment

TS_2.19

Issue 6 | July 2025

nationalgrid

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PURPOSE AND SCOPE

This document forms part of a suite of documents which define National Grid's functional and performance requirements for new equipment.

This specification defines the functional and performance requirements for all ancillary light current equipment used in conjunction with protection, control, monitoring and metering systems and ancillary equipment associated with primary equipment.

1 GENERAL REQUIREMENTS

1.1 General

1.1.1 Ancillary light current equipment in substations and other locations forming part of the transmission system shall conform to the relevant International or British Standards for its application, be fit for purpose and comply with the requirements of the appropriate level 2 or level 3 technical specification.

1.1.2 The constructional requirements and tests for control gear assemblies shall comply with BS EN IEC 61439-2.

1.1.3 Electrical installations shall comply with the appropriate requirements of BS 7671.

Informative: This requirement relates primarily to AC small power and lighting installations. Where TS_2.19 clauses conflict with the Wiring Regulations, the requirements of TS_2.19 will take precedence. The wire core colours for 48 V and 110 V DC installations used in substations differ from those recommended in the wiring regulations.

1.1.4 Telecommunications equipment and telecommunication cabling shall comply with the appropriate requirements of BS 6701.

1.1.5 The use of auxiliary energising voltages above 110 V AC shall be avoided. The use of centre tap earthed 110 V shall be used where practicable. Supplies for test purposes above 110 V AC shall be labelled as such. Electrical hazard labels shall be fitted to all plug and sockets connected to systems with nominal voltages above 125 V AC or DC. The labels shall be in accordance with BS EN ISO 7010, Part 5.

1.1.6 For the requirements of 400 V three phase LVAC power supply systems, refer to TS_3.12.03. Wiring for three phase power supplies shall be segregated from other wiring.

1.1.7 All equipment shall be marked to identify the manufacturer and product reference.

1.1.8 Equipment that consists of elements that can be withdrawn shall have marking on all the fixed and removable portions, to assist in the correct replacement of equipment.

1.1.9 Covers shall be easily removed and replaced without risk of damage to, or inadvertent operation of equipment. They shall be constructed and fastened so that they cannot be replaced incorrectly, or damaged or distorted by their fastenings.

1.1.10 Where plug-in links are employed, the design shall be such that it is impossible to insert the link incorrectly. For example, it may be necessary to use different horizontal and vertical link spacing to avoid a possible cross connection.

1.1.11 All materials shall be non-ignitable or resistant to flame propagation (tested in accordance with BS EN IEC 60695-2-13 or BS EN IEC 60695-9-1).

1.1.12 All materials shall be dimensionally stable i.e., they shall be distortion-free to the extent necessary for the correct functioning of the equipment in service.

1.1.13 Protective finishes shall be of such a standard that they shall not require renewal during the life of the equipment in the specified ambient conditions.

1.1.14 All contacts and mechanisms shall be protected from dust.

1.1.15 Equipment shall be designed such that all maintenance operations may be carried out safely, in an unencumbered manner and in compliance with the statutory requirements quoted in TS_1.

1.1.16 Equipment that requires removal from a panel or cubicle for maintenance purposes shall be readily removable without disturbing other equipment or wiring.

1.1.17 Electronic devices, contactors, relays, and power supplies shall be installed in the orientation as recommended by the manufacturer. Where multiple devices are installed near to each other, to prevent potential overheating or malfunction, the layout shall:

a) Ensure there is adequate spacing between adjacent devices to allow sufficient air flow around the devices.

b) Consider any ventilation apertures built into the individual devices. This requirement shall be met regardless of the provision of cooling fans within their panels/enclosures or air conditioning within the room the equipment is installed in.

1.2 Isolation Facilities

1.2.1 All LV points of safety isolation i.e., isolation links and fuses shall be capable of having a locking device fitted to maintain isolation when the link is removed, on an individual link rather than a grouped basis.

1.2.2 Isolation facilities for redundant systems e.g., fans or pumps operating on a “duty / standby” philosophy shall not be shared. It shall be possible to work safely on one system whilst the other remains in operational service.

1.2.3 Where fuses, links and their holders are required to be used for isolation they shall comply with the requirements of BS EN 60269-1 and be lockable.

1.2.4 Where Miniature Circuit-Breakers (MCBs) are used for power supply isolation purposes they shall meet the requirements of BS EN 60947-2 and shall either be removable, or facilities shall be provided such that they can be locked in the open position. MCBs shall have an auxiliary contact for alarm purposes.

1.2.5 MCBs used for power supply isolation shall interrupt all phase(s) and neutral poles (AC) and both poles of the supply (DC).

Informative: This requirement relates to MCBs controlling the supplies to individual items of equipment e.g., electric motor, which are required to be worked on and where danger is to be excluded via isolation. MCBs forming part of small power and lighting distribution systems, installed in accordance with the relevant edition of BS 7671, and in which the neutral is effectively earthed at source, will usually be placed in the live pole(s) only. Provided suitable isolating switches are available to allow work to proceed on individual distribution boards, the use of single and three pole MCBs is acceptable.

[NOTE: ACBs, MCCBs, and Fuse Switches for main LVAC boards and standby diesel generators are covered in NGTS_3.12.3]

1.2.6 The rating of the fuse or MCB shall be clearly identified.

1.3 Switchgear Auxiliary Switches

1.3.1 Auxiliary switches in HV switchgear shall comply with the requirements of BS EN 62271-1 and the relevant level 2 or 3 technical specification.

1.4 Indicators

1.4.1 Indicators of equipment state shall be clearly visible from all points of operation.

1.5 Common Requirements for Cubicles and Kiosks

1.5.1 All equipment, terminals and wiring shall be readily accessible.

1.5.2 All equipment requiring access for test or adjustment or equipment that has a readable display shall be mounted at a height at which reasonably foreseeable work activities e.g., commissioning, testing, interrogation, operation of equipment from a bay control unit, operation of selector switches etc., can be conducted comfortably and safely, without the use of additional access equipment. No equipment of this nature shall be mounted greater than 2.0 m above permanent access ways. It is acceptable to mount MCBs, links and fuses at plinth height.

1.5.3 All cable glands shall comply with the requirements of BS EN 62444.

1.5.4 All access doors shall be provided with locking facilities accepting a padlock having a shackle of 4.5 mm thickness and 28.5 mm clearance (padlock type C300-28).

1.5.5 Cabling from external equipment shall be terminated on one side of the terminal blocks within the cubicle or kiosk only. Inter cubicle or bus wiring shall also be located on separate terminal rails within the cubicle.

1.5.6 Facilities shall be provided to maintain the air temperature and humidity within the relevant TS_1 Class 1, 2 or 3, without condensation.

1.5.7 Where heaters are required, these shall be positioned such that damage to plastic insulation and ancillary equipment e.g., plastic trunking and cable containment from localised sources of heat is avoided by design.

1.5.8 Where interface kiosks or wall boxes are required between National Grid systems and other user systems, separate compartments will be provided with clear segregation between National Grid wiring and terminals and user wiring and terminals. Locking and access arrangements shall reflect the detail recorded in the site responsibility schedule between National Grid and the user.

1.6 Additional Requirements for Indoor Equipment Cubicles

1.6.1 Cubicles shall normally be manufactured, equipped, wired, and tested in the manufacturers' or contractors' works before delivery to site. All trunking provided within the cubicle(s) shall be capable of accommodating all cables and wiring for the complete site installation, allowing for reasonable future expansion. On the completed installation all cable identification, ferruling and labelling shall be clearly visible and legible to personnel requiring access to the cubicle for maintenance or testing/commissioning purposes.

1.6.2 Where a cubicle is to house differing systems within the same panel the following conditions shall apply:

a) Equipment within the cubicle shall be segregated and clearly labelled on both the front and rear of the cubicle.

b) All equipment within a system shall where practicable be grouped together. For the avoidance of doubt system in this context includes fuses, links and MCBs.

c) Different systems shall where practicable use separate terminal rails.

d) All terminal blocks shall be clearly labelled.

e) All tripping racks shall be mounted as separate systems and shall not be incorporated into other protection systems, excepting a trip relay that is part of a function-based system. The tripping racks shall include all necessary trip relays, trip circuit supervision relays, fuses, links and MCBs.

1.6.3 First and Second Main Feeder Protections and, where duplicated busbar protection systems are installed, the First and Second Busbar Protections shall not be housed in the same cubicle.

1.6.4 Cubicles shall be rigid, free standing and capable of being fixed down. 19" rack mounting arrangements with the dimensions stated in BS EN 60297 Part 3-100 are standard. Larger rack sizes shall be agreed with National Grid. Suitable and sufficient cable glanding facilities shall be provided, considering future expansion.

1.6.5 Cubicles shall be provided with internal illumination such that all internal labelling, ferruling, and wiring can be readily identified. Low wattage 110 V DC LED lighting shall be used in new cubicles installed at existing and new build substations. 230 V AC supplies shall not be used for cubicle illumination. Where existing panels are to be retained with new front sheets or block house Z-frame racks are being retained, existing lighting arrangements need not be modified. The use of 'bulkhead' lighting is discouraged and lighting solutions such as low wattage 110 V DC LED lighting is preferred. However, the use of LED lighting should not make the procurement of replacement LED lamps difficult.

1.6.6 110 V AC shall be used for heating supplies on new equipment where practicable. However, it is accepted that where many heaters may have to be connected to one supply (for example all the kiosks/panels on outdoor sites) 230 V AC supplies may have to be used to keep the loadings and ratings to reasonable levels.

1.6.7 On cubicles where equipment is mounted on a swing door, stops to limit the travel of the equipment frame shall be provided. When closed, the equipment door shall be secured against vibration.

1.6.8 Where test blocks are fitted, they should be mounted in such a way that when the test plug is inserted it will not foul any other equipment on the swing frame. In addition, the swing frame shall be able to fully open/close with the test blocks and leads fitted.

1.6.9 The cubicle by its construction shall minimise the spread of fire from any cubicle to its neighbour.

1.6.10 Cubicles shall meet rating IP 44 as a minimum requirement as specified in BS EN 60529. Where individual equipment, such as a relay, has an IP rating less than that specified in the appropriate level 2 technical specification, consideration shall be given to increasing the cubicle IP rating to meet the requirement of the level 2 technical specification.

1.6.11 Where fans and filters are fitted within cubicles, sufficient space for adequate ventilation and maintenance access shall be provided.

1.6.12 Equipment on panel fronts shall be flush mounted.

1.7 Additional Requirements for Outdoor Kiosks

1.7.1 Outdoor kiosks shall be of rigid construction and suitable, without any maintenance, for the life of the associated equipment. Kiosks shall meet Environmental Class 4 conditions, (see TS_1), without any condensation forming and shall meet IP 54 as specified in BS EN 60529.

1.7.2 Doors shall be weatherproof with provision of a wind stop.

1.7.3 An unrestricted view of the instruments without opening the doors shall be provided and, where vibration is to be expected the instruments shall be on resilient mountings.

1.7.4 Cable entries shall always be from below.

1.7.5 The cable entry (e.g., gland plates) shall be at least 450 mm above ground level, shall be vermin proof and project above the inside of the kiosk base to prevent water entering the cable.

1.7.6 Cable ties for outdoor use shall be of stainless-steel construction to prevent weather related deterioration in service.

1.8 Termination Boxes

1.8.1 Termination boxes shall be of rigid construction and suitable, without any maintenance, for the life of the associated equipment. Termination boxes shall not collect condensation.

1.8.2 All terminations and connections shall be readily accessible.

1.8.3 Cable entries (e.g., glands) shall project above the inside of the termination box base to prevent water entering the cable.

1.8.4 For outdoor termination boxes, cable entries shall always be from below.

1.8.5 When vibration is expected, termination boxes shall be fitted on anti-vibration mountings.

1.8.6 Termination boxes for siting conditions covered by TS_1 Ambient Class 1, 2 and 3 may be provided with sliding covers. Other types of covers shall be secured with captive fasteners.

1.8.7 Termination boxes for use outdoors shall be suitable for TS_1 Ambient Class 4 conditions and shall be mounted to prevent pockets or spaces that could collect water. Termination boxes shall meet the requirements of BS EN 60529 with classification IP 54. Indoor termination boxes shall be to IP 44.

1.9 Marshalling

1.9.1 Cable glands shall be installed within dedicated gland plates and not via holes drilled in kiosks or panels.

1.9.2 Where practicable, marshalling cubicles or racks in relay or equipment rooms shall be arranged with external cables entering the cubicle at the bottom and inter-panel connections entering from the top. However, external top entry may be necessary due to building layout and cable tray constraints. External cables shall be glanded above the floor of the cubicle or rack and cores shall be terminated on terminal blocks in number order.

1.9.3 All cable cores shall be terminated on the same side of the terminal block and the side used shall be consistent with the rest of the site/installation. Inter-panel connections shall be terminated on terminal blocks in number order and on the same side of the terminal blocks in each panel, where practicable. All cores on both external cables and inter-panel connections shall be terminated. A jumper field, which shall be installed in the factory whenever possible, shall be used to interconnect the external cables and the inter-panel connections.

1.9.4 Systems employing fibre optics shall be installed such that the fibre optic cable and its terminations are not subjected to bend radii more than those stipulated in the cable manufacturers' recommendations. This requirement applies equally to installations where the equipment is mounted on movable panels (e.g., swing-frame racks). The cable and terminations shall not be put under tension or be bent beyond the manufacturers' guidelines throughout the complete range of motion of the cubicle panel/door.

1.10 Earthing

1.10.1 Cubicles, racks, kiosks, and termination boxes shall be connected to the station main earth system by a 25 mm wide by 3 mm thick copper bar, aluminium equivalent or minimum 16 mm^2 stranded copper cable. Where a copper earth bar is employed, the stud connection to the earth bar shall be phosphor bronze or high tensile brass. Where an aluminium earth bar is employed, the stud shall be galvanised steel.

1.10.2 All equipment within a cubicle and the cubicle metalwork shall be electrically bonded to earth. A single earth connection shall be provided between the cubicle and the substation earth mat. This connection shall meet the requirements of TS_3.01.02. As a minimum, a cubicle shall be fitted with an earth terminal or stud as specified below, for kiosks and termination boxes. The disconnection of any one piece of equipment from earth shall not disconnect any other equipment from its earth connection.

1.10.3 Kiosks and termination boxes shall be provided with a 10 mm diameter, low resistivity earth terminal or stud. This termination shall be in an accessible position, clear of obstruction and unambiguously labelled.

1.10.4 Electrical continuity shall be maintained between cubicles and associated termination boxes. If electrical continuity is not inherently provided between the cubicles and associated termination box, then a copper earth wire shall interconnect the equipment. The cross-sectional area of the wire shall be not less than 2.5 mm^2 if protection against mechanical damage is provided and 4 mm^2 if mechanical protection is not provided. Doors, covers, subracks etc. shall be similarly interconnected to ensure electrical continuity to earth.

1.10.5 Where earth connections are made to metal work, paint shall be removed to ensure a good electrical contact, and the connection protected against corrosion.

1.10.6 The secondary circuits of interposing transformers shall not normally be earthed.

1.11 Marking & Labelling of Equipment

1.11.1 Labels shall be provided for the clear and unambiguous identification of all ancillary light current equipment. Text sizes shall be legible and readable to the satisfaction of National Grid.

1.11.2 Equipment with the same system function (e.g., First Main Protection) shall be clearly identified and separate from other equipment in the same panel but providing another protection function (e.g. System Backup Protection). Such equipment shall be clearly and unambiguously labelled front and back. For the avoidance of doubt equipment in this context includes links, MCBs and, where possible, terminal rails. As a minimum, each label shall state the reference and a description of its function (i.e., **LK01 ALARM INIT**, **D+/D-(1) FPFM 110V DC MCB**) and, where applicable, ratings.

1.11.3 Where the removal of covers allows access to exposed conductors which may present danger, suitable warning labels shall be provided. Additional warning labels shall be supplied where specified.

1.11.4 All labels and inscriptions shall be resistant to wear or deterioration in the ambient conditions prevailing and shall be suitable for the life of the equipment.

1.11.5 Cubicle and kiosk external labels, including flush mounted equipment in cubicles and operational equipment such as test / normal switches, isolation links, MCBs, fuses etc., shall be labelled using mechanical fixings which allow the labels to be changed in service as outlined in TS_2.01.

1.11.6 Within enclosures, where mechanical fixing is demonstrably not practicable, adhesives for instruction labels and identification labels for equipment shall be tested in accordance with BS EN ISO 8510-2 or evidence offered of equivalent service experience demonstrating longevity.

1.11.7 All wire-end terminations shall be marked. It shall be possible, using wire-end marking ("ferruling"), to identify individual wire-end terminations along with their function. All wire-end marking shall be in accordance with the requirements of Energy Networks Association Technical Specification 50-19 (Standard Numbering for Small Wiring). Wire-end marking shall be unique within a panel or enclosure i.e., two individual circuits shall not use the same wire-end marking identification without appropriate use of suffixes to distinguish between separate circuits.

1.11.8 Where wiring forms part of a station level function, e.g., Operational Tripping Schemes (OTS) and multiple circuits are monitored, the philosophy of 1.11.7 shall be applied, viz, identification via circuit suffixes will still be required in order to distinguish between circuitry associated with different circuits in the same common panel or enclosure.

1.11.9 For equipment forming part of a standard bay solution, type registered by National Grid, and designed and built for use on the National Grid system, the wire marking shall, where practicable, use the system outlined in 1.11.10 at all terminations. Where proprietary equipment is provided which is of a standard market design, e.g., tapchanger drive mechanism, circuit-breaker, disconnector, then the wire marking shall apply to the interface point only, as outlined in ENA TS 50-19 Section 4.1.

1.11.10 The letters and wire numbers applied shall be as outlined in Table 1 of ENA TS 50-19 with application specific number allocations agreed with National Grid at the design approval stage, having regard to established standard numbering allocations. (See guidance in **Appendix 2**)

1.11.11 Ferrules shall be durable and legible throughout the lifetime of the installation with letters and numerals in strong contrast to the background material and a minimum font size of 6 point. The ferrules shall be held via friction fit against the wire insulation and shall not easily rotate such that the identity of a wire can always be ascertained, throughout the lifetime of the installation.

Informative: Experience has shown that Critchley 'Z Type' or Tyco 'silver fox' are the most effective wire marking systems to satisfy the above requirements. 'Clip on' markers are considered unsuitable as they can become detached. Where heat-shrink tubing is used, the correct size tubing for the conductor overall diameter shall be confirmed and the printing and assembly methods shall be demonstrated to be sufficiently stable and durable e.g., professional thermal transfer labelling.

1.11.12 For telecommunications equipment, a recognised standard of identification e.g., colour coding of cores, may be used as an alternative to wire end marking.

1.11.13 Marking and labelling of equipment shall provide a logical and convenient means by which the lifetime management of the equipment can take place.

1.11.14 Labels shall be consistently sited and not obscured by any other equipment. There shall be no ambiguity as to the equipment to which the labelled parts refer. Labelling identity shall be consistent across grouped equipment and the wider site and shall match descriptions given on drawings and control system displays.

1.11.15 Circuit identification labels shall be provided on the front of cubicles and on the back for rear access cubicles and shall be the predominant label in size and position.

1.11.16 Where identification labels are affixed to doors or covers, a similar label shall be provided and sited so that it is visible when the door or cover is opened or removed.

1.11.17 Asset code tags and suppliers' own proprietary identification systems e.g., "= BAY E01" etc are not required by National Grid. Only circuit and equipment identification labels shall be provided, in conformance to TS_2.1 and ET/BP_109.

1.11.18 Supplier branding shall be subordinate in size and prominence to other labels and should be affixed in a position which does not detract from the circuit or equipment label. Arrangements shall be discussed and agreed with National Grid at the design stage and at the FAT.

1.11.19 Each rail/group of terminals shall be identified with an appropriate rail/group reference. Terminals within each rail/group shall be individually and sequentially numbered. The labels shall be mounted such that they are not disassociated from the mouldings when access to terminals is required.

1.12 Terminal Bocks and Terminations

1.12.1 For the avoidance of doubt the requirements contained in this section apply to all equipment including, but not limited to, wound equipment, circuit-breakers, disconnectors, instrument transformers, cubicles, and kiosks.

1.12.2 The application and conditions of use for conductor terminations shall be in accordance with the terminal manufacturer's requirements. The design of conductor termination and how a conductor is terminated shall be appropriate to the application, considering the lifetime management of the equipment. The type of termination shall be compatible with the terminal with which it is to be used as specified by the terminal manufacturer.

1.12.3 Terminal blocks shall be adequately rated for their duty and conform to the appropriate requirements of BS EN 60947-7-1.

1.12.4 Terminal blocks shall be of the requisite size for the wire and termination such that conductors do not distort or twist the terminal block or mounting.

1.12.5 All terminal blocks shall be demonstrated to provide reliable and secure connection and shall be suitable for the life of the primary equipment without maintenance.

1.12.6 The design of terminal blocks shall be such that the integrity of the connection may be confirmed by visual inspection.

1.12.7 Terminal blocks of the insulation displacement type are acceptable only for telecommunications applications.

1.12.8 All connections shall be made in accordance with the terminal manufacturer's instructions. Connections shall be made only by appropriately trained and supervised staff. The correct tools shall be used and where applicable these shall be calibrated (e.g., torque screwdrivers). Each connection shall be inspected, including checking of torque settings where applicable, and the inspection recorded.

1.12.9 Where terminals of the screw or stud types are used, the correct torque shall be applied in accordance with the manufacturer's instructions. The torque setting shall be confirmed during commissioning.

1.12.10 Terminal blocks shall be suitable for accommodating the required number of terminations in accordance with the terminal block manufacturer's instructions, allowing for reasonable future expansion.

1.12.11 Terminal blocks and their installation shall allow unencumbered access to all terminations. For the avoidance of doubt termination arrangements that provide more than two cable entries on the same vertical plane (double stacked terminal blocks) are not acceptable.

1.12.12 Terminal blocks provided for alarm, indication and control connections to substation control system equipment shall incorporate isolating facilities.

1.12.13 Terminal blocks in outdoor kiosks or equipment cubicles shall have separate terminals for incoming and outgoing connections, not more than two terminations being permitted on any one terminal excluding any purpose made interconnectors.

1.12.14 All terminal blocks shall by virtue of their design prevent accidental short-circuiting between adjacent terminals. Dissimilar terminal blocks shall not be mounted adjacent to each other without suitable end caps and clamps.

1.12.15 When terminals are used that rely on the adjacent terminal for insulation from live connections (e.g., RSF3) the mounting arrangements used shall prevent a terminal from being inadvertently inverted causing a possible short circuit to the adjacent terminal. Choice of profile of the mounting rail can prevent this risk, i.e., 'top hat' profiled rail allows terminals to be mounted both ways whereas 'G' profiled rail does not. Where use of profiled rail is not practicable, alternative mitigations shall be discussed with National Grid.

1.12.16 Terminal covers shall be provided where terminal blocks are used at nominal voltages above 125 V (AC or DC), or where high transient over-voltages may occur, e.g., current transformer circuits. They shall be to IP 20 as specified in BS EN 60529. Where hazardous voltages could be present, warning labels shall be provided.

1.12.17 No live metal shall be exposed at the back of terminal blocks.

1.12.18 Test sockets, where provided, shall normally be suitable for test plugs of 4 mm diameter, but a smaller size may be acceptable where the terminal block dimensions make 4 mm impractical.

1.12.19 Where a protection system incorporates a selection facility for the direct or selective tripping of the remote end of a circuit from the local busbar protection system(s) this shall be provided by clearly and unambiguously labelled bolted or hard-wired links mounted in the back of the appropriate relay cubicle panel.

1.12.20 Terminal blocks associated with CT, VT and protection wiring shall be either:

a) STUD type utilising flat washers and spring washers allowing sufficient stud length for the application of a second nut and termination (e.g., for shorting CTs in service) or;

b) SPRING loaded screw type

Informative: This is to ensure that the integrity of CT, VT and protection wiring is not compromised by accidental loosening of the primary captive arrangement in service due to vibration or inadvertent interference.

1.13 Provision of Shorting Links, Earthing Links and Terminals for CT AC Wiring

1.13.1 CT terminal blocks housed at the first marshalling point closest to the CT shall facilitate the application of temporary shorting links that are secured using a nut and washer locking arrangement. Facilities for isolating the short-circuited CT shall also be provided at this point. The design shall be such that the integrity of the shorted and open circuits may be readily confirmed by visual inspection. The terminal block shall be located at an easily accessible position.

1.13.2 On high impedance busbar protection schemes only, termination blocks that facilitate the in-service shorting and disconnection of CTs (i.e., isolation and earthing links) shall be provided at the point of connection to the common bus-wiring to allow the safe removal of individual circuits from the in-service busbar protection AC rings.

1.13.3 To implement the requirements of 1.13.1 for all CT secondary circuits, except for high impedance busbar protection, terminal blocks of type ST5 or equivalent with shorting capability shall be used.

1.13.4 The ST5 or equivalent terminal blocks with shorting capability shall be provided at the first interface/marshalling point after the CT terminal box. The following locations are considered suitable: -

- The site circuit marshalling kiosk for sites with a common relay room and no GIS Local Control Cubicle (LCC).
- The GIS LCC for sites provided with such.
- Wound equipment marshalling kiosks for bushing/neutral end CTs.
- The circuit marshalling rack for sites with a blockhouse.
- Where none of the above can be applied the terminals shall be located at suitable location between the CT and relay panel as close to the CT as possible.

Informative: This requirement is to allow application of the National Grid Safety Rules to protection and control equipment such that points of isolation can be established outside of the work area, allowing relay cubicles to be replaced safely.

1.13.5 The terminals shall be arranged such that arrangements to take on-load readings can be easily applied and they shall be mounted to be easily accessible.

1.13.6 All CT secondary circuits shall be connected to earth at one point only. This connection shall be via a secure sliding link and shall be labelled as an earth link. The link shall be of a captive type and mounted such that the moving element shall, if inadvertently left loose, fall under gravity to the earthed position. All circuit earth connections and links shall be readily accessible in the relay cubicle or associated terminal box. A notice warning of dangerous voltage shall be provided adjacent to the CT secondary earth link.

1.13.7 The CT earth link shall be of type STL5 or equivalent with shorting capability and shall be located at the relay panel.

1.14 Crimping

1.14.1 The crimping assembly shall meet the requirements of BS EN 60352-2.

1.14.2 Barrel sizes shall suit the sizes and forms of conductor supplied. Barrels that take a range of conductor sizes are acceptable.

1.14.3 Crimps used shall be suitable for the terminal or product in which they are to be terminated.

1.14.4 Stranded type conductors shall be terminated with a suitable crimp. Bare wire terminations are not acceptable.

1.14.5 The use of push fit and similar terminations which are specifically designed to accept uncrimped, uninsulated wire ends shall be agreed with National Grid.

1.14.6 Conductors up to 6 mm^2 shall be terminated with insulated crimps. Uninsulated 'bullet' and uninsulated 'bootlace' type ferrules are not acceptable. Where a terminal on an item of equipment will not accept an insulated crimp, the termination shall be discussed with National Grid.

1.14.7 The contractor shall provide sufficient evidence of a suitable 'termination strategy' to prevent any risk of occurrences of incompatibility between the wire/core, crimp, and termination block.

1.14.8 The termination strategy shall, as a minimum, refer to the following aspects: -

- Method of preparing and crimping the conductor for all termination types proposed
- Selection and approval of crimping tool for use on all termination types proposed and ensuring that the crimping tool is calibrated and maintained in a serviceable condition
- Method of tooling to ensure full compression of the termination is achieved
- Reference to barrel size to suit the size and form of conductor proposed
- Selection of and the use of wire strippers to ensure the correct amount of insulation is removed with no nicks or cut strands
- Crimping is performed in accordance with manufacturer's instructions by appropriately trained staff
- Compatibility between the cable, crimp, crimping tool, and terminal block is achieved
- Visual checks following crimping as part of a formal quality inspection system to formally confirm that all wiring activities have been completed in accordance with BS EN Standards, manufacturer's instructions, technical specifications, and other relevant documentation.
- Quality monitoring system to confirm adherence to the above 'termination strategy' principles is in place.

1.14.9 Each crimped termination shall be fitted with one conductor only.

1.14.10 Crimps shall be used for CT secondary terminal connections and shall be such that they cannot become loose. The manufacturer shall demonstrate that the connection cannot become loose through vibration or other environmental factors.

1.15 Heavy Duty Plug & Socket Connectors

1.15.1 CT wiring shall not be routed via plug and socket connectors due to the safety and fire risk of an open circuit CT.

1.15.2 Plug and socket connectors shall be equipped with a coding facility to avoid incorrect connections being made. The design of connector used shall ensure correct alignment of the pins on connection. Each plug and socket shall be identified.

1.15.3 The degree of protection provided on plug and socket connectors for use in protection and control cubicles sited in relays rooms shall be to IP 50 as specified in BS EN 60529. Outdoor types shall be a minimum of IP 54 and shall be suitable for the environment in which they are applied over the life of the associated primary equipment.

1.15.4 Cable strain relief shall be provided at the cable gland, such that the integrity of the plug/socket housing IP rating is not affected. This includes armoured cable where the strain associated with the cable being bent can place additional strain on the cable gland or plug/socket.

1.15.5 Male and female electrical contacts for use in protection and control systems shall not be of the stamped metal design.

1.16 Small Wiring

1.16.1 The colouring of small wiring shall comply with Table 1 except where specified below.

Function	Cable Colour	Ferrule Colour
Protective conductors Functional earthing conductors	Green-and-yellow Cream	White with black lettering
A.C. power circuit (motor/fan drives, power socket outlets, lighting (i) 110 V centre tapped supply (ii) 230 V single-phase (iii) 400 V THREE-PHASE	(i) Brown(L1), Black (L2) (ii) Brown (L), Blue (N) (iii) Brown (L1), Black (L2), Grey (L3), Blue (N)	White with black lettering
A.C control circuits and other applications (including VT/CT secondary wiring)	White	White with black lettering, except: - CT secondary wiring ferruled in red coloured ferrules or deploy red coloured ring markers at termination blocks. VT secondary wiring ferruled in yellow-coloured ferrules or deploy yellow coloured ring markers at termination blocks.
D.C power circuit:- 110 V D.C. 48 V D.C. (positive earthed)	Brown (+'ve), Grey (-'ve) Blue (+'ve), Grey (-'ve)	White with black lettering
D.C. control circuit	White	White with black lettering
24 V D.C.	Red (+'ve), Blue (-'ve)	

Table 1 - Small Wiring Colours

1.16.2 Where a minor addition or modification to an existing wiring scheme is undertaken, the existing wiring convention should be adopted. For the purposes of the above, minor shall be considered as being an addition or deletion of single protection or control functions. Full protection or control replacements shall require the adoption of Table 1.

1.16.3 Multicore cables shall be identified below the gland with a unique marker referring to the multicore cable number as allocated on the site cable schedule. The identification method shall be durable and suitable for outdoor use for the lifecycle of the cable system.

1.16.4 All metallic cables shall be of low smoke, low fume, zero halogen insulation with suitable mechanical protection. Cables run in trenches, ducts or troughs shall also be armoured.

1.16.5 Factory produced equipment wiring panels, i.e., those associated with and included within a type registration solution, are not affected by the requirements of this clause. Examples of the above are:

a) A current transformer (CT) secondary winding loom from the CT winding to the equipment terminals connection point.

b) Wiring from a HV disconnector motor winding and/or its auxiliary contact assemblies to the equipment terminals connect point.

1.16.6 All CT wiring and the tripping wiring between trip relays and circuit-breaker trip coils shall have a cross-sectional area of not less than 2.5 mm^2 unless specifically agreed with National Grid. For other applications the general wire size shall be a minimum of 1 mm^2, smaller wire sizes may be acceptable with the agreement of National Grid. Wiring sizes shall always be designed for electrical requirements such as volt drop, current etc. and consider mechanical integrity. The conductor shall meet the requirements of BS EN IEC 60228.

1.16.7 Multicore cables shall be terminated in such a way that the conductors are able to comfortably reach every terminal in the associated group to allow for future modifications and the efficient use of spare cores.

1.16.8 For new installations consideration shall also be given to segregation of signals between multicore cables. As a minimum the following signals shall be allocated to separate cables:

- 230/400 V AC supplies.
- 110 V DC supplies.
- 48 V DC supplies.
- First and second supplies shall also be run in separate cables.
- CT connections.
- VT connections.

- DC trip, alarm, control, and interlocking signals can be allocated to the same cable but first and second tripping systems shall be run in separate cables.

- Transducer mA output signals. These shall also be allocated to screened twisted pair cable.

1.16.9 Where signals are being sent between different sites, for example between the HV and LV sides of transformers the first and second trip systems shall be allocated to separate cables. Ideally these cables should be physically separated by at least 5 metres to prevent accidental damage to both and be run in separate ducts/trenches from any parallel power cables.

1.16.10 For asset replacement works where existing cross site cables are commonly reused consideration shall be given to segregating the following signals between multicore cables:

1. Cores being used for CT and VT connections shall be in separate cables from cores being used to energise IED status inputs using optical couplers.
2. Cores used for first and second protection systems should be in separate cables.
3. Where practicable, cores carrying CT and VT connections should be in separate cables from those carrying DC and tripping supplies.
4. 400 V AC supplies should be run in dedicated cables.

Item 1 is mandatory. If there are sufficient spare cores available in the existing cables the opportunity should be taken to segregate functions across the multicore cables as per items 2, 3 and 4 with item 2 being given the highest priority.

1.16.11 Occasionally contractors may have difficulties in obtaining multicore cable with cores covered with white coloured insulation. This has been found to be particularly the case with multicore cables with cores of 4 mm^2 or larger. Where this is the case, the coloured cores shall be covered with white coloured sleeving where the outside insulation/armouring have been stripped away. The cores shall be suitably numbered, and continuity tested after the sleeving has been applied. For 230 V and 400 V AC cables, sleeving of conductors is not acceptable as suitable coloured cores complying with BS 7671 are readily available.

Informative: the white coloured sleeving shall be applied to the visible part of the cable cores, from the termination point to the point at which the cable enters trunking, or, if affixed to cable tray, covering the full extent of the cores to the point at which the inner insulation sleeve has been removed.

1.16.12 As multicore cables of 2.5 mm^2 and below are readily available with white insulated cores it is not permissible to use these sizes with coloured cores for cabling/wiring that requires white coloured cores.

Informative: Multicore cables to ENA TS 09-06 are available with WHITE cores of 2.5 mm^2 and below. As 4 mm^2, 6 mm^2 and 10 mm^2 cables with fewer than seven cores are only available with coloured cores, it is acceptable to sleeve these cores as outlined in Clause 1.16.11.

1.16.13 Where insulated small wiring is used, it shall be in accordance with BS 6231, BS 6004 (or IEC 60227 parts 1, 3 and 4) and BS 7211 as appropriate to the application being considered. The contract shall specify the general ambient conditions for small wiring and where low smoke zero halogen insulation is required.

1.16.14 Connections between cubicles shall be made via the use of multicore cables as opposed to single cores run in conduit or trunking except in the case of adjacent relay cubicles forming a suite of cubicles for a common circuit of function e.g., First Main and Second Main feeder protections or cubicles housing mesh DAR or busbar protection.

1.17 Interposing Relays

1.17.1 General

1.17.4.1 The environmental and performance test requirements for interposing relays are as specified in TS_3.24.15.

1.17.4.2 When a plug-in relay is utilised, it shall have a device to retain the relay or element in place. It shall not be possible to insert a plug-in relay into its base incorrectly

1.17.4.3 The relay shall have an enclosure specification to IP 50 as specified in BS EN 60529 and have transparent covers.

1.17.4.4 It shall not be possible to replace a cover incorrectly.

1.17.4.5 The contact performance for relays used for local control purposes shall be in accordance with the requirements stated in TS_ 3.24.4 where relevant. However, a lower rating may be used where it can be shown that the contacts are suitable for the application.

1.17.4.6 The relay will be required to operate either from a 48 V or 110 V nominal DC supply as specified in TS_3.12.4

1.17.2 In/Out Switching for Protection Relays and Auto-Reclose Equipment

1.17.2.1 The relay shall be of the latched type with independent operate and reset coils. The operate coil shall perform the 'OUT' function. A contact in series with each coil shall break the coil current during, or at the end of the mechanical travel.

1.17.2.2 A self-resetting indicator on the relay that displays the words 'IN' and/or 'OUT' when applicable and masks the inapplicable word shall be provided.

1.17.2.3 A hand resetting mechanism shall not be fitted.

1.17.2.4 The relay shall be sized according to the application. Consideration shall be given to the provision of a sufficient number of spare contacts to allow for future requirements.

1.17.3 Control Interposing Relays

1.17.3.1 Contacts of interposing relays for control purposes shall be suitable for controlling inductive circuits associated with the operating gear of the equipment to be controlled.

1.17.3.2 48 V DC control interposing relays shall be double pole switched.

1.17.3.3 110 V DC control interposing relays shall be Class 2 in Table 2 or shall be double pole switched.

1.17.4 Forced Tripping Relays

1.17.4.1 Relays that provide a forced tripping function on 110 V DC systems shall be Class 1 or Class 2 as specified in Table 2. Class 2 may be required where extensive dc wiring is associated with the relay and operation due to capacitive discharge is more likely.

1.17.4.2 Forced tripping relays for use on 48 V DC systems, shall be double pole switched.

1.18 Testing Facilities

1.18.1 Facilities shall be provided to enable all routine maintenance testing to be carried out from the front of the equipment. For the avoidance of doubt this includes a requirement to provide a 'simulated trip test' facility for each circuit bay tripping system. The simulated trip test system shall provide a means of testing the tripping system up to but not including the bay circuit-breaker. A 'dummy circuit-breaker' shall be provided in the form of an indication lamp on the relay panel or a portable plug-in test box that simulates the operation of the bay circuit-breaker. As a guide the 'simulated trip test' facility shall provide an equivalent interface and have the same functionality as the English Electric / GE Grid Solutions simulated trip test socket and dummy circuit-breaker test box type VAB.

1.18.2 Test blocks shall be provided on relay panels to enable access into the CT, VT and input/output circuits of the protection relays for commissioning and periodic testing of the relay equipment without disturbing any wiring connections associated with the protection scheme. Test plugs for use with the test blocks, shall have all circuits (14 circuits) brought out to twenty-eight 4 mm sockets on the front of the plug, with no shorting devices between the sockets or plugs, allowing full access to the CT, VT and protection circuits for injection or measurement purposes. The test plugs shall be compatible with test blocks (MMLG02/ 2RMLG-02 or equivalent).

1.18.3 Test blocks shall be orientated in logical sequence i.e. First Main protection test block 1 in the left most position, followed by First Main protection test block 2 and so on, with layout then replicated on the Second Main protection and subsequent panels, to aid ergonomic operation of the equipment and enhance process safety.

1.18.4 The test blocks shall be 19'' rack compatible, and shall comply with the following IEC specifications:

1.18.4.1 Insulation

BS EN 60255-27 (2014)- Power frequency voltage withstand with the following duties:

5 kV rms for 1 minute between all case terminals connected together and the case earth terminal

5 kV rms for 1 minute between any contact pair and adjacent alternate contact pair provided the intermediate contact pair is not used.

2 kV rms for 1 minute between any contact pair and adjacent contact pair.

1.18.4.2 Current Withstand

All contact circuits rated at 20 A continuously or 400 A for 1 s, AC or DC.

1.18.4.1 Temperature

BS EN 60255-1 (2010):

Storage and transit: -25°C to +70°C.

Operating: -25°C to +70°C.

BS EN 60068-2-1 (2007). – Cold.

BS EN 60068-2-2 (2007). – Dry Heat.

1.18.4.2 Humidity

BS EN 60068-2-78 (2002). – 56 days at 93% RH and +40°C.

1.18.4.3 Enclosure Protection

BS EN 60529 (1992). – IP50 (dust protected).

1.18.4.4 Mechanical Environment

BS EN 60255-21-1 (1996). – Response Class 2

1.19 Use of Opto Coupler Inputs on Numerical IEDs

1.19.1 The following restrictions and limitations should be applied to installations utilising optical coupler inputs:

- The preferred method of switching optical coupler inputs is through double pole switching devices. However, it is recognised that this will not be achievable in all applications due to unavailability of initiating contacts or in situations where the negative terminals of the optical coupler inputs are connected internally within the protection relay and presented externally as a single common terminal. Cross site initiations which can directly or indirectly cause a trip, have been proven to be problematic, these should be either double pole switched or connected as stated below.
- Where double pole switching is utilised, drain resistors shall not be fitted across the contacts switching the negative side of the supply.
- Under no circumstances should cables connecting optical coupler inputs share conductors carrying AC circuits. This means CT, VT or 230 V/400 V AC circuits.
- Without exception 110 V DC systems supplying optical coupler inputs should be of the centre tapped earth arrangement.
- Where cross site initiations cannot be connected as above and the initiating contact is on a remote site (with a separate earth mat) to the optical coupler via a long pilot cable, consideration shall be given to fitting a high burden (EB2 in ER M16/2) interposing relay.

1.20 VT Secondary Isolation Facilities

1.20.1 Within new substations or when completing protection refurbishment/replacement MCBs shall be fitted rather than fuses and links to protect and isolate the VT circuitry.

1.20.2 Within each VT secondary isolation box, common VT Isolation Links shall be fitted to enable isolation of the windings with the individual circuits fitted with MCBs so that they can be individually protected and isolated. A typical arrangement is illustrated in **Appendix 1**. The link carriers shall be coloured white. It should also be noted that the VT secondary windings should be single point earthed only via bolted links.

1.20.3 The VT secondary isolation boxes shall be mounted on the VT support structure to keep the connection between the VT and the secondary isolation box as short as possible to minimise the length of cable/wiring unprotected by the MCB. Where the VTs are mounted on separate phase segregated structures an individual fuse box shall be provided per phase. Common 3 phase secondary isolation boxes may be used when the individual phase VTs are mounted on a common structure such as in GIS and lower voltage installations providing the unprotected cable is kept as short as possible and mounted on the structure.

1.20.4 Within the synchronising circuits no other links other than the VT Isolation Links should be designed in series with the MCBs or fuses to prevent inadvertent circuit breaker closure in the event links are not replaced. MCB operation will block synchronising or DAR closures.

1.20.5 All protection circuitry should have a means of physically isolating all VT inputs on the front of the relay panel, either in the form of a link or an MCB.

1.20.6 The above clauses 1.20.1 to 1.20.5 apply to VTs for protection and general use, as defined in TS_3.02.05. HRC fuses are applied between VTs for settlement metering use and the associated meters, as outlined in SCT_16.03.

1.21 DC Changeover Schemes

1.21.1 Where DC changeover schemes are required, for example for busbar protection or SCS bay controllers they shall meet the following requirements:

- All the equipment shall be continuously rated at the maximum supply voltage, i.e., for 110 V DC nominal schemes the relays and other auxiliary equipment shall be rated at the maximum voltage of 137.5 V.
- Where possible the scheme should be designed such that the contactor coils and other components are normally de-energised.
- The scheme should include a manual changeover facility.
- The changeover equipment shall be physically separated from the rest of the equipment in the panel by locating it within its own compartment.
- Speed of changeover performance shall ensure continuous operation of the system it is supplying

2 INTERFACE REQUIREMENTS

2.1 Enclosures and Equipment

2.1.1 Enclosures, equipment, and ancillary components etc. shall be designed to operate under the appropriate general ambient conditions specified in TS_1 Table 1.

2.2 Terminal Blocks

2.2.1 Terminal blocks for use on CT circuits shall have a rated insulation voltage of 800 V and be tested with a test voltage selected from BS EN 60947-7-1 Table V (3500 V rms). The terminal block shall also meet the requirements of the impulse voltage test in IEC 60255-5 with a test voltage of 5 kV.

2.2.2 Terminal blocks for use in 110 V and 48 V DC systems shall have a rated insulation voltage up to 300 V and be tested with a test voltage selected from BS EN 60947-7-1 Table V. Other systems shall have rated insulation and impulse voltage in accordance with that specified in the appropriate level 2 technical specification.

2.2.3 Terminal blocks for use with pilot cables shall be rated to withstand the potential rise induced during switching of the associated primary circuits.

2.3 Plug and Socket Type Connections

2.3.1 The rated insulation and impulse voltage shall be in accordance with the requirements for terminal blocks.

2.4 In/Out Switching Relays for Protection and Auto-Reclose Equipment

2.4.1 For operation at 48 V DC the following requirements apply:

a) The burden of the coil shall not exceed 15 W at 48 V DC

b) For general application the relay shall function correctly with 200 Ω in series with each coil and with a battery voltage of 46 V. For applications associated with a coordinated control system, where the control is via a local bay computer the relay shall function correctly with 15 Ω in series with each coil.

c) The relay shall function correctly when 56 V DC is applied and maintained at the appropriate terminals.

d) Minimum operating and resetting current shall be 25 mA.

e) Operation or resetting should not occur when 110 V AC 50 Hz is applied to the external case terminals of the respective relay coil circuit for 5 seconds.

2.4.2 For operation at 110 V DC the following requirements apply:

a) The relay shall function correctly with 30 Ω (or 15 Ω where the supply originates at the relay panel) in series with each coil and a battery voltage of 100 V.

b) The relay shall have a rated voltage of 125 V DC.

2.5 Control Interposing Relays

2.5.1 Relays associated with the direct operation of switchgear shall have Class 1 or Class 2 performance as specified in Table 2.

Class	1		2
D.C. System Nominal Voltage (V)	110	48	110
Relay rated voltage (V)	125	48	125
Normal Working Voltage (V)	125	54	125
Operative Voltage Range (V)	87.5 to 137.5	37.5 to 60	87.5 to 137.5
Energising current at or below which the relay shall not operate (mA)	25	10	50
Capacitance discharge test *	N/A	N/A	10 μF at 150 V
Thermal withstand voltage at 40°C ambient (V)	137.5	60	137.5

Table 2 - Control Interposing Relays

* For details of the capacitive discharge test refer to 3.2.1.

2.5.2 The requirements for capacitor discharge immunity shall not apply to auxiliary energising circuits of a relay.

2.5.3 48 V DC control interposing relays shall function correctly with 200 Ω in series with each coil and with a battery voltage of 46 V.

2.5.4 Interposing relays energised at 110 V DC shall operate within their declared specification with 100 Ω in series with the operate coil.

3 Test Requirements

3.1 General

3.1.1 Equipment offered to meet this specification shall have passed the test requirements laid down in applicable International or British Standards.

3.2 Control Interposing Relays

3.2.1 Capacitive Discharge Test

3.2.1.1 The trip relay shall be tested to ensure that it does not operate when a charged capacitor is discharged across the DC energising circuit(s). The value of the capacitor and charging voltage is as specified in Table 2.

3.2.1.2 The accuracy shall not be affected by more than ±10% (±2% for auxiliary power supply variations) under the range of system and atmospheric conditions specified in TS_1.

4 Technical Data

4.1 General

4.1.1 The equipment supplier shall provide technical data to support the general, performance and test requirements where required by National Grid to demonstrate compliance with this specification.

5 Forms and Records

Not applicable

6 Definitions

The definitions given in TS_1 and TS_2.2 apply to this document.

7 Amendments Record

Issue	Date	Summary of Changes / Reasons	Author(s)	Approved By (Inc. Job Title)
1	April 1996	New document		
2	July 1999	Inclusion of the requirement for Testing Facilities, Marshalling. Requirements for terminal and wire end marking strengthened. Appendix A deleted.	Terry England	John Scott General Manager Engineering and Technology
3	December 2005	Major revision	Paul Coventry	Peter Roberts Asset Strategy Manager
4	August 2017	Major revision. Numerous changes to various sections such as crimping, small wiring colours, segregation of signals between multicore cables. New sections added:- • Provision of shorting links, earthing links & terminals for CT AC wiring • Use of opto coupler inputs on modern relays • CVT secondary isolation facilities • DC Changeover schemes	Andrew Ridley	Stewart Whyte Asset Policy Manager
5	July 2022	Scope increased beyond substations to include all transmission locations. Normative standards checked and updated. Wire end marking requirements clarified and strengthened. Adherence to EATS 50-19 made mandatory. Appendix 2 added. Requirements for kiosks and cubicles simplified.	Andrew Ridley Jody Collett Tim Murrell Brendon Phillips Peter Trigg James Watson	Damien Cully Asset Manager – Substation Infrastructure Asset Management – Substations & Circuits
6	July 2025	Reformatted and transferred to latest Technical Specification Template. Addenda post Issue 5 incorporated into TS. Normative references updated. Wire end marking requirements clarified. Panel heights adjusted based on supplier feedback, SCS isolation facilities expanded to include alarm and indication functions.	Andrew Ridley James Watson	Damien Cully Asset Lifecycle Manager – Substation Infrastructure Asset Management – Substations & Circuits

8 References

This specification refers to, or should be read in conjunction with, the following documents.

International and British Standards and Specifications

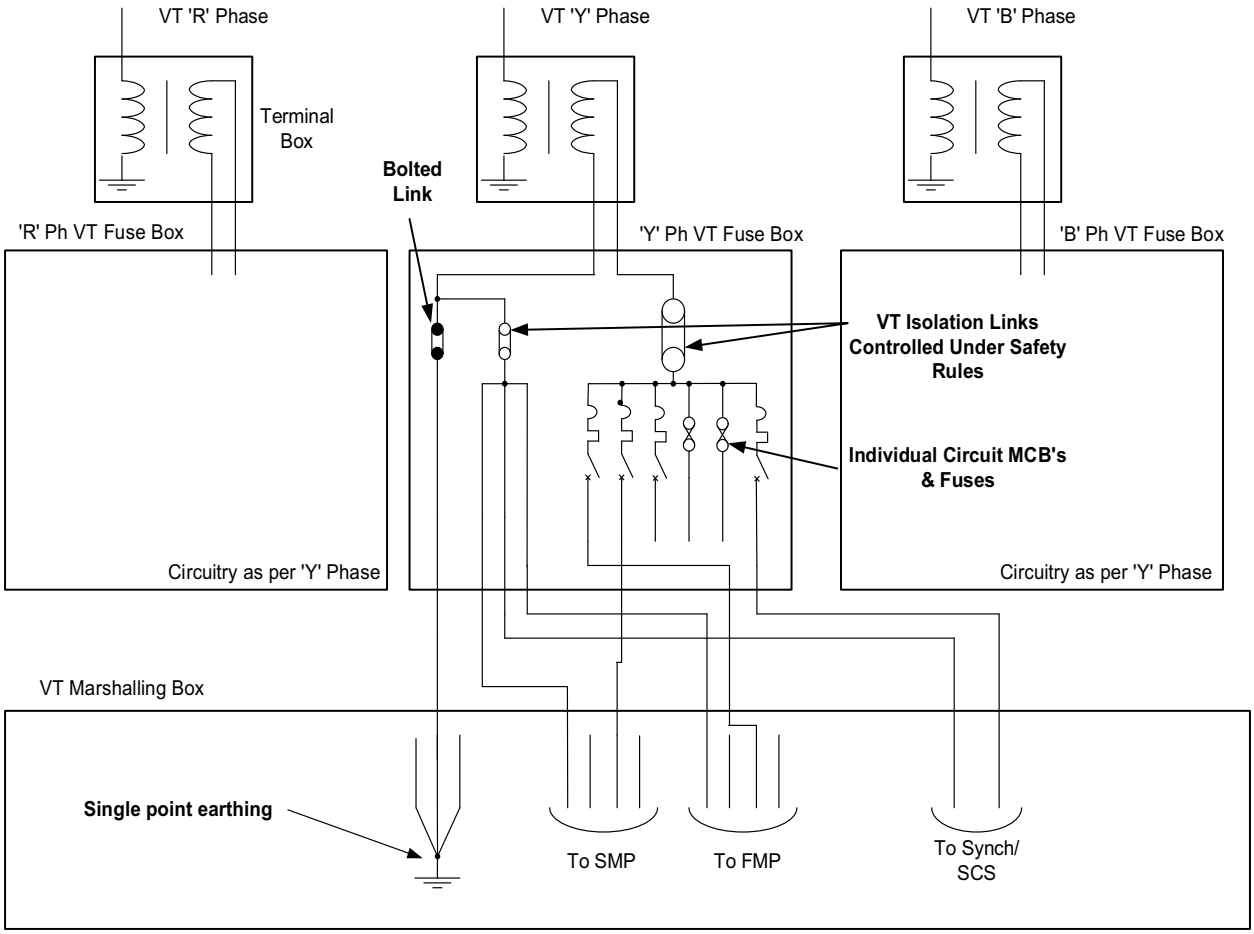
BS EN IEC 61439-2	Low-Voltage Switchgear and Controlgear Assemblies - Part 2: Power Switchgear and Controlgear Assemblies.
BS 7671	Requirements for Electrical Installations. IET Wiring Regulations - Current Edition.
BS 6701	Telecommunication equipment and telecommunications cabling – specification for installation, operation and maintenance.
BS EN ISO 7010	Graphical symbols and signs. Safety signs, including fire safety signs. Part 5- Signs with specific safety meanings.
BS EN IEC 60695-2-13	Fire Hazard Testing. Parts 2-13. Glowing/hot-wire based test methods. Glow wire ignition temperature (GWIT) test method for materials.
BS EN IEC 60695-9-1	Fire hazard testing. Parts 9-1. Surface spread of flame. General guidance.
BS EN 60269-1	Low Voltage Fuses Part 1: General Requirements.
BS EN 60947-2	Low-voltage switchgear and controlgear. Part 2- Circuit-breakers.
BS EN 62271-1	Common Specifications for High-voltage switchgear and controlgear. Part 1 – Common specifications for alternating current switchgear and controlgear.
BS EN 62444	Cable Glands for Electrical Installations.
BS EN 60297-3-100	Mechanical Structures for electronic equipment. Dimensions of mechanical structures of the 482.6 mm (19 in) Series. Part 3-100: Basic dimensions of front panels, subracks, chassis, racks and cabinets.
BS EN 60529	Degrees of protection provided by enclosures (IP code).
BS EN ISO 8510-2	Adhesives - Peel test for a flexible-bonded-to-rigid test specimen assembly. Part 2: 180 degrees peel.
ENA TS 50-19	Standard numbering for small wiring (for switchgear and transformers together with their associated relay panels)
BS EN 60947-7-1	Low-voltage switchgear and controlgear. Part 7-1: Ancillary equipment - Terminal blocks for copper conductors.
BS EN 60352-2	Solderless connections. Part 2: Crimped connections. General requirements, test methods and practical guidance.
BS EN IEC 60228	Conductors of insulated cables.
ENA-TS 09-06	Auxiliary multicore and multipair cables.

BS 6231	Electrical cables – single core PVC insulated flexible cables of rated voltages 600/1000 V for switchgear and controlgear wiring.
BS 6004	Electric cables. PVC insulated, and PVC sheathed cables for voltages up to and including 300/500 V, for electric power and lighting.
IEC 60227 (1, 2 & 4)	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V.
BS 7211	Electric cables - Thermosetting insulated and thermoplastic sheathed cables for voltages up to and including 450/750 V, for electric power and lighting and having low emission of smoke and corrosive gases when affected by fire.
BS EN 60255 (1 & 27)	Measuring relays and protection equipment.
BS EN 60068-2 (1, 2 & 78)	Environmental Testing
BS EN 60255-21-1	Electrical Relays – Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment.
ER M16/2	Electricity Council Chief Engineers' Conference May 1967 – Engineering Recommendation M16/2 – Tripping Relays and Auxiliary Repeat Relays for Nominal 110 V DC Circuits.

National Grid Documents

TS_1	Ratings and General Requirements for Plant, equipment and Apparatus for the National Grid System.
TS_2.01	Substations
TS_2.02	Switchgear
TS_3.01.02	Earthing
TS_3.12.03	Substation LVAC Supplies
TS_3.12.04	48 V and 110 V DC Supplies
TS_3.24.04	Hardware Platform
TS_3.24.15	Environmental and Test Requirements for Electronic Equipment

APPENDIX 1: TYPICAL VT FUSE BOX AND MARSHALLING CIRCUITRY



APPENDIX 2: GUIDANCE PRINCIPLES FOR THE APPLICATION OF WIRE-END MARKING

Table 1 of EA TS 50-19 provides the high-level philosophy for wire-end marking, reproduced below:

Letter	Circuit function	Wire numbers [1)]
A	Current transformers for primary protection excluding overcurrent	10-29 L1 (Red) phase 30-49 L2 (Yell.) phase 50-69 L3 (Blue) phase 70-89 Residual circuits and neutral current transformers 90 Earth wires directly connected to the earth bar 91-99 Test windings, normally inoperative
B	Current transformers for busbar protection	
C	Current transformers for overcurrent protection (including combined earth-fault protection) and instruments	
D	Current transformers for metering and voltage control	
E	Reference voltage for instruments, metering and protection	
F	Reference voltage for voltage control	
G	Reference voltage for synchronising	
H	a.c. and a.c./d.c. supplies	1-69 Switchgear and generators 70-99 Transformers
J	d.c. supplies	
K	Closing and tripping control circuits	Any number from 1 upwards
L	Alarms and indication initiated by auxiliary switches and relay contacts, excluding those for remote selective control and for general indication equipment	
M	Auxiliary and control motor devices, e.g. governor motor, rheostat motor, generator AVR control, spring charging motors, transformer cooler motor control, motors for isolator operation	1-19 Switchgear 20-69 Generators 70-99 Transformers
N	Tap change control, including AVC, tap position and progress indications	Any number from 1 upwards
O	An indication that the ferruling is not in accordance with the general scheme and that if it is not altered double ferruling will be required for co-ordination with the remaining equipment in the station (See Rule 4.9)	

P	D.C tripping circuits used solely for busbar protection	
R	Interlock circuits not covered above	
S	D.C instruments and relays, exciter and field circuits for generators	
T	Pilot conductors (including directly associated connections) between panels, independent of the distance between them, for pilot-wire protection, for intertripping or for both	
U	Spare cores; connections to spare contacts	Spare cores shall be numbered from 1 upwards in each cable, and shall be so arranged that they can be readily identified on site with the cable containing them. This shall be achieved by suitable grouping, and unless the location of each group is clear from the diagram, the groups shall be labelled. Alternatively the cable number shall precede the core number.
V	Automatic switching circuits not integral with circuit breaker control schemes, i.e. separately supplied or isolatable from, the circuit breaker control scheme	Any number from 1 upwards
W	Light current control connections(Clause 4.8.5)	
X	Alarms and indications to and from general indication and remote selective control equipments	
Y	Telephones	
NOTE: The term "remote selective control" denotes "control at a point distant from the switchgear by the transmission of electrical signals through common communication channels using selective means to operate one or a number of switching devices".		
[1)] If, for functions A-G and for functions H, J and M, more numbers are required, add multiples of one hundred (e.g. 10-29 may be extended to 110-129, 210-229, etc.)		

Further guidance for National Grid small wiring is then obtained from archived CEGB Standard 994205 (TPS 12/5) which provides a wire numbering system at Section 5, reproduced below:

WIRE FUNCTION LETTER AND NUMBER SERIES	CIRCUIT FUNCTION	COMMENTS
DC TRIP AND CONTROL FUNCTIONS – 48 OR 110V DC NOMINAL		
K0 – K99	FIRST MAIN FEEDER PROTECTION (275KV AND ABOVE) MAIN FEEDER PROTECTION (132KV AND BELOW) CIRCUIT-BREAKER TRIPPING AND CLOSING (FIRST SYSTEM) TRANSFORMER PROTECTION	
K101 – K199	INTERTRIPPING	
K200 – K299	TRIP RELAY RESET	
K300 – K399	SECOND MAIN FEEDER PROTECTION (275KV AND ABOVE) CIRCUIT-BREAKER TRIPPING AND CLOSING (SECOND SYSTEM)	
K400 – K499	DISCONNECTOR CONTROL	
K500 – K599	TRANSFORMER LV PROTECTION IN HV PANELS SYNCHRONOUS AND STATIC COMPENSATION EQUIPMENT ASSOCIATED WITH AUTO-TRANSFORMERS	
K600 – K699	SYSTEM BACKUP PROTECTION FOR FEEDERS	
K700 – K799	ALLOCATED TO SUPPLIERS	
K800 – K899	SYSTEM BACKUP PROTECTION (BUS SECTION AND BUS COUPLER)	
K900 – K999	BYPASS TRIPPING, SEQUENTIAL TRIPPING AND MESH CROSS-TRIPPING	
DC BUSBAR PROTECTION AND BACK TRIPPING FUNCTIONS – 110V DC NOMINAL		
P0 – P99	MESH / BUSBAR / CB FAIL (FIRST SYSTEM WHERE APPLICABLE) BUSBAR / CB FAIL UNIT SUPPLY	
P100 – P199	MESH / BUSBAR / CB FAIL PROTECTION FIRST SUPPLY	
P200 – P299	MESH / BUSBAR / CB FAIL PROTECTION COMMON (FIRST SYSTEM WHERE APPLICABLE)	
P300 – P399	MESH / BUSBAR / CB FAIL PROTECTION SECOND SUPPLY (COMMON SUPPLY WHERE APPLICABLE)	
P400 – P499	MESH / BUSBAR / CB FAIL PROTECTION COMMON (SECOND SYSTEM WHERE APPLICABLE)	
AC CT WIRING FOR PROTECTION PURPOSES		
A10 – A19 A30 – A39 A50 – A59 A70 – A79	TRANSFORMER OVERALL PROTECTION AND REF DOUBLE WOUND TRANSFORMERS – HV SIDE ONLY AUTO-TRANSFORMERS – THROUGHOUT	
A20 – A29 A40 – A49 A60 – A69 A80 – A89	FIRST MAIN FEEDER PROTECTION (275KV AND ABOVE) MAIN FEEDER PROTECTION (132KV AND BELOW)	
A320 – A329 A340 – A349 A360 – A369 A380 – A389	SECOND MAIN FEEDER PROTECTION (275KV AND ABOVE)	

WIRE FUNCTION LETTER AND NUMBER SERIES	CIRCUIT FUNCTION	COMMENTS
A510 – A519 A530 – A539 A550 – A559 A570 – A579	TRANSFORMER OVERALL PROTECTION AND REF DOUBLE WOUND TRANSFORMERS – LV SIDE ONLY AUTO-TRANSFORMERS – NOT APPLICABLE	
A520 – A529 A540 – A549 A560 – A569 A580 – A589	LV CONNECTIONS PROTECTION	
B10 – B90	BUSBAR PROTECTION	
B110 – B119 B130 – B139 B150 – B159 B170 – B179	HV CONNECTIONS PROTECTION MESH CORNER PROTECTION AND SINGLE SWITCH AND FOUR SWITCH STATIONS	
AC CT WIRING FOR PROTECTION PURPOSES (CONT'D..)		
B120 – B129 B140 – B149 B160 – B169 B180 – B189	MESH CORNER PROTECTION AT THREE SWITCH STATIONS	
C10 – C19 C30 – C39 C50 – C59 C70 – C79	BACKUP PROTECTION	
C20 – C29 C40 – C49 C60 – C69	INSTRUMENTS WHEN SEPARATE FROM BACKUP PROTECTION CB FAIL PROTECTION	
C80 – C89	HIGH SPEED NEUTRAL AMMETER NEUTRAL EARTH FAULT CHECK / ALARM / INTERLOCK PHASES UNBALANCED DETECTION	
C510 – C590	LV BACKUP PROTECTION IN HV PANELS	
C610 – C619 C630 – C639 C650 – C659 C670 – C679	BUS SECTION SYSTEM BACKUP PROTECTION CB FAIL PROTECTION AT SINGLE SWITCH MESH STATION	
C620 – C629 C640 – C649 C660 – C669 C680 – C689	FEEDER SYSTEM BACKUP PROTECTION CB FAIL PROTECTION AT THREE SWITCH MESH STATIONS AND BUSBAR STATIONS	
A710 – A799 B710 – B799 C710 – C799	ALLOCATED TO SUPPLIERS	
AUTOMATIC SWITCHING SYSTEMS – 110V DC NOMINAL		
V0 – V50	IN / OUT SWITCHING CONTROL FUNCTIONS	
V51 – V150	MESH CORNER DAR AND AUTO ISOLATION	
V151 – V250	MESH CORNER DAR – CIRCUIT-BREAKER CONTROLS	
V251 – V300	LV CIRCUIT-BREAKERS	
V301 – V350	DAR AT BUSBAR STATIONS	
V351 – V400	TRIP RELAY AUTO RESETTING	
V401 – V450	AUTO CLOSE	
ALARM AND INDICATION WIRING – 48V OR 110V DC NOMINAL		
L0 – L999	ALARM AND INDICATION – UNIVERSAL	
L1000 – L9999	ALLOCATED TO SUPPLIERS	

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Appendix N Comparison Table for Clarification Regarding Plot Number Alterations in Suffolk and Kent

Table N.1 Comparison table for clarification regarding plot number alterations in Suffolk

Old Land Parcel	Area size / m2 (Deadline 1)	New Land Parcel	Area size / m2 (Deadline 1a)	Comment
1/12 (part)	9758	1/74	7300	Old Plot still remains in DCO but has been overwritten in parts
1/14 (part)	229	1/75	220	Old Plot still remains in DCO but has been overwritten in parts
1/15	7507	1/76	7507	
New Plot	N/A	1/77	354	
1/17 (part)	26244	1/78	665	Old Plot still remains in DCO but has been overwritten in parts
New Plot	N/A	1/79	7945	
New Plot	N/A	1/80	2636	
1/32	3405	1/81	2732	
New Plot	N/A	1/82	194	
1/33	345	1/83	70	Old Plot was overwritten but 1/33 now exists elsewhere and has changed to class 3

Old Land Parcel	Area size / m2 (Deadline 1)	New Land Parcel	Area size / m2 (Deadline 1a)	Comment
1/31 (part)	19733	1/84	119	Old Plot still remains in DCO but has been overwritten in parts
1/47 (part)	2695	1/85	193	Old Plot still remains in DCO but has been overwritten in parts
1/42 (part)	27612	1/85	193	Old Plot still remains in DCO but has been overwritten in parts
1/45 (part)	2540	1/86	10	Old Plot still remains in DCO but has been overwritten in parts
1/60	135	1/87	135	Old Plot has been overwritten but is now located elsewhere and has changed to class 7
1/53 (part)	1125	1/88	75	Old Plot still remains in DCO but has been overwritten in parts
1/54	472	1/89	472	
1/47 (part)	2695	1/90	137	Old Plot still remains in DCO but has been overwritten in parts
1/61	96	1/91	96	
1/62	18	1/92	18	
New Plot	N/A	1/93	991	
1/63	687	1/94	687	
1/64 (part)	1793	1/95	184	Old Plot still remains in DCO but has been overwritten in parts
1/65	44	1/96	44	

Old Land Parcel	Area size / m2 (Deadline 1)	New Land Parcel	Area size / m2 (Deadline 1a)	Comment
1/55	19	1/97	19	
1/68	323	1/98	323	
1/66	699	1/99	699	
New Plot	N/A	1/100	899	
2/86	54	2/100	54	
2/87	2904	2/101	2904	
2/88	1900	2/102	1900	
2/89	891	2/103	891	
2/90 (part)	306	2/104	306	Old Plot still remains in DCO but has been overwritten in parts
2/91	373	2/105	373	
2/92	5534	2/106	5534	
2/93	1424	2/107	1424	
New Plot	N/A	2/108	7279	
2/94	15635	2/109	15635	
New Plot	N/A	2/110	5598	
2/95	782	2/111	782	Changed to class 3
2/96	1445	2/112	1445	Changed to class 3
3/21 (part)	11006	3/41	549	Old Plot still remains in DCO but has been overwritten in parts

Old Land Parcel	Area size / m2 (Deadline 1)	New Land Parcel	Area size / m2 (Deadline 1a)	Comment
3/22 (part)	3710	3/42	23	Old Plot still remains in DCO but has been overwritten in parts
3/23 (part)	2917	3/43	1181	Old Plot still remains in DCO but has been overwritten in parts
3/24	1181	3/44	1181	
3/25 (part)	2361	3/45	1301	
3/26 (part)	40966	3/46	24700	Changed to class 3
3/26 (part)	40966	3/47	16266	
3/27	660	3/48	660	Changed to class 3
3/25 (part)	2361	3/49	395	Changed to class 3
3/28	3869	3/50	3869	Changed to class 3
3/29	2719	3/51	2719	Changed to class 3
3/30	2186	3/52	2504	
3/31	18809	3/53	73354	
3/25 (part)	2361	3/53	73354	Changed to class 3
New Plot	N/A	3/54	28735	
3/33	42	3/55	42	Changed to class 3
3/32 (part)	1275	3/56	603	
3/32 (part)	1275	3/57	683	
3/37 (part)	1848	3/58	1254	

Old Land Parcel	Area size / m2 (Deadline 1)	New Land Parcel	Area size / m2 (Deadline 1a)	Comment
3/36	8	3/59	17	
3/37 (part)	1848	3/60	571	
3/35 (part)	467	3/61	435	Old Plot still remains in DCO but has been overwritten in parts
3/34 (part)	1912	3/62	604	Changed to class 3
3/40 (part)	24176	3/63	178	Old Plot still remains in DCO but has been overwritten in parts
3/34 (part)	1912	3/64	1309	
New Plot	N/A	7/1	1054	New Benhall Bridge Referencing Area
New Plot	N/A	7/4	2	New Benhall Bridge Referencing Area
New Plot	N/A	7/13	145	New Benhall Bridge Referencing Area
New Plot	N/A	7/15	120	New Benhall Bridge Referencing Area
New Plot	N/A	7/16	32	New Benhall Bridge Referencing Area
New Plot	N/A	7/17	154	New Benhall Bridge Referencing Area
New Plot	N/A	7/21	719	New Benhall Bridge Referencing Area
New Plot	N/A	7/22	661	New Benhall Bridge Referencing Area
New Plot	N/A	7/23	11	New Benhall Bridge Referencing Area
New Plot	N/A	7/24	31	New Benhall Bridge Referencing Area
New Plot	N/A	7/25	21	New Benhall Bridge Referencing Area
New Plot	N/A	7/26	944	New Benhall Bridge Referencing Area

Old Land Parcel	Area size / m2 (Deadline 1)	New Land Parcel	Area size / m2 (Deadline 1a)	Comment
New Plot	N/A	7/27	85	New Benhall Bridge Referencing Area
New Plot	N/A	7/28	673	New Benhall Bridge Referencing Area
New Plot	N/A	7/29	48	New Benhall Bridge Referencing Area
New Plot	N/A	7/30	103	New Benhall Bridge Referencing Area
New Plot	N/A	7/31	1362	New Benhall Bridge Referencing Area

Table N.2 Comparison table for clarification regarding plot number alterations in Kent

Old Land Parcel	Area size / m2 (Deadline 1)	New Land Parcel	Area size / m2 (Deadline 3)	Comment
3/66 (Part)	36,589	3/99	14,375	Old Plot still remains in DCO but has been overwritten in parts
3/67	1168	3/100	1168	
3/68	1136	3/101	1136	
3/68a	423	3/102	423	
3/68b	30	3/103	30	
3/68c	29	3/104	29	
3/68d	112	3/105	112	
3/69	69	3/106	69	

Old Land Parcel	Area size / m2 (Deadline 1)	New Land Parcel	Area size / m2 (Deadline 3)	Comment
3/70	7957	3/107	7957	
3/71	745	3/108	745	
3/72	7164	3/109	7164	
3/73	3495	3/110	3495	
3/90 (part)	5728	3/111	3431	Old Plot still remains in DCO but has been overwritten in parts
New plot	N/A	3/112	760	
5/1 (part)	413,916	5/26	402,291	Old Plot still remains in DCO but has been overwritten in parts
5/2	150,347	5/27	150,347	
5/3	2,121	5/28	2,121	Changed to class 8
5/4 (part)	3,194	5/29	2,065	old plot has been split and renumbered
5/5	10,705	5/30	10,705	Changed to class 8
5/6 (part)	567,816	5/31	16,280	Old Plot still remains in DCO but has been overwritten in parts
5/6 (part)	567,816	5/32	105,621	Old Plot still remains in DCO but has been overwritten in parts, Changed to class 5

Old Land Parcel	Area size / m2 (Deadline 1)	New Land Parcel	Area size / m2 (Deadline 3)	Comment
5/6 (part)	567,816	5/39	317,744	Old Plot still remains in DCO but has been overwritten in parts
5/6 (part)	567,816	5/47	1,166	Old Plot still remains in DCO but has been overwritten in parts, Changed to class 5
5/7 (part)	212,879	5/35	191,908	part of plot has merged to another parcel
5/8 (part)	18,138	5/36	9,869	Old Plot still remains in DCO but has been overwritten in parts
5/9 (part)	4,976	5/37	1,220	Old Plot still remains in DCO but has been overwritten in parts
5/10 (part)	139,871	5/38	82	Old Plot still remains in DCO but has been overwritten in parts
5/19	8,496	5/40	8,496	
5/20	23	5/41	23	
5/21	144	5/42	144	
5/22	4	5/43	4	
5/23	2	5/44	2	
5/24 (part)	7,129	5/30a	585	Old Plot still remains in DCO but has been overwritten in parts

Old Land Parcel	Area size / m2 (Deadline 1)	New Land Parcel	Area size / m2 (Deadline 3)	Comment
5/24 (part)	7,129	5/45	6,544	Old Plot still remains in DCO but has been overwritten in parts
5/25 (part)	65,102	5/46	14,098	Old Plot still remains in DCO but has been overwritten in parts
New plot	N/A	5/34	1,129	
New plot	N/A	5/33	14,518	
New plot	N/A	5/48	9,902	

Appendix O Copy of the Canterbury Navigation and Sandwich Harbour Act 1825



ANNO SEXTO

GEORGII IV. REGIS.

***

Ville of *Sarr*, and the several Parishes of *Saint Nicholas at Wade*, *Monkton*, *Minster*, *Saint Lawrence*, and *Stonar*, in the Isle of *Thanet* in the said County of *Kent*, the said Town and Port of *Sandwich*, and the Liberties of the same Town and Port, and the several Parishes of *Saint Mary the Virgin*, *Saint Peter the Apostle*, and *Saint Clement*, in the said Town and Port and Liberties of *Sandwich* and County of *Kent*, or some of the said Parishes or Places, unto or a short Distance below a certain Place in the said Town and Port of *Sandwich*, or within the said Parish of *Saint Clement* there, called *Lower Head*; and the cutting, making, and maintaining a New Haven from or below the said Place called *Lower Head*, in the said Town and Port and Liberties of *Sandwich*, or within the said Parish of *Saint Clement* there, in and through the same Parish of *Saint Clement*, in the said Town and Port and Liberties of *Sandwich*, and the several Parishes of *Word* otherwise *Worth*, *Sholden*, and *Northborne*, in the said County of *Kent*, or some of them, to the Sea, between the Batteries No. 1. and No. 2. there; and the making and maintaining a Harbour on the Sea Shore there, in the said Parishes of *Word* otherwise *Worth*, *Sholden*, and *Northborne*, or some or one of them, with proper Piers, Jetties, Breakwaters, Basins, Docks, Locks, Quays, Wharfs, Landing Places, Warehouses, and other Works, for the greater and more convenient Use of the said River, Haven, Cuts, New Haven, and Harbour, with fit Roads, Ways, Avenues, and Approaches to the same; will benefit the Trade of the said City of *Canterbury*, and the said Town and Port of *Sandwich*, and the neighbouring Country, and will facilitate the commercial Intercourse of the said City of *Canterbury*, and of the said Town and Port of *Sandwich*, and of the Country in the Neighbourhood thereof, by opening a Water Conveyance for Goods, Wares, and Merchandize of every Description; and such Harbour will afford Shelter to Ships and Vessels in Stress of Weather, and may be the Means of preserving the Lives and Property of many of His Majesty's Subjects: And whereas for the better improving the Navigation of the said River *Stour*, it will be necessary that divers New Cuts should be made on or near the Line thereof, as herein-after mentioned, through the said several Parishes of *Saint Mary Northgate*, *Hackington* otherwise *Saint Stephens*, *Sturry*, and *Fordwich*, in the said City of *Canterbury* and County of the same City, and the said County of *Kent*; and that the Waters of the said River and Haven, or Part thereof, should be diverted from the said River and Haven into and through, or taken from the said River and Haven for the Supply of the said Cuts, New Haven, and Harbour; but the several Purposes aforesaid cannot be effected without the Authority of Parliament: May it therefore please Your Majesty that it may be enacted; and be it enacted by the King's most Excellent Majesty, by and with the Advice and Consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament

Proprietors. assembled, and by the Authority of the same, That *William Abbott*, Reverend *Mason Anderson*, *Charlotte Anderson*, *John Grimsdale Anderson*, *Emelin Anderson*, *Clement Austin*, *Timothy Appleton*, *Thomas Appleton*, *Edward Appleton*, *William Arnold*, *W. Anderson*, *Samuel Barlow*, *Samuel Barlow* Junior, *Daniel Blatchford*, *Samuel Brandram*, *James Boys*, *William Fuller Boteler*, *William M. Baskerville*,

ville, Benjamin Barnard, James S. Browne, John Browne, F. S. Browne, John Saunders Bennett, William Bowman, Thomas Boorman, William Beer, Charles De Beauvois, William Wyborn Bradley, Edward Baker, John Baker, Richard Baker, Ann Baker, Thomas Baker, George Blake, John Brookes, Daniel Blackman, Simon Nunn Bunton, James Bunton, James Norris Bristow, Thomes Bowes, John Bowes, Mary Bowes, John Boakes, Joseph Bundock, Corporation of *Sandwich,* Mayor, Jurats, and Commonalty, Reverend *William Chapman, John Gurr Chaplin, Thomas Cooke, John Cooper, Henry Cooper, Thomas Cooper, John Cheesman, Anne Collard, Joseph Cox, John Clements, Thomas Cowland, Ambrose Charles, William Curling, William Cocking, Elizabeth Cocking, William Collard, Catherine Clarinbull, Slodden Castle, Slodden Castle* Junior, *William Castle, Sarah Castle, Catherine Castle, John Castle, Isaac Chandler, Thomas Coleman, William Culver* Junior, *James Culver, Mary Child, Anne Child, George Clendon, Edward Spencer Curling, Richard Collard, Benjamin Coleman, Benjamin Coleman* Junior, *H. T. Colebrook, John Wellsford Cowell, Charles Chitty, David Carruthers, Amy Clarke, Richard Chitty, Henry Collard,* Earl of *Darnley, Richard Dangerfield, George Dorset, Henry Dower, Mary Delasaux, James Dunn, Thomas Davis, Edward Duthoit, Benjamin Denne, Elizabeth Denne, Henry Denne, John Denne, John Denne, Daniel Deverson, Robert Deverson, William Drayson, Edward Drayson, George Drayson, John Christopher Drayson, John Drayson, Michael Drayson, John Davis, William Doorn, William Dunn, Joseph Dyason, Lewis John De la Chaumette, Thomas Davis, Charles Danvers, Henry Denne, John Dowty, Judith Anne Denne, Benjamin Denne, Richard Emmerson, Charles Emmerson, Detlez Eike, Henry Robert Eyles, John Edward Eyles, George Eastes, Charles Elgar,* Reverend *William Elwyn, John Ewell, Henry Ewell, John Edwards, Henry Ewell, John Edwards, Henry Earle, John Ellison, Edward Edwards, Stephen Elgar,* Sir *Robert Farquhar* Baronet, Major *Faussett, Richard Fennell, Samuel Fennell, Joseph Henry Fenner, William Filmer, John Filmer, William Filmer, Flint and* Co., *John Fletcher, Charles Fea, John Friend, William Fisher* Junior, *Peter Fisher, Benjamin Foster, Benjamin Foster* Junior, *John Friend, John Friend, William Fish Forster, Robert Famariss, Horace Frisby, Charles Fells, Charles Fearnley,* Adm[l] *John Ferrier, George Fry, Rest Flint, John Goulden, John Grist, Frederick Grey, Edward Gibbons, George Garrett, Giles Gimber, John Gent, Samuel Gimber, Richard Gowland, James Goldsmith, Golder, George Hooper, George Hooper* Junior, *Edward Hatfield, John Homersham, William Hyder, William Hester, James Richard Hardy, Samuel Houston,* Major *Henniker, Richard Halford, A. P. Hamilton, William Homersham, John Friend Homersham, Edward Homersham, James Homersham, Samuel Hacker, George Homersham, Thomas Hart, Henry Hatcher, Hannah Hatcher, Daniel Hodgson, Stephen Hooper, John Sackett Hooper, Herbert Hooper, Valentine Hoile, John Hoile, Henry Hoile, Richard Harrison, John Hicks, Thomas Hurst, George Horn, John Hawkes, Edward Harvey, John Hayman, H Herbert, Robert Harris, Robert John Harpur, Jane Frances Hodgson, William Hodgson, Thomas Christopher Hodgson, Robert Hodgson, Henry Burden Hodgson, George Harper, Samuel Houston, Thomas Jackson, John Jessard, John Joslin, William Jarman, Sarah Jordan, Edward Iggulden,*

gulden, Admiral Sir *John Knight*, Lady *Knight*, *Thomas King*, *Sarah Keeler*, *John Kebble*, *Henry Kebble*, *Edward Emanuel Kebble*, *John Knowles*, *Thomas Knight*, *Nathaniel Kettle*, *Mary Kite*, *William Kite*, *Thomas Kennett*, *Ann Kelsey*, *Charles Kerr*, *Adolphus Kent*, *George Keys*, Sir *William Kay* Baronet, *William Kemp*, *Samuel Legge*, *Jabez Legge*, *R. W. Lavender*, *John Lancefield*, *T. P. Lewis*, *Lewis Levy*, *Elizabeth Lawrence*, *Lewis Lloyd*, *S. J. Lloyd*, *James Wittet Lyon*, *John Leech*, *John May*, *Joseph Marryat*, General *Thomas G. Montressor*, *George May*, *James S. Moses*, *George Moss*, *Thomas Marseille*, *Benjamin Mutton*, *William Moses Mutton*, *Thomas Mose*, *John Marbrooke*, *William Morris*, *Sarah Morris*, *William T. Mackney*, *Thomas Mead*, *Edward Miles*, *John Miles*, *Michael Minter*, *William Moody*, *Keith Milnes*, *George Manser*, *William S. Mackney*, Colonel *Mulcaster*, *Frederick Edward Morrice*, *Frederick Francis James Morrice*, *John Francis Maubert*, *Hugh M'Intosh*, *Andrew Ancadie Mieville*, *Charles Macinnon*, *William Morgan*, *William Mackney*, *Johanna Morewicke*, *George Alfred Muskett*, *John Miller*, Sir *Gerard Noel* Baronet, *John Neame*, *Charles Neame*, *George Neame*, *John Nutt*, *Henry King Nisbett*, *George Noakes*, *Stephen Neame*, Sir *Edward William Campbell Rich Owen* Knight, *Latham Osborne*, *Latham Osborne*, *John Omer*, *John Plumptre*, *Dean John Parker*, *John Prince*, Reverend *Thomas Pearse*, *John James Pierce*, *James Pratt*, *William Pettitt*, *Charles Parker*, *John Pilbrow*, *Joseph Potter*, *William Pott*, *Lydia Porter*, *Thomas Pearson*, *John Perkins*, *Ann Pettman*, *John Presland*, Mistress *Thomas Powell*, *Philip Palmer*, *Robert Birks Pitman*, *Thomas Purday*, *Charles Henry Purday*, *James George Pilcher*, *William Pilcher*, *Stephen Pritchard*, *Thomas Pilgrim*, Reverend *Richard Roberts*, *William Henry Rolfe*, *Richard Richford*, *Edward Francis Stratton Reader*, *Ambrose Rose*, *Elizabeth Rose*, *Sarah Rose*, *Lucy Rose*, *Daniel Ralph*, *Daniel Ralph* Junior, *Sarah Richards*, *Robert Ruglyss*, *William Ruglyss*, *Henry Minter Rigden*, *Stephen Ratcliffe*, *Peter Rainier*, *Daniel Rainier*, *George Stanley Repton*, *W. Ralph* Junior, *Elizabeth Ralph*, *William Slarke*, *William Slarke* Junior, *Henry Knott Swinford*, *John Swan*, *John Smithers*, *John Sackett*, *Alexander Hannah Spratt*, *Thomas Starr*, *Osborne Snoulten*, *Edmund Saxby*, *William Simonds*, *Robert Shindler*, *John Thomas Scudamore*, *William Slodden*, *Alfred Sabine*, *William Street*, *John Swinford*, *Charles Spencer*, *Stephen Saunders*, *Edward Slaughter*, *William Slaughter*, *George Sayer*, *Elizabeth Stevens Soal*, *Sarah Soal*, *John Simmonds*, *William Stokes*, *William Sedgwick*, *Nathaniel Sheepwash*, *Thomas Solly*, *Thomas Solly* Junior, *Thomas Solly*, *James Sandcraft*, *James Shrewsbury*, *Richard Sanderson*, *Robert Saddington*, *John Smith*, *James Simpson*, *Elizabeth Smith*, *Smithit Spain*, *Elizabeth Simmonds*, *John Simmonds* Senior, Lord Viscount *Teynham*, *James Taddy*, *James Tomlin*, *Sarah Twyman*, *Daniel Towse*, *Samuel Elgar Toomer*, *Thomas Minter Tomlin*, *Robert Tomlin*, *William Tomlin*, *David Taylor*, *William Thiselton*, *John Tapley* R. N., *Mary Tapley*, *Henry Temple*, *Henry Temple*, *Thomas Taylor*, *Daniel Towse*, *Edward Tapley*, *J. Tabor*, *P. M. Tabor*, *M. A. Tabor*, *Richard Edmund Tattersall*, *Edward Vincer*, *William Viney*, *James Urquhart*, *William White*, *William Woodcock*, *Frances Watkins*, *Henry Welland*, *Thomas Wilkinson*, *George Wood*, *Samuel Wright*, *Dilnot Wildish*, *William Dilnot Wildish*, *Edward White*, *Henry Ward*, *Mary Waller*,

John Wyborn, *John Wyborn* Captain R. N., *Robert Wyborn*, *John Wright*, *James Witherden*, *John Wilkinson*, *John Wilkinson*, *John Warren*, *James Hall Warman*, *Susan Wood*, *James Wood*, *William Watts*, *Thomas Woodruff*, *Isaac Witherden*, *John Williams*, *William Webster*, *William Wodsworth* Clerk, *Henry Woodcock*, *Henry Wood*, *Isaac Watt*, *William Wood* Lieutenant R. N., *Mary White*, *John Wilkinson*, *James Waters*, *John Young*, *William Young*, and their several and respective Successors, Executors, Administrators, and Assigns, together with such Person or Persons, Body or Bodies Politic, Corporate, or Collegiate, as shall at any Time hereafter be possessed of any Share or Shares in the Undertaking hereby authorized to be carried into Execution, shall be, and they are hereby united into a Company for the Improvement of the said River *Stour* and *Sandwich* Haven, and for the making, completing, and maintaining the said intended Cuts, New Haven and Harbour, and other Works, according to the Rules, Orders, and Directions herein mentioned and expressed, and shall for that Purpose be One Body Politic and Corporate, by the Name and Style of *The Canterbury Navigation and Sandwich Harbour Company*, and by that Name shall have perpetual Succession and a Common Seal, and by that Name shall and may sue and be sued, plead and be impleaded, at Law and in Equity; and also by that Name shall and may have full Power and Authority to purchase Lands, Tenements, and Hereditaments to them and their Successors and Assigns, for the Use of the said Undertaking, and the several Works hereby authorized to be made, and for the several other Purposes herein mentioned, without incurring any of the Penalties or Forfeitures of the Statute of Mortmain; and also to sell any of the Lands, Tenements, or Hereditaments purchased for the Purposes aforesaid.

Incorporated.

Their Style.

II. And be it further enacted, That it shall and may be lawful to and for the said Company of Proprietors hereby united as aforesaid, to raise and contribute among themselves a competent Sum of Money for the Improvement of the said River *Stour* and *Sandwich* Haven, and for making and maintaining the said Cuts, New Haven, and Harbour, and all the Basins, Locks, Ways, Quays, Wharfs, Warehouses, and all other Works and Conveniences belonging or requisite thereto, not exceeding in the whole the Sum of One hundred thousand Pounds (save and except as herein mentioned), and the same shall be divided into Shares of Twenty-five Pounds each; and no Person subscribing thereto, or becoming a Proprietor in such Undertaking, shall become a Proprietor of less than One Share, or more than Two hundred Shares; and the said Shares shall be and are hereby vested in the several Persons so raising and contributing the same, and their several and respective Executors, Administrators, Successors, and Assigns, to their and every of their proper Use and Benefit, proportionably to the Sums they shall severally raise and contribute; and all Bodies Politic, Corporate, and Collegiate, and all Persons, their several and respective Successors, Executors, Administrators, and Assigns, who shall severally subscribe for One or more Share or Shares, or such Sum or Sums of Money as shall be demanded in lieu thereof, towards the Improvement of the said River *Stour* and *Sandwich* Haven, and the carrying on and completing

Proprietors to raise Money among themselves for improving the River and making the New Haven and Harbour.

completing the said Cuts, New Haven, and Harbour, and Works, and other the Purposes of the said Subscription, shall be entitled to and receive the entire and net Distribution of an equal proportionable Part, according to the Money so by them respectively paid, of the Profits and Advantages that shall and may arise and accrue by the Rates and other Sums of Money to be raised, recovered, or received by the said Company of Proprietors by the Authority of this Act; and every Body Politic, Corporate, and Collegiate, Person and Persons, having such Property in the said Undertaking as aforesaid, shall bear and pay a proportionable Sum towards carrying on the same in Manner herein directed and appointed.

Shares to be Personal Estate.

III. And be it further enacted, That all and every the Shares and Proportions of all Bodies Politic, Corporate, and Collegiate, and all and every other Person and Persons, of and in the said Undertaking, or the Joint Stock or Fund of the said Company of Proprietors, shall be deemed Personal Estate, and transmissible as such, and not of the Nature of Real Property.

Subscribers to have a Vote, &c.

IV. And be it further enacted, That every Body Politic, Corporate, or Collegiate, and every Person who shall by virtue of this Act have subscribed or undertaken for or hold One or more Share or Shares in the said Undertaking, not exceeding Four Shares altogether, his, her, or their respective Successors, Executors, Administrators, and Assigns, shall have One Vote for such Share or Shares in the General and Special General Assemblies to be held as herein appointed for carrying on the said Undertaking; and every Body Politic, Corporate, or Collegiate, and every Person who shall have subscribed or undertaken for or hold Five or more Shares in the said Undertaking, not exceeding Nine Shares altogether, his, her, or their respective Successors, Executors, Administrators, and Assigns, shall have Two Votes for such Shares in such General and Special General Assemblies; and every Body Politic, Corporate, or Collegiate, and every Person who shall have subscribed or undertaken for or hold Ten or more Shares in the said Undertaking, his, her, or their respective Successors, Executors, Administrators, and Assigns, shall have Three Votes for such Shares in such General and Special General Assemblies; but no Person shall have more than Three Votes at such General or Special General Assemblies, except as herein-after mentioned; and every Question, Matter, or Thing which shall be proposed, discussed, or considered in any General or Special General Assembly of the said Court of Proprietors shall be determined by the Majority of Votes then present, computing the Votes in Manner aforesaid.

Proprietors may vote by Proxy.

V. Provided always, and be it further enacted, That it shall and may be lawful for every such Body Politic, Corporate, or Collegiate, entitled to vote at Meetings of the said Company of Proprietors to be held in pursuance of this Act, by Writing under their Common or Corporate Seal, and also for all and every other Person and Persons entitled to vote as aforesaid, by Writing under his, her, or their Hand or Hands, and in case of Infancy, Idiotcy, or Lunacy of any such Person or Persons, then for his, her, or their

Guardian or Guardians, Committee or Committees, by Writing under the Hand or Hands of such Guardian or Guardians, Committee or Committees, to constitute and appoint any other Proprietor or Proprietors entitled to vote in respect of his, her, or their own Share or Shares in the said Undertaking, his, her, or their Proxy or Proxies, to vote at any such Meetings of the said Company; and every such Vote by Proxy shall be as good and valid to all Intents and Purposes as if the Principal or Principals had voted in Person.

Form of Appointment of Proxy.

VI. And be it further enacted, That the Appointment of every Proxy to vote under and by virtue of this Act shall and may be made in the Form or to the Effect following; that is to say,

'I Proprietor [*or* Guardian, *or*]
'a Proprietor of Shares in the *Canterbury* and
'*Sandwich* Navigation, do hereby nominate, constitute, and appoint
'to be my Proxy [*or* Proxy of the said
'] in my [*or* his, *or* her] Name, and in my [*or* his, *or* her]
'Absence to vote and give my [*or* his, *or* her] Assent or Dissent to
'any Business, Matter, or Thing relating to the said Navigation,
'which shall be mentioned or proposed at any Meeting of the said
'Company, or any Adjournment thereof, until I [*or* the said
'] shall revoke this Appointment, by Notice in Writing
'to the Clerk of the said Company. In Witness whereof I have
'hereunto set my Hand, this Day of
'.'

And every such Appointment shall be produced to the Clerk of the said Company, and entered in a Book to be kept by him for that Purpose, before any Vote shall be given in respect of such Appointment, which Book shall be sufficient Authority for any Proxy to give his Vote or Votes, without Production of his Appointment at the Time of voting, until the same is revoked.

Power to raise Money by Mortgage.

VII. And be it further enacted, That in case the Money hereinbefore authorized to be raised shall be found insufficient for the Improvement, making, completing, and maintaining of the said River *Stour*, *Sandwich* Haven, Cuts, New Haven and Harbour, and other the Works hereby authorized to be made, and all necessary Charges and Expences relating thereto, then and in such Case it shall and may be lawful to and for the said Company of Proprietors to raise a further Sum of Forty thousand Pounds, or any Part thereof, by Mortgage of the said Undertaking, and shall make an Order or enter into a Resolution to that Effect at a Special Meeting of the said Proprietors for that Purpose, to be called by their Committee of Management to be appointed by virtue of this Act for the Time being, and of which Meeting Fourteen Days previous Notice shall be given in the *London Gazette*, and in One Newspaper usually circulated in the Eastern Parts of the County of *Kent*, mentioning the Time and Place of such Meeting; and it shall and may be lawful to and for the said Company of Proprietors, pursuant to such Order or Resolution, to borrow and take up at Interest all or any Part of the said Sum of Forty thousand Pounds on the Credit of the said River *Stour*, *Sandwich* Haven, Cuts, New Haven and Harbour,

and

and to assign the Property of the said Undertaking, and the Rates arising or to arise to the said Company of Proprietors by virtue of this Act, or any Part thereof, (the Costs and Charges of assigning the same to be paid out of such Rates,) as a Security for any Sum or Sums of Money so to be borrowed, with Interest, to such Person or Persons, or to his, her, or their Trustee or Trustees, who shall advance the same; all which said Assignments shall be made under the Common Seal of the said Company of Proprietors, in the Form or to the Effect following; that is to say,

Form of Mortgage.

'BY virtue of an Act of Parliament made in the Sixth Year of the 'Reign of King *George* the Fourth, intituled *An Act [here set 'forth the Title of this Act]*, we, the *Canterbury* Navigation and '*Sandwich* Harbour Company, incorporated by and under the said 'Act, in consideration of the Sum of
'to us in Hand paid by *A. B.* of
'do hereby bargain, sell, and assign unto the said *A. B.*, his 'Executors, Administrators, and Assigns, all and singular the Dues 'and other Rates arising and payable to us by virtue of the said 'Act, and all our Estate, Right, Title, and Interest of, in, and to 'the same, to hold unto the said *A. B.*, his Executors, Admini-'strators, and Assigns, until the said Sum of
' with Interest for the same after the Rate of
' *per Centum per Annum*, shall be fully paid and satisfied.
'Given under our Common Seal, this Day of
' in the Year of our Lord
'.'

And all Persons to whom such Assignments shall be made shall be equally entitled one with the other to their Proportion of the said Rates and Premises, according to the respective Sums in such Assignments mentioned to be advanced, without any Preference by reason of Priority of any such Assignments, or on any other Account; and a Memorial of every such Assignment, containing the Date, Name or Names, Addition or Additions of the Person or Persons to whom made, the Sum of Money borrowed, and Rate of Interest paid, shall, within Twenty-one Days from the Date of every such Assignment, be entered in One or more Book or Books, to be kept by the Clerks to the said Company of Proprietors, for which Entry the said Clerks shall be paid the Sum of Two Shillings and Sixpence, and no more; which Book or Books shall and may be perused at all seasonable Times by any of the Proprietors or Creditors of the said Undertaking, and any other Persons interested therein, without Fee or Reward; and the Person or Persons to whom any such Assignment shall be made as aforesaid, or who shall be entitled to the Money due thereon, shall and may from Time to Time transfer his, her, or their Right or Interest therein to any Person or Persons, by Writing under his, her, or their Hand and Seal, or Hands and Seals, in the Form or to the Effect following:

Mortgages may be transferred.

Form of Transfer.

'I *A. B.* of in consideration
' of the Sum of paid by *C. D.*
'of do hereby transfer a certain
' Mortgage

'Mortgage made by the *Canterbury* Navigation and *Sandwich*
'Harbour Company to
'bearing Date the Day of
'in the Year of our Lord
'for securing the Sum of
'and all Interest now due and to become due thereon, and all my
'Right and Property therein, to the said *C. D.*
' Executors, Administrators, and Assigns. Dated this
' Day of in the Year
'of our Lord .'

And every such Transfer shall within Twenty-one Days after the Date thereof be produced to the Clerks to the said Company of Proprietors, who shall cause a Memorial to be made thereof in like Manner as of the original Mortgages or Assignments, for which the said Clerks shall be paid the Sum of Two Shillings and Sixpence, and no more; and every such Entry made of such Transfer shall from thenceforth entitle such Assignee or Assignees, his, her, or their Executors, Administrators, and Assigns, to the full Benefit of the original Mortgage; and it shall not from thenceforth be in the Power of any Person or Persons who shall have made any such Assignment, to make void, release, or discharge the original Mortgage, or any Money thereby secured, or any Part thereof; and the Interest of the Money which shall be borrowed or raised by Mortgage as aforesaid, shall be provided for and paid Half-yearly to the several Persons entitled thereto, before any Yearly or other Interest or Dividends due to the said Company of Proprietors, or any of them, shall be paid, made, or divided.

Interest of Money borrowed to be paid in preference to Dividends.

VIII. Provided always, and be it enacted, That no Sum or Sums of Money so lent and advanced on Mortgage shall be paid off and discharged (save and except with the Consent of the Person or Persons so lending and advancing such Sum or Sums of Money), unless Six Months previous Notice, signed by the Clerks to the said Company of Proprietors, shall have been given to the Person or Persons lending and advancing such Sum or Sums of Money, of such their Intention to pay off and discharge the same.

Six Months Notice to be given of paying off Money.

IX. Provided always, and be it enacted, That no Person to whom any such Assignment shall be made or transferred, or any Annuity granted as aforesaid, shall be capable of acting or voting by virtue of such Assignment at any Assembly or Meeting of the said Company of Proprietors, for or on account of his or her having lent or advanced any Money on the Credit of any such Assignment.

Mortgagees or Assignees not to vote on account of having lent Money.

X. And be it further enacted, That it shall and may be lawful for the said Company of Proprietors, and they are hereby authorized and empowered, to have, receive, and take up any Sum or Sums of Money not exceeding in the whole the Sum of Twenty thousand Pounds, Part of the said Sum of Forty thousand Pounds, and by Writing under their Common Seal to grant an Annuity or Annuities to any Persons, Body Politic, Corporate, or Collegiate, who shall contribute, advance, and pay to the said Company of Pro-

Company may raise any Sum not exceeding 20,000*l.* by way of Annuity.

prietors, or their Treasurer or Treasurers for the Time being, any Sum or Sums of Money for the absolute Purchase of any Annuity or Annuities, to be paid and payable during the natural Life of such one Person as shall be nominated by or on behalf of such Contributor or Contributors respectively at the Time of the Payment of his, her, or their Purchase Money or Monies; and such Annuity or Annuities is and are hereby charged on the said Rates and Duties arising by virtue of this Act; and the Grant of every such Annuity may be in the Form or to the Effect following:

Form of Grant of Annuity.

'WE the *Canterbury* Navigation and *Sandwich* Harbour Company, incorporated by an Act of Parliament passed in the Sixth Year of the Reign of King *George* the Fourth, intituled [*here set forth the Title of this Act*] in consideration of the Sum of paid by of to us upon the Credit and for the Purposes of the said Act, do hereby grant unto the said Executors, Administrators, and Assigns, an Annuity or clear Yearly Sum of out of the said Rates and Duties authorized by the said Act, which said Annuity or Yearly Sum of shall be paid to the said Executors, Administrators, or Assigns, by Half-yearly Payments, on the Day of and the Day of , or within Days after each of the said Days in every Year during the Life of ; and the Sum of being a fractional Part of the First Payment thereof, shall be paid on the Day of next ensuing the Date of these Presents; and the said Executors, Administrators, or Assigns, shall be entitled to receive a proportionable Part of the said Annuity from the last of the said Days appointed for Payment thereof up to the Day of the Death of the said . In Witness whereof we have hereunto set our Common Seal, the Day of in the Year of our Lord .'

And every such Grant shall be good and valid in Law, and shall not be subject to the Provisions of any Act or Acts of Parliament now in force relative to the Inrolment or Registering of Annuities; and the several Annuities so granted shall be and they are hereby charged upon and made payable in preference to any Dividends due and payable by virtue of this Act to the Persons who have already subscribed to the said Undertaking, or who shall become Purchasers of any new or additional Shares or Sums of Money under the Powers herein-before contained for selling such new or additional Shares or Sums of Money.

XI. And whereas by an Act made in the Fifty-seventh Year of His late Majesty's Reign, intituled *An Act to authorize the Issue of Exchequer Bills, and the Advance of Money out of the Consolidated Fund to a limited Amount, for carrying on of Public Works and Fisheries in the United Kingdom, and Employment of the Poor in* Great Britain, *in Manner therein mentioned*, certain Commissioners therein named and appointed are authorized and empowered to issue and advance Exchequer Bills, under the Restrictions and Regulations therein specified, for the carrying on of Public Works in *Great Britain;* and by One other Act passed in the Fifty-seventh Year of His said late Majesty's Reign,

57 G.3. c.34.

Reign, intituled *An Act to amend an Act made in the present Session of Parliament, for authorizing the Issue of Exchequer Bills and the Advance of Money for carrying on Public Works and Fisheries, and Employment of the Poor*, the Powers of the said first-mentioned Act are enlarged and extended: And whereas by an Act passed in the First Year of the Reign of His present Majesty, intituled *An Act to amend and continue Two Acts, passed in the Fifty-seventh Year of His late Majesty King* George *the Third, for authorizing the Issue of Exchequer Bills and the Advance of Money for carrying on of Public Works and Fisheries and Employment of the Poor, and to extend the Powers of the Commissioners for executing the said Acts in* Great Britain; and by another Act passed in the Third Year of the Reign of His present Majesty, intituled *An Act to amend Two Acts, of the Fifty-seventh Year of His late Majesty and the First Year of His present Majesty, for authorizing the Issue of Exchequer Bills and the Advance of Money for carrying on Public Works and Fisheries, and Employment of the Poor; and to authorize a further Issue of Exchequer Bills for the Purposes of the said Acts;* and also by another Act passed in the Fifth Year of the Reign of His present Majesty, intituled *An Act to amend the Acts for the Issue of Exchequer Bills for Public Works;* the Powers of the said Two Acts passed in the said Fifty-seventh Year of His said late Majesty are altered, amended, and enlarged: And whereas it would be of great public Benefit if the said Commissioners for the Issue of Exchequer Bills, acting in Execution of the said last-recited Acts, were authorized and empowered to advance to the said Company of Proprietors a certain Sum of Money to be secured by Mortgage of the Rates and Duties by this Act granted; be it therefore enacted and declared, That it shall and may be lawful to and for the said Company of Proprietors, at a Special Assembly of the said Company of Proprietors for that Purpose, to be called by the said Board of Directors in Manner aforesaid, and they are hereby authorized and empowered, to borrow and take up at Interest, in such Manner and upon such of the Terms and Conditions provided by the said Acts of the Fifty-seventh Year of His said late Majesty as the Commissioners named and appointed by the said last-mentioned Acts shall direct and appoint, the said Sum of Forty thousand Pounds, or such Part thereof as the said Company of Proprietors shall deem necessary or requisite for completing the said Navigation, New Haven, Harbour, and other Works, and effectuating the Purposes of this Act; and the said Company of Proprietors are hereby authorized and empowered, by any Writing or Instrument under their Common Seal, to mortgage, demise, grant, bargain, and sell the said Rates and Duties arising or to arise, and to be collected and received by virtue hereof, as a Security for any Sum or Sums of Money to be borrowed from the said Commissioners named and appointed by the said Acts of the Fifty-seventh Year of His said late Majesty, with Interest thereon at a Rate not exceeding the Rate of Five Pounds *per Centum per Annum.*

57 G. 3. c. 124.

1 G. 4. c. 60.

3 G. 4. c. 86.

5 G. 4. c. 77.

Power to borrow Money from Exchequer Bill Commissioners.

XII. And for preventing any improvident Grants of Annuities, be it further enacted, That the Amount of every Annuity to be granted by virtue of this Act shall be regulated according to the Price of the Three Pounds *per Centum* Consolidated Bank Annuities at the Time of

Restrictions as to Grants of Annuities.

of granting the same, in the Manner and according to the Rate prescribed by Two several Acts, One passed in the Forty-eighth Year of
48G.3.c.142. the Reign of His late Majesty King *George* the Third, intituled *An Act to enable the Commissioners for the Reduction of the National Debt to grant Life Annuities*, and the other passed in the Fifty-second
52G.3.c.129. Year of the Reign of His said late Majesty, intituled *An Act for amending Two Acts, passed in the Forty-eighth and Forty-ninth Years of His present Majesty, for enabling the Commissioners for the Reduction of the National Debt to grant Life Annuities.*

First and other General Assemblies.

XIII. And be it further enacted, That the First General Assembly of the said Company of Proprietors for putting this Act into Execution shall be held in the Guildhall in the City and County of *Canterbury*, upon the Fourth *Monday* after the passing of this Act, at the Hour of Twelve at Noon; and the Second General Assembly of the said Company of Proprietors for putting this Act into Execution shall be held in the Guildhall in the said City and County of *Canterbury*, upon the First *Tuesday* in *December* after the said First General Assembly, at the same Hour; and the Third General Assembly of the said Company of Proprietors for putting this Act into Execution shall be held in the Guildhall of the said Town and Port of *Sandwich*, on the First *Tuesday* in *June*, at the Hour of Twelve at Noon; and the Fourth General Assembly of the said Company of Proprietors shall be held in the said last-mentioned Guildhall, on the First *Tuesday* in *December*, at the same Hour; and all future General Assemblies of the said Company (except such Special General Assemblies as herein-after mentioned) shall be held in like Manner once in every other Year on the said First *Tuesday* in the said Months respectively, in the said City and County of *Canterbury*, and the said Town and Port of *Sandwich*, alternately, in every Year, at the same Hour, at the respective Guildhalls of the said City and County, and Town and Port, or at such other Places in the said City and County, and Town and Port, and at such Hour as the Directors of the said Company of Proprietors shall from Time to Time direct and appoint; of all which General Assemblies Fourteen Days previous Notice at the least shall be given by public Advertisement in some One Newspaper usually circulated in the Eastern Parts of the County of *Kent*, or in such other Manner as the said Company of Proprietors at their respective General Assemblies shall direct; and the said Company of Proprietors, at their First General Assembly to be held in pursuance of this Act, shall and may appoint a Chairman to preside at such General Assembly, and such Chairman shall not only vote as a Proprietor at such General Assembly, but in case of an Equality of Votes, shall have the decisive or casting Vote; and the said Company of Proprietors, at their First General Assembly, shall and may choose and elect, out of such of the said Proprietors as at the Time of such Election shall respectively be possessed in their own Right of Stock to the Amount of Ten Shares at the least in the said Undertaking, a Board of Twenty-one Directors, to manage the Affairs of the said Company of Proprietors as herein directed, and to direct the Receipt and Payment of all Monies, and to adjust all Accounts in respect thereof; of whom Five shall at the same Time be chosen by the said

May elect Directors.

said General Assembly to execute the Office of Auditors of the Accounts of the said Company of Proprietors and Directors; and Seven at least of such shall be resident in the City of *Canterbury*, or within One Mile thereof, and Seven others at least shall be resident in the Town and Port of *Sandwich*, or within One Mile thereof, and the other Seven Persons shall be resident in *London* or elsewhere; and which Twenty-one Persons shall continue as Directors of the said Undertaking until the General Assembly of Proprietors to be held in the Month of *June* One thousand eight hundred and twenty-eight; and that the said Company of Proprietors, at such their General Assembly to be held in the Month of *June* as aforesaid, and at every other ordinary General Assembly to be held afterwards as aforesaid, and at no other Times, except as herein-after mentioned, shall choose and elect, out of such of the said Proprietors as at the Time of such Election shall respectively be qualified and resident in Manner herein-before prescribed, a like Number of Directors to manage the Affairs of the said Company of Proprietors as herein-after directed; and the said Persons shall continue from the Time of their Election until another shall be chosen in their Stead, unless any Member or Members thereof shall die, or refuse to act, or cease to be qualified in Manner before prescribed, in any of which Cases it shall be lawful for the said Board of Directors to fill up such Vacancy or Vacancies for the remainder of the Time, until the next General Election of such Board of Directors, and so from Time to Time as occasion may require; provided that such Vacancy or Vacancies be filled from the Place or Places where the same shall occur, or permit the same Vacancy or Vacancies to remain open until the next General Election of such Directors, as they shall think fit: Provided always, that no Person holding any Office, Employment, or Contract under the said Company, shall be capable of being chosen or acting as a Director of the said Company during the Time of his Continuance in such Office or Employment, or holding such Contract.

Appointment of Governor and Deputy Governor.

XIV. And be it further enacted, That the said Directors at their First Meeting next after their Election as aforesaid, and also at their First Meeting next after every succeeding Election of Directors, before any other Business is proceeded in, shall elect and choose from among themselves a Governor and Deputy Governor of the said Company of Proprietors; and that at all General Assemblies, except the First, of the said Company of Proprietors, and at all their Special General Assemblies, and at all Meetings of the said Directors, or Committees of the Directors, the Governor of the said Company of Proprietors, if there shall be one at the Time, and he shall be present, shall preside; or in case of a Vacancy in the Office of Governor, or in case of his Absence, then the Deputy Governor of the said Company, if there shall be one at the Time, and he shall be present, shall preside; or in case of a Vacancy in the Offices of both Governor and Deputy Governor, or the Absence of both, then a Chairman shall be elected to preside at the Assembly or Meeting, before they proceed to other Business; and besides the Vote or Votes which such Governor, Deputy Governor, or Chairman, shall be entitled to give at such Assembly or Meeting as a Proprietor of Shares

in the said Undertaking, or as a Member of the Directors or Committees, he shall, in case of an Equality of Votes upon any Question at such Assembly or Meeting, have the decisive or casting Vote.

Auditing Accounts, &c.

XV. And be it further enacted, That the said Company of Proprietors at every or any such General Assembly shall have Power to call for, examine, and inspect all Accounts of Money received, laid out, and disbursed on account of the said Undertaking by the Treasurers, Receivers, or Collectors of the Rates, and other Officers by them appointed, or by any other Person or Persons whomsoever, employed by or concerned for or under them in and about the said River *Stour*, *Sandwich* Haven, Cuts, New Haven and Harbour, and the Works thereto belonging; and the said Company of Proprietors shall have Power to adjourn themselves from Time to Time, to such Place or Places as shall at such General Assemblies be thought proper and convenient.

General Meetings may make and alter Rules and Bye Laws.

XVI. And be it further enacted, That the said Company of Proprietors at any such General Assembly shall have full Power to revoke, alter, amend, or change all or any of the Rules, Bye Laws, Orders, and Directions which may have been prescribed and laid down by virtue of this Act, with regard to their Proceedings amongst themselves, as they shall think proper, (the Method of calling General or Special Assemblies, and their Time and Place of meeting and voting, and appointing Governor, Deputy Governor, and Directors, only excepted); and shall also have full Power to make all such new Rules, Bye Laws, Orders, and Directions for the good Government of the said Company and of the said Board of Directors, and of their Servants, Agents, or Workmen, and for the whole, complete, and total Superintendence and Management of the said Undertaking, and of the Masters, Mates, Seamen, and others on board of or belonging to Ships and Vessels which may enter or take shelter in the said Harbour, or any of the Works thereunto belonging, or pass along the said Harbour, New Haven, Cuts, *Sandwich* Haven, or River *Stour*, and the Bargemen, Watermen, Boatmen, and others who shall carry or assist in carrying any Goods, Wares, or Merchandize within or upon any Part of the said River *Stour*, *Sandwich* Haven, Cuts, New Haven and Harbour, as to the said General Assemblies shall seem meet; and to impose and inflict such reasonable Fines or Forfeitures upon all Persons who shall offend against any such Rules, Bye Laws, or Orders, as to such General Assembly shall seem meet, not exceeding the Sum of Five Pounds for any one Offence; which said Rules, Bye Laws, and Orders, being reduced into Writing, shall be binding upon and observed by all Parties using or in any way concerned in the said River *Stour*, *Sandwich* Haven, Cuts, New Haven and Harbour, and shall be sufficient in any Court of Law or Equity to justify all Persons who shall act under the same; provided that they be not inconsistent with or repugnant to the Laws of that Part of the United Kingdom called *England*, or to the Provisions and Directions in this Act contained, or to any of them; and provided that Copies of such Rules, Orders, and Bye Laws, or such of them as shall concern or relate to the using of the

said intended Navigation and Works, and the Roads and Ways belonging thereto, or to the Conduct and Behaviour of Masters, Mates, Seamen, and others on board of or belonging to any Ship or Vessel therein, or Bargemen, Boatmen, Watermen, and others conveying Goods thereon, or to the Conduct and Behaviour of any Officers, Servants, or other Persons employed in or about the said Navigation and Works, or of the Persons resorting to or making use thereof, shall be written, printed, and painted on Boards in large Characters, and be affixed and continued in some conspicuous Places upon or near adjoining the Piers, Jetties, Locks, and all the Wharfs on the said Navigation and Harbour, and renewed as often as the same shall be obliterated or defaced.

Authenticated Bye Laws to be Evidence.

XVII. Provided always, and be it further enacted, That in all Cases of Prosecution for Offences against the said Rules, Orders, and Bye Laws, the Production of a written or printed Paper, purporting to be the Rules, Orders, and Bye Laws of the said Company, and authenticated by the engraved or printed Impression, or Copy of Impression of such Rules, Orders, and Bye Laws, having the Common Seal of the Company affixed thereto, shall be sufficient Evidence of the Existence of such Rules, Orders, or Bye Laws; and it shall be sufficient to prove that a written or printed Paper, and painted Boards in Characters sufficiently plain, purporting to be a Copy of such Rules, Orders, and Bye Laws, hath been affixed and published in Manner aforesaid, and in case of its being afterwards displaced or damaged, hath been replaced with another such Paper and Boards as soon as conveniently might be, in some conspicuous Places upon or near adjoining the Place where the Offence was committed, unless Proof shall be adduced by the Defendant that such written or printed Paper, or painted Board, is not a Copy of such Rules, Orders, or Bye Laws, or hath not been duly kept up and generally continued at such Piers, Jetties, Locks, and Wharfs in Manner aforesaid: Provided always, that Twenty-one Days previous Notice at the least shall be given to the Clerks for the Time being of the said Company of Proprietors, signed by Twenty or more Proprietors entitled to vote at such General Assembly, who shall propose to revoke, alter, amend, or change any such Rules, Orders, or Bye Laws, or to propose any such new Rules, Orders, or Bye Laws; and such Notice shall state specifically the Rules, Orders, or Bye Laws proposed to be revoked, altered, amended, or changed, and also the Particulars of the proposed Alterations or Amendments; and also the Particulars of any new Rule, Order, or Bye Law intended to be proposed; and the Clerks for the Time being of the said Company of Proprietors shall and they are hereby required, Twenty-one Days at the least before such General Assembly, to publish such Notice in the *London Gazette* and in One Newspaper usually in Circulation in the Eastern Parts of the County of *Kent*, or in such other Manner as the said Company of Proprietors at their General Assemblies shall direct; and it shall not be competent to such General Assembly to revoke, alter, amend, or change any Rule, Order, or Bye Law, or to make any new Rule, Order, or Bye Law, not specifically mentioned and particularized in such Notice, nor unless such Notice shall have been published as aforesaid.

Previous Notice to be given of any Alteration to be proposed in Bye Laws.

XVIII. Pro-

General Assemblies to consist of Thirty Persons entitled to Five Shares each.

XVIII. Provided always, and be it further enacted, That if at any such stated General Assembly there shall not be Thirty Persons present who shall be possessed of or entitled unto at least Five Shares each in the said Undertaking, no Choice of Governor, Deputy Governor, Directors, or other Officers or Servants of the said Company, nor any other Matters or Things to be taken into Consideration, or done at such stated General Assembly, shall be made or done at that Time; but in such Case there shall be another General Assembly of the said Company of Proprietors at the same Place and Hour upon that Day Fortnight, and so from Time to Time until there shall be such Persons present at such Assembly having such Number of Shares as aforesaid, and such Choice, Matters, or Things shall then take place and be determined upon and done, and not before; and the Persons then chosen to be such Governor, Deputy Governor, Directors, or other Officers or Servants, shall have the same Powers which they would have had, and shall continue in such Offices until such Time as they would have done, had they been chosen by any such stated General Assembly on the Day first appointed for holding the same; and the other Matters and Things then determined upon or done shall be as valid as they would have been had they been determined upon or done at any such stated General Assembly on the Day first appointed for holding the same; provided always, that Three Days previous Notice at the least shall be given of every such Second or subsequent or adjourned Assembly, in the same Manner as Notice is herein-before directed to be given of the original General Assembly.

Assembly of Proprietors may be specially convened.

XIX. And be it further enacted, That if it shall at any Time appear, that for the more effectually putting this Act into Execution a Special General Assembly of the said Company of Proprietors is necessary to be held, it shall and may be lawful to and for any Number of the said Proprietors, not less than Twenty, who may be possessed of or entitled unto Five Shares each at the least in the whole in the said Undertaking, to cause Twenty-one Days Notice at least to be given thereof in One of the Newspapers usually circulating in the Eastern Parts of the County of *Kent*, or in any other Manner as the said Company of Proprietors shall at any General Assembly direct or appoint, specifying in such Notice the Reason and Intention of requesting such Special Assembly, and the Time when and Place where the same shall be held, which Place shall be within the said City of *Canterbury* or Town and Port of *Sandwich*; and the said Proprietors are hereby authorized to meet pursuant to such Notice, and such of them as shall be present shall proceed to the Execution of the Powers by this Act given to the said Company of Proprietors, with respect to the Matters so specified only; and all such Acts of the Proprietors, or of the Part of them having the greater Number of Votes according to the Provisions herein-before in that Behalf contained, met together at every such Special General Assembly, (provided such Proprietors so met together shall not be less than Thirty, and holding at least Five Shares each in the said Navigation) shall be as valid with respect to the Matters specified in such Notice, as if the same had been done at any stated General Assembly.

XX. And

General Assembly to appoint Officers.

XX. And be it further enacted, That it shall and may be lawful to and for the said Company of Proprietors at any General Assembly, and they are hereby authorized and required, from Time to Time to nominate and appoint Five Auditors of the Accounts of the said Company of Proprietors, a Treasurer or Treasurers, One Engineer, Two Clerks, One to be resident in the City of *Canterbury* and the other in the Town and Port of *Sandwich* aforesaid, and who shall also act as Clerks of the said Directors, One or more Collector or Collectors of the said Rates, One Harbour Master, and such other Agents, Officers, and Servants as may from Time to Time appear expedient; and such Clerks shall, in proper Books to be provided by the said Company of Proprietors for that Purpose, a Duplicate being to be kept by each of them, enter and keep a true and perfect Account of the Names and Places of Abode of the several Proprietors of the said Navigation, and of the several Persons who shall from Time to Time become Owners and Proprietors of or entitled to any Share or Shares therein, and of all Acts, Proceedings, and Transactions of the said Company of Proprietors and Directors respectively; and in case such Auditors, Treasurers, Engineer, Clerks, Collectors, or other Agents, Officers, or Servants, or any of them, shall die or quit the Service of the said Proprietors or such Directors, or by reason of any Negligence, Misconduct, or Inability in such Auditors, Treasurers, or Engineer, Clerks, Collectors, Agents, Officers, or Servants, or any of them, to execute such Office or Offices, it shall be requisite to displace or remove him or them, then and in every such Case it shall and may be lawful to and for the Proprietors assembled at any such stated or special General Assembly as aforesaid to remove such Auditors, Treasurers, Engineer, Clerks, Collectors, Agents, or Servants, or any of them, or for the said Directors to remove such Collectors, Agents, Officers, or Servants, except the Auditors, Treasurers, Engineer, or Clerks; and in case such Auditors, Treasurers, Clerks, Collectors, Agents, Officers, or Servants, or any of them, shall so die, be removed from, or quit the Service of the said Company of Proprietors, or of the said Directors, then it shall and may be lawful to and for the said Company of Proprietors at their said General or Special General Assemblies, or for the said Directors of the said Proprietors, to appoint any other fit Person or Persons to execute such Office or Offices in the Place of the Person or Persons who shall so die, be removed from, or quit the Service of the said Proprietors, or of the said Directors; but in case any such new Appointment be made by the said Directors, the same shall only continue until the next General or Special General Assembly of the said Proprietors, when the Appointment of such Person or Persons to such respective Office or Offices shall either be confirmed, or such other fit Person or Persons be appointed to succeed to such Office or Offices, as the said Proprietors at such General or Special General Assembly may think proper.

Treasurer, Collector, &c. to find Security.

XXI. And be it further enacted, That the said Company of Proprietors shall and they are hereby required to take such Security from the Treasurers, Engineer, Clerks, or Collectors, to be appointed for the Purposes of this Act, and every of them, for the due Execution of their Offices, and for their faithfully accounting for all the Monies

received by them, or Services to be performed by them in virtue of their said Offices, as to the said Company of Proprietors or the said Directors shall seem meet.

Clerks and Treasurers not to be same Persons.

XXII. Provided always, and be it enacted, That it shall not be lawful for the Company of Proprietors to appoint the Persons who may be appointed to act as their Clerks in the Execution of this Act, or either of them, or the Partner or Partners of such Clerks, or either of them, or any Person in the Service or Employ of either of such Clerks, or of his or their Partner or Partners, the Treasurers or Treasurer for the Purposes of this Act, or to appoint the Person or Persons who may be appointed Treasurers, or either or any of them, or the Partner or Partners of such Treasurers, or either or any of them, or any Person in the Service or Employ of any such Treasurers, or either or any of them, the Clerks of the said Company, or either of them; and if any Person shall act in both the Capacities of Clerk and Treasurer for the Purposes of this Act, or if any Person being the Partner of either of such Clerks, or in the Service or Employ of either of such Clerks, or of his or their Partner or Partners, shall act as Treasurer, or being the Partner of such Treasurers, or either or any of them, or in the Service or Employ of such Treasurers, or either or any of them, or of his or their Partner or Partners, shall act as Clerk in the Execution of this Act, every Person so offending shall for every such Offence forfeit and pay the Sum of One hundred Pounds to any Person or Persons who shall sue for the same, to be recovered in any of His Majesty's Courts of Record at *Westminster*, by Action of Debt, or on the Case, or by Bill, Suit, or Information, wherein no Essoign, Protection, or Wager of Law, or more than One Imparlance, shall be allowed.

Powers of the Directors and Regulations respecting the same.

XXIII. And be it further enacted, That no Director shall have more than One Vote in any Meeting of Directors, except the Governor, or in his Absence the Deputy Governor, or in the Absence of both, the Director chosen to preside at any Meeting, and who, in case of an Equality of Votes upon any Question which may be agitated by the said Directors, shall have the casting Vote, although he may have given One Vote before; and that all the Powers and Authorities hereby vested in or directed to be exercised by the said Directors, may be done and exercised by the major Part of them present at their respective Meetings, the whole Number present not being less than Seven; and such Directors shall from Time to Time make Reports of their Proceedings to the said General Assemblies, and, if required, to the said Special General Assemblies of the Proprietors, and shall obey their Orders and Directions; and the said Directors shall (subject nevertheless at all Times to such Orders and Directions as aforesaid) meet at such Times and Places, and shall from Time to Time adjourn themselves to such other Times and Places as they shall think fit; but no Person holding any Place, Office, or Employment under the said Company shall be capable of being chosen to serve or of serving as a Director during the Time of his Continuance in such Place, Office, or Employment; and in order to defray the Expences of their Meetings, the said Directors shall from Time to Time receive out of the Capital Stock of the said Proprietors such Sum or Sums

Sums of Money as shall be directed, adjusted, and settled at such General Assemblies, not exceeding the Sum of Ten Shillings for each Day of Meeting in addition to Nine-pence *per* Mile for Travelling Expences for every One of the Directors present at the Meeting (calculating the Number of Miles from the Place of Residence of each Director to the Place of Meeting, as the Distance for which such Travelling Allowance is to be made); and the said Directors (subject nevertheless at all Times to such Orders and Directions as aforesaid) shall make Agreements and Bargains with the Workmen, Agents, Undertakers, and other Persons employed or concerned in improving the said River, *Sandwich* Haven, Cuts, New Haven and Harbour, and in making and completing the said other Works, and all and every Part or Parts thereof; and shall, by themselves or their Clerks aforesaid, keep a full and true Account of all Monies disbursed and Payments made by the said Directors, and by all and every Person and Persons employed by or under them, and of all and every Sum and Sums of Money which they shall receive on behalf or in respect of such River, *Sandwich* Haven, Cuts, New Haven and Harbour, and other Works, from any Collector or Collectors of the said Rates, or other Officer or Officers, or from any other Person or Persons whomsoever employed in, or having any Concerns, Dealings, or Transactions with the said Harbour, Navigation, and Undertakings, or in or with any Part or Parts thereof, and shall regularly, by themselves or their Clerks as aforesaid, write, insert, and enter in a Book or Books to be from Time to Time provided at the Expence of the said Company of Proprietors for that Purpose, Notes, Minutes, or Copies (as the Case shall require) of every such Contract, Bargain, Receipt, and Disbursement, and of all other their Orders and Proceedings; which Book or Books shall be securely deposited with and kept locked up under the Care and Direction of the said Board.

Board of Directors to make Calls.

XXIV. And be it further enacted, That the said Directors shall have Power from Time to Time to make such Call or Calls of Money from the Subscribers to and Proprietors of the said Undertaking, to defray the Expences of, or to carry on the same, as they from Time to Time shall find wanting and necessary for those Purposes, so that no such Call shall exceed the Sum of Five Pounds for every Share, and so in proportion for any greater or less Share or Interest which any Person or Persons shall or may be possessed of or entitled unto in the said Undertaking; and such Call or Calls shall not be made but at the Distance of Three Calendar Months at least from each other, and Twenty-one Days Notice at the least shall be given of all such Calls as aforesaid, by Advertisement in some One Newspaper usually circulating in the Eastern Parts of the said County of *Kent*, and by Letter to be signed by the Clerks, or either of them, addressed to the respective Subscribers at his, her, or their Place of Abode, as the same stand described or recorded in the Books of the said Company of Proprietors; and the said Directors shall (subject nevertheless to the Orders and Directions of such General Assemblies as aforesaid) have full Power and Authority to direct and manage all and every the Affairs of the said Company of Proprietors, as well in contracting for and purchasing Messuages, Lands, Tenements, and other Here-

Hereditaments and Materials for the Use of, or for the improving and making the said River, *Sandwich* Haven, Cuts, New Haven and Harbour, and the Piers, Jetties, Ways, Roads, Avenues, and other Works thereunto belonging, as in employing, ordering, and directing the Workmen, and in placing and displacing Officers, Servants, and Agents, (except as herein-after is excepted,) and in making all Contracts and Bargains touching the said Undertaking; and every Owner or Owners of any Share or Shares in the said Undertaking shall pay his, her, or their rateable Proportions of the Monies to be called for as aforesaid, to such Person or Persons, and at such Time and Place as the said Directors shall from Time to Time appoint and direct.

Recovery of Shares.

XXV. And be it further enacted, That if any Person or Persons shall neglect or refuse to pay his, her, or their rateable or proportionable Part of the Money so called for as aforesaid at the Time and Place appointed by such Directors, or within Fourteen Days next ensuing, he, she, or they so neglecting or refusing shall forfeit a Sum not exceeding Ten Pounds for every Share; and in case such Person or Persons shall continue to neglect or refuse to pay his, her, or their rateable Call as aforesaid for the Space of Three Calendar Months next after the Time so appointed for Payment thereof, then he, she, or they so neglecting or refusing shall, at the Option of the said Company of Proprietors, forfeit his, her, or their respective Share and Shares in the said Undertaking, and all the Profits and Benefits thereof; all which Shares so forfeited shall be vested in the said Company of Proprietors, in Trust for and for the Benefit of all the rest of the said Proprietors, in proportion to their respective Interests in the said Undertaking, or shall, at the Discretion of the said stated or special General Assemblies, be publicly sold for the Use of the rest of the said Proprietors whose Shares and Interests shall not have been forfeited as aforesaid: Provided nevertheless, that no Advantage shall be taken of any Forfeiture of any Share or Shares in the said Undertaking until personal Notice shall have been given to, or Notice left at or sent by the General Post addressed to the usual Place or Places of Abode of the Owner or Owners of such Share or Shares respectively; and the same Share or Shares shall likewise be declared to be forfeited at some stated General Assembly of the Company of Proprietors within Six Months next after such Forfeiture shall have been incurred, and Ten Days Notice at least previously to such General Assembly, be advertised in the *London Gazette*, and in some One Newspaper usually circulated in the Eastern Parts of the County of *Kent*; Provided always nevertheless, that every such Forfeiture, after the same shall be declared as aforesaid, shall be an absolute Indemnification and Discharge to and for the Proprietor or Proprietors so forfeiting against all Actions, Suits, and Prosecutions for any Breach of Contract or other Agreement between such Proprietor or Proprietors so forfeiting, and the said Company, with regard to any Call or Calls for Money subsequent to the Declaration of such Forfeiture, or the future carrying on and Management of the said Undertaking; but no such Share or Shares shall be forfeited if the Owner or Owners thereof shall at or before such stated General

Shares may be forfeited, but no Advantage to be taken of Forfeiture without Notice.

Forfeiture of Shares to be an Indemnity to Persons forfeiting; but Shares not to be forfeited if Arrear and Interest paid or tendered

Assembly pay or tender to the Treasurers of the said Company of Proprietors, or any or either of them, what shall be due thereon, together with legal Interest for the same from the Time at which the same ought to have been paid, and all Expences incurred for Recovery thereof. at or before General Assembly.

XXVI. And be it further enacted, That if any Proprietor or Proprietors shall neglect or refuse to pay his, her, or their proportionable Part of the Money to be called for as aforesaid, at the Time and Place appointed for that Purpose, it shall be lawful for the said Company of Proprietors, in case they shall think fit, to sue for and recover the same, with Interest, at the Rate of Five Pounds *per Centum per Annum*, from the Time appointed for Payment thereof, in any of His Majesty's Courts of Record at *Westminster*, by Action of Debt, or on the Case; and in any such Action it shall be sufficient for the said Company to declare and allege that the Defendant or Defendants, being a Proprietor or Proprietors of such or so many Shares in the said Navigation and Harbour, is or are indebted to the said Company in such Sum or Sums of Money as the Call or Calls in Arrear shall amount unto, for such or so many Call or Calls of such or so many Sum or Sums of Money upon such or so many Share or Shares belonging to the said Defendant or Defendants (as the Case may happen to be), whereby an Action hath accrued to the said Company by virtue of this Act, without setting forth the special Matter; and in such Action it shall be only necessary to prove that the Defendant or Defendants at the Time of making such Call or Calls was or were Proprietor or Proprietors of some Share or Shares in the said Undertaking, and that such Call or Calls was or were in fact made, and that such Notice thereof was given as is directed by this Act, without proving the Appointment of the Committee who made such Call or Calls, or any other Matters whatsoever; and the said Company shall thereupon be entitled to recover what shall appear due, unless it shall appear that any such Call exceeded the Sum of Five Pounds for every Share of Twenty-five Pounds, or was made within the Distance of Three Calendar Months from the last preceding Call, or without Notice given as aforesaid. Company may sue for Calls not made at Time appointed.

XXVII. And be it further enacted, That it shall and may be lafwul to and for the several Proprietors of the said Undertaking, his, her, or their respective Executors or Administrators, to sell and dispose of any Share or Shares to which he, she, or they may be entitled therein, subject to the Rules and Conditions herein mentioned; the Conveyance of which Shares shall be in the Form or to the Effect following: Shares may be sold.

Form of Conveyance of Shares.

'I *A. B.* of in consideration of
' paid to me by *C. D.* of
' do hereby bargain, sell, assign, and transfer to the said
' *C. D.* the Sum of
' Capital Stock of and in the *Canterbury* Navigation and *Sandwich*
' Harbour Company, and in the Works and Premises belonging to
' the said Company, being Part [*or* the Whole, *as the Case may be*]
' of my Share in the said Undertaking, to hold to the said *C. D.*

'Executors, Administrators, and Assigns, subject to the same Rules, 'Orders, and Restrictions, and on the same Conditions that I held 'the same immediately before the Execution hereof; and I the said 'C. D. do hereby agree to take and accept the said Capital Stock or 'Share of , subject to the same Rules, 'Orders, Restrictions, and Conditions: As witness our Hands and 'Seals the Day of in the Year of 'our Lord .'

And on every such Sale the said Deed of Conveyance (being executed by the Seller or Sellers and the Purchaser or Purchasers of such Share or Shares) shall be kept by the said Purchaser or Purchasers, for his, her, or their Security, after the Clerks to the said Company of Proprietors, or One of them, shall have entered in a proper Book or Books to be kept for that Purpose, a Memorial of such Transfer and Sale, for the Use of the said Company, and have testified or indorsed the Entry of such Memorial on the said Deed of Sale or Transfer; for which Transfer and Memorial no more than Five Shillings shall be paid, exclusive of the Stamp and other Duty; and the said Clerks are hereby required to make such Entry or Memorial accordingly; and until such Memorial shall have been made and entered as above directed, such Purchaser or Purchasers shall have no Part or Share of the Profits of the said Undertaking, nor any Interest for such Share or Shares paid to him, her, or them, nor any Vote in respect thereof as a Proprietor or Proprietors of the said Undertaking.

After a Call, no Share to be sold until such Call shall be paid.

XXVIII. And be it further enacted, That after any Call of such Money shall have been made by such Board of Directors as aforesaid, no Person or Persons shall sell or transfer any Share or Shares which he, she, or they shall possess in the said Undertaking, on pain of forfeiting his, her, or their respective Share or Shares therein to the said Company of Proprietors, in Trust for the Benefit of all the said Proprietors, unless he, she, or they, at the Time of such Sale or Transfer, shall have paid and discharged to the Treasurer or Treasurers of the said Company of Proprietors, or some or One of them, the whole and entire Sum of Money which shall have been called for upon each Share so sold or transferred; such Forfeiture nevertheless to be notified and declared at a General Assembly in Manner before directed.

Regulations as to the Acquisition of Shares,

by Marriage,

XXIX. And whereas much Inconvenience may arise by the frequent Change of the Right and Title to the Shares of and in the said Undertaking by the Marriage or Death of Proprietors, and it may be difficult in such Cases to ascertain to whom the Dividends arising or becoming due upon such Shares ought to be paid and do belong; be it therefore enacted, That before any Person or Persons who shall claim any Part or Share of the Profits of the said Undertaking in Right of Marriage shall be entitled to receive the same, an Affidavit, containing a Copy of the Register of such Marriage, or the Effect of such Register shall be made and sworn to by some credible Person, before a Master or Master Extraordinary in Chancery, or One of His Majesty's Justices of the Peace; and the said Master or Master Extraordinary in Chancery, and Justices of the

Peace, are hereby authorized and empowered to swear any such Person to such Affidavit; and such Affidavit shall be transmitted (Post or Carriage free) to the Clerks to the said Company of Proprietors for the Time being, or One of them, who shall file the same, and make an Entry thereof in the Book or Books which shall be kept by the said Clerks for the Entry of Transfers and Sales of Shares in the said Undertaking; and that before any Person or Persons who shall claim any Part or Share of the Profits of the said Undertaking by virtue of any Bequest or Will, or in a Course of Administration, shall be entitled to receive the same, the said Will, or the Probate Copy thereof, shall be produced and shown to the said Clerks, or One of them, or an Affidavit, containing a Copy of so much of such Will as shall relate to the Share or Shares of the Testator, or of the Letters of Administration, in case the Proprietors shall have died intestate, shall be made and sworn to by an Executor or Executors of such Will, or by an Administrator or Administrators of the Estate and Effects (as the Case may happen to be), before a Master or Master Extraordinary in Chancery, or One of His Majesty's Justices of the Peace, and shall also be transmitted (Post or Carriage free) to the said Clerks, or One of them, who shall file and enter the same in Manner herein-before mentioned; and for every such Entry the Clerks of the said Company shall be entitled to receive from the Person or Persons claiming such Share or Shares by Marriage, or Will, or in Course of Administration as aforesaid, the Sum of Two Shillings and Sixpence, and no more.

or Will, or in Course of Administration.

XXX. And for the better Security of the several Proprietors of the said Undertaking to their respective Shares therein, be it further enacted, That the said Company of Proprietors shall and they are hereby required, at their First or some subsequent General Assembly, to cause the Names and proper Additions of the several Persons who shall then be entitled to the Shares in the said Undertaking, with the Number of the Shares, or the Amount of all the Subscriptions which they are then respectively entitled to hold, and also the proper Number by which every Share shall be distinguished, to be fairly and distinctly entered in a Book to be kept by the Clerks to the said Company of Proprietors, and after such Entry, to cause their Common Seal to be affixed thereto; and shall also cause a Ticket or Instrument, with the Common Seal of the said Company affixed thereto, to be delivered to every such Subscriber upon Demand, specifying the Share or Shares to which he or she is entitled in the said Undertaking, every such Proprietor paying to the Clerks Two Shillings and Sixpence, and no more, for every such Ticket or Instrument; and such Ticket or Instrument shall be admitted in all Courts whatever as Evidence of the Title of such Subscriber, his or her Executors, Administrators, and Assigns, to the Share or Shares therein specified, but the Want of such Ticket or Instrument shall not hinder or prevent the Owner of any of the said Shares from selling or disposing thereof.

Names of Proprietors to be entered, and Tickets of their Shares delivered to them.

XXXI. And be it further enacted, That if the several Persons who have become Subscribers towards the Purposes of this Act, or any Ten or more of them, or any Person or Persons who shall hereafter

For enforcing Payment of Subscriptions.

after become or agree to become a Subscriber or Subscribers for that Purpose, or shall be the Proprietor or Proprietors, by Purchase or otherwise, of any Share or Shares in the said Undertaking, shall after Twenty-one Days previous Notice in Writing under the Hands of the Clerks to the said Company, or One of them, given to him, her, or them personally, or left at or sent by the General Post addressed to his, her, or their usual Place or Places of Abode, as the same may stand registered in the Books of the said Company, refuse or neglect to make Payment of the Sum or respective Sums by him, her, or them so subscribed or agreed to be subscribed, or such Part or Parts thereof as may be required in such Notice, at such Place or Places and to such Person or Persons as the said Company shall authorize to receive the same, it shall be lawful for the said Company to bring or cause to be brought any Action or Actions of Debt, or on the Case, or Bill, Plaint, or Suit, against the Person or Persons so refusing or neglecting as aforesaid, or his, her, or their Heirs, Executors, or Administrators, in any of His Majesty's Courts of Record at *Westminster*, wherein no Essoign, Protection, or Wager of Law, nor more than One Imparlance, shall be allowed; and after Proof of such Person or Persons having so subscribed or agreed to subscribe, and that such Notice was given as aforesaid, a Verdict shall be given for the Plaintiff in all such Action and Actions, and Execution shall issue thereupon as the Case may require.

Power to appoint Committees.

XXXII. And be it further enacted, That it shall be lawful for the said Directors, at their First Meeting after every Election of such Board, or at any subsequent Meeting, to nominate and appoint One or more Committee or Committees, (every such Committee consisting of Seven or more Directors, and of which the Governor and Deputy Governor of the said Company shall be Two); and such Committee and Committees shall have full Power and Authority to do, execute, and perform all Matters and Things whatsoever, in and about the said Undertaking, which the said Directors shall from Time to Time entrust to the Management of such Committee or Committees; and such Committee and Committees shall meet at such Time and Place and Times and Places as they shall think proper, and shall be allowed for the Expences of their Meetings such Sums of Money as shall from Time to Time be directed, adjusted, and settled at the General Meetings of the said Proprietors, not exceeding the Rate of Allowance for the Expences of the Meetings of the said Directors; and all Powers hereby vested, or which shall be vested in such Committee or Committees by the said Directors as aforesaid, shall be exercised by the major Part present at their respective Meetings, the whole Number of Members present not being less than Five; and all Questions shall be decided by the Majority of Votes; and no Member of such Committee or Committees shall have more than One Vote at any of their Meetings, except the said Governor or Deputy Governor, or the Chairman of the Meeting, who, in case of an equal Division, shall have the casting Vote; and such Committee and Committees shall from Time to Time make Reports, and send Copies of their Proceedings to the Directors, and shall at all Times be subject to the Controul of the said Directors, and shall obey all

all their Orders and Directions in and about the Affairs of the said Company of Proprietors, so that such Orders and Directions be not contrary to the express Directions, Regulations, and Provisions contained in this Act, or the Rules, Bye Laws, or Orders of the said Company of Proprietors.

Power to improve River Stour and Sandwich Haven, and to make New Cuts, Haven, and Harbour.

XXXIII. And be it further enacted, That it shall and may be lawful for the said Company of Proprietors, and they are hereby authorized and empowered, by themselves, their Deputies, Agents, Officers, Workmen, Servants, and others, to improve, cleanse, scour, enlarge, inhigh, embank, deepen, widen, render more straight, and maintain the said River *Stour* and *Sandwich* Haven, for improving the Navigation thereof from *Abbott's Mill*, in the City of *Canterbury* and County of the same City, in and through the several Parishes of *All Saints*, *Saint Alphage*, *Saint Peter*, *Holy Cross Westgate*, *Saint Mary Northgate*, *Hackington* otherwise *Saint Stephens*, and *Fordwich*, in the said City of *Canterbury* and County of the same City, a certain Extra-parochial Place called the *Black Friars*, and a certain other Extra-parochial Place called the *Black Prince's Chantry*, in or near the said City of *Canterbury* and County of the same City, an Extra-parochial Place called the Borough of *Staplegate*, and the several Parishes of *Holy Cross Westgate*, *Hackington* otherwise *Saint Stephens*, and *Sturry*, in the County of *Kent*, the Town of *Fordwich* and its Liberties, and the Parish of *Fordwich* in the said County of *Kent*, and the several Parishes of *Westbere*, *Littlebourne*, *Stodmarsh*, *Stourmouth*, *Chislet*, *Wingham*, *Ickham*, *Wickhambreux*, *Preston next Wingham*, *Elmstone*, *Ash next Sandwich*, and *Woodnesborough* otherwise *Winsborough*, in the said County of *Kent*, and the Ville of *Sarr*, and the several Parishes of *Saint Nicholas at Wade*, *Monkton*, *Minster*, *Saint Lawrence*, and *Stonar*, in the *Isle of Thanet* in the said County of *Kent*, the said Town and Port of *Sandwich*, and the Liberties of the same Town and Port, and the several Parishes of *Saint Mary the Virgin*, *Saint Peter the Apostle*, and *Saint Clement*, in the said Town and Port and Liberties of *Sandwich* and County of *Kent*, or some of them, unto or a short Distance below a certain Place in the said Town and Port of *Sandwich*, or within the said Parish of *Saint Clement* there, called *Lower Head*; and also to form and maintain One or more Basin or Basins, with proper Quays, Wharfs, Landing Places, and Warehouses adjoining thereto, near *Abbott's Mill* aforesaid, in the said Parishes of *Saint Alphage*, *Holy Cross Westgate*, *Saint Peter*, *Saint Mary Northgate*, *Hackington* otherwise *Saint Stephens*, in the said City of *Canterbury* and County of the same City, and in the said Extra-parochial Places called the *Black Friars* and *Black Prince's Chantry*, in or near the said City of *Canterbury* and County of the same City, and in the said Borough of *Staplegate*, and the said Parishes of *Holy Cross Westgate* and *Hackington* otherwise *Saint Stephens*, in the said County of *Kent*, or in some of them; and also to make and maintain a New Cut at or near a certain Place on the said River called *Cold Harbour*, in the said Parish of *Saint Mary Northgate*, in the said City and County of *Canterbury*, and *Hackington* otherwise *Saint Stephens*, in the said City and County of *Canterbury*, and in the said County of *Kent*, or in one of the said last-mentioned Parishes; and another

New Cut at or near a certain other Place on or near the said River, called *Horse Shoe Hole*, in the said Parishes of *Saint Mary Northgate* and *Hackington* otherwise *Saint Stephens*, or one of them; and also another New Cut from just below or near unto a certain other Place on the said River, called *Chancery Head*, in the said Parish of *Sturry* in the said County of *Kent*, and Parish of *Fordwich* in the said County of the City of *Canterbury* and County of *Kent*, or one of the said last-mentioned Parishes, to a Place on the said River in the said Parish of *Fordwich* in the said County of *Kent*, a little above *Fordwich* Bridge; and to divert the Water of the said River *Stour* or any Part thereof into the said New Cuts, or to supply the said New Cuts with Water taken from the said River, with all requisite Locks, Weirs, Flood Gates, and Sluices, upon the Line of the said River and New Cuts; and also to cut, make, and maintain a New Haven from the said Place called *Lower Head*, or from a short Distance below the same, in and through Part of the said Parish of *Saint Clement* in the said Town and Port and Liberties of *Sandwich*, and the several Parishes of *Word* otherwise *Worth*, *Sholden*, and *Northborne*, or in some or one of them, in the said County of *Kent*, to the Sea, between the Batteries No. 1. and No. 2. there; and also to form One or more Basin or Basins, with proper Quays, Wharfs, Landing Places, Warehouses, and other Conveniences adjoining thereto, in the said Parishes of *Saint Mary the Virgin*, *Saint Peter the Apostle*, and *Saint Clement*, in the said Town and Port of *Sandwich*, and in the said Parish of *Stonar* in the said County of *Kent*, or in some or one of them, with Locks, Flood Gates, Dams, and Sluices across the said New Haven at or near the said Place called *Lower Head*, if the same shall be deemed necessary; and to erect and make a Tumbling Bay Lock or Sluice, and Bridge, across the Old Haven, at or near the said Place called *Lower Head*, in the said Town and Port and Liberties of *Sandwich*; also to erect, make, and maintain a Bridge where the said Third before-mentioned New Cut will cross the Turnpike Road from *Canterbury* to *Ramsgate*; and to divert the Waters of the said Old Haven, or any Part thereof, into the said New Haven; and to cut, make, and maintain a Harbour on the Sea Shore in the said Parishes of *Word* otherwise *Worth*, *Sholden*, and *Northborne*, or some or one of them, with proper Piers, Jetties, Breakwaters, Quays, Wharfs, Warehouses, Mooring Chains, Light Houses, Buoys, and other Works, within or adjoining thereto, as may be necessary for the reception, shelter, loading, and unloading of Ships and Vessels resorting thereto, and for the better enabling such Ships and Vessels to come into and go out of and pass through the same, and there to lie and continue; and to make all such convenient Tram or Rail Roads, Ways, Roads, and Passages of Communication, with all Turnpike Roads or Highways already made or to be made, within One hundred Yards of the said several Basins, Quays, Wharfs, Warehouses, River, Haven, Cuts, New Haven or Harbour, as may be requisite for giving necessary Access to the same, and the Carriage of Goods and all other necessary Purposes at, in, and upon, and to and from the same; and to erect and make Wharfs, Quays, Landing Places, and other Conveniences for the Purpose of loading and unloading, shipping and unshipping, landing and conveyance of Goods to and from the said River, Haven, Cuts, New Haven and Harbour, and to supply the said

said Cuts and New Haven whilst making, and at all Times for ever after the same shall be made, with Water from the said River *Stour* and Old Haven, and all Rivers, Brooks, Springs, Streams, Rivulets, and Watercourses incident thereto, which shall be found in digging or making the said Cuts and New Haven, or any of them; and the said Company of Proprietors are hereby also authorized and empowered, by themselves and their Deputies, Agents, Officers, and Workmen, to make, for the Purpose of supplying the said River, Haven, Cuts, and New Haven, or any Part or Parts thereof with Water, such and so many Soughs, Tunnels, Feeders, Aqueducts, and Channels, as they shall think fit, for supplying the said River, Haven, Cuts, and New Haven with Water; and also, for effectuating the Purposes of this Act, to enlarge, widen, divert, alter, or vary any Roads or Ways, and the Course of such Brooks, Streams, or Watercourses which are or shall be situate within the Line or Track of the said River, Haven, Cuts, or New Haven, or which shall or may hinder, prevent, or otherwise obstruct the making of the said Works; and for the Purposes aforesaid or any of them, the said Company of Proprietors and their Deputies, Servants, Agents, and Workmen, are hereby authorized and empowered to enter into and upon the Lands and Grounds of any Person or Persons, Bodies Politic, Corporate, or Collegiate whatsoever, and to survey and take Levels of the same or of any Part thereof, and to set out and ascertain such Parts thereof as they shall think necessary and proper for making the said Cuts and the other Works and Conveniences hereby authorized to be made, and there to bore, dig, cut, trench, and sough, and also to remove, take, carry away, and lay any Earth, Clay, Stone, Soil, Rubbish, Trees, Roots of Trees, Beds of Gravel or Sand, or any other Matters or Things which may be dug or got in making, or which may hinder, prevent, or obstruct the making, carrying on, maintaining, or repairing the said Cuts and other Works respectively, according to the true Intent and Meaning of this Act; and also to make Carriage Roads and other Ways, as well for the carrying and conveying of all Manner of Materials necessary or intended for the making, erecting, finishing, altering, repairing, widening, enlarging, or improving the said Cuts, and other Works hereby authorized, as also for the Purposes of the said intended Navigation, and for the carrying and conveying of Goods, Wares, Merchandize, and other Things to and from the said River, Haven, Cuts, or New Haven; and also to make, build, drive, erect, and set up in or upon the said River, Haven, Cuts, or New Haven, or in or upon the Lands adjoining thereto respectively, such and so many Bridges, Piers, Arches, Tunnels, Soughs, Aqueducts, Culverts, Sluices, Locks, Flood Gates, Weirs, Banks, Dams, Pens of Water, Water Tanks, Reservoirs, Basins, Wharfs, Quays, Houses, Warehouses, Toll Houses, Watchhouses, Landing Places, Weighing Beams, Cranes, Dry Docks and other Docks, Steam Engines, Machines, and other Works, Ways, Roads, Gates, Fences, and Conveniences, for the Purposes of the said intended Works, as and where the said Company of Proprietors shall think requisite and convenient; and also from Time to Time alter, repair, and amend or discontinue the same or any of them; and to place, lay, work, or manufacture any Materials on the Lands

or Grounds adjoining to the Place or Places where the said Works, or any of them, shall be carrying on; and also to make, set out, and appoint such Towing Paths, Banks, Roads, and Ways for the towing, haling, or drawing of Barges, Boats, Lighters, Rafts, and other Vessels passing upon the said River and Cuts, with Men, Horses or otherwise, and such convenient Places for Barges, Boats, and other Vessels and Rafts, to turn, lie, or pass each other in, as the said Company of Proprietors shall think proper and expedient; and also to dig, take, and carry away any Soil, Clay, Gravel, Sand, or Stone, which shall be proper, requisite, or convenient for the making, maintaining, and repairing the several Works aforesaid, or any of them, in or from the Grounds of any Person or Persons adjoining or lying convenient thereto; and also from Time to Time to make, build, erect, construct, and keep in Repair any Piers, Arches, Aqueducts, and other Works, in, upon, over or across any Roads, Rivers, Brooks, or Valleys, for making, carrying on, using, maintaining, and repairing of the said Canal and Towing Paths; and also to construct, erect, make, and do all other Matters and Things which they shall think convenient and necessary for the making, effecting, extending, preserving, improving, completing, and using the said River, Haven, Cuts, New Haven and Harbour, and other Works, in pursuance of and according to the true Intent and Meaning of this Act; they the said Company of Proprietors, their several Deputies, Agents, Officers, and Workmen, doing as little Damage as may be in the Execution of the several Powers to them hereby granted, and making Satisfaction in Manner herein-after mentioned to the Owners and Proprietors of and other Persons interested in any Lands, Tenements, or other Hereditaments, Waters, Watercourses, Brooks, or Rivers respectively, which shall be taken, used, removed, diverted, or prejudiced, for all Damages to be by them sustained in or by the Execution of all or any of the Powers of this Act; and this Act shall be sufficient to indemnify the said Company of Proprietors, and their Deputies, Agents, Officers, and Workmen, and all other Persons whomsoever, for what they or any of them shall do by virtue of the Powers hereby granted, subject to such Provisoes and Restrictions as are herein-after mentioned.

Steam Engines to consume their own Smoke.

XXXIV. And be it further enacted, That every Steam Engine which shall be erected by the said Company of Proprietors, or in pursuance of this Act, shall be erected and built upon the best and most approved Principle of consuming its own Smoke.

Certain Lands, &c. not to be taken for the Purposes of the Act.

XXXV. Provided always, and it is hereby further enacted, That it shall not be lawful to and for the said Company of Proprietors to take for the Purposes of this Act, without the Consent of the respective Owners thereof, any Lands, Tenements, or Hereditaments, belonging to the Mayor and Commonalty of the City of *Canterbury*, or the Quay or Wharf at the said Town of *Fordwich*, belonging to the Mayor, Jurats, and Commonalty of the said Town of *Fordwich*, or any Part thereof, or the Part of the Quay or Wharf at the Town and Port of *Sandwich* belonging to the Mayor, Jurats, and Commonalty of the said Town and Port of *Sandwich*, extending from *Sandwich* Bridge for the Space of Thirty Yards along the Haven to

a certain Wet Dock now there being, belonging to the Mayor, Jurats, and Commonalty of the said Town and Port of *Sandwich;* but nevertheless the said Company of Proprietors may take for the Purposes of this Act the Lands described in Schedule (A.) hereunto annexed, (excepting the Lands, Buildings, and Premises mentioned in the said Schedule belonging to the Mayor and Commonalty of the City of *Canterbury*, of which such Part only shall be taken as may be required for the said Basin and Navigation,) and also the Part of the said Quay or Wharf belonging to the Mayor, Jurats, and Commonalty of the Town and Port of *Sandwich*, extending from the Eastern or lower Side of the said Wet Dock belonging to the said Mayor, Jurats, and Commonalty of the Town and Port of *Sandwich*, along the Haven to the said Place called *Lower Head*, and also a certain Piece or Parcel of Pasture Land belonging to the said Mayor, Jurats, and Commonalty of *Sandwich*, called *The Vigo Piece*, containing Three Acres, situate in the said Parish of *Saint Clement*, in the said Town and Port of *Sandwich*, and also the Piece or Parcel of Pasture Land belonging to the said Mayor, Jurats, and Commonalty of *Sandwich*, called *Cold Harbour*, situate in the said Parish of *Saint Clement*, now held by *Joseph Stewart* Esquire, and containing, by Estimation, Three Acres, paying for the same Lands and Hereditaments respectively the Value thereof; and the said Mayor, Jurats, and Commonalty of *Sandwich* shall for ever hereafter suffer the Road or Way along the said Quay or Wharf belonging to them, from *Sandwich* Bridge and the High Street in *Sandwich* to *Lower Head*, and the Road or Way from *Fisher's Gate* into the said first-mentioned Road or Way, to remain and be open and unobstructed for the Use of the said Company of Proprietors, their Servants and Agents, and all other Persons having Business or Concerns with them, or having occasion to go or travel with Carriages or Horses, or on Foot, along the South Side of the said Haven, New Haven and Harbour, or any Part thereof.

Houses, Gardens, &c. not to be injured, except such as are mentioned in the First Schedule.

XXXVI. Provided also, and be it further enacted, That nothing herein contained shall authorize or empower the said Company of Proprietors, or any Person or Persons acting by or under their Authority, to take, use, injure, or damage, for the Purposes of the said Undertaking, or any other of the Purposes aforesaid, any House, Mill, Quay, Wharf, or other Building or Erection which was erected and built on or before the First Day of *January* One thousand eight hundred and twenty-four, or any Land or Ground which on the said First Day of *January* One thousand eight hundred and twenty-four was set apart and used as or for a Garden, Orchard, Park, Paddock, planted Walk, or Avenue to a House, without the Consent of the Owners or Occupiers thereof, other than and except the Houses, Mills, Buildings, Gardens, Orchards, Yards, and Paddocks mentioned in Schedule A. to this Act annexed, and the Lands and Hereditaments herein-before mentioned.

Breadth of River, Haven, and Harbour, and Length of Harbour.

XXXVII. And be it further enacted, That the Lands and Grounds to be taken or used for improving and making the said River, Haven, Cuts, New Haven and Harbour, and the Slopes and Embankments thereof, and for the Towing Paths thereto, and the Ditches, Drains, and

and Fences to separate such Slopes, Embankments, and Towing Paths from the adjoining Lands, shall not, including the Bed or Channel of the River or Haven, exceed Three hundred and fifty Feet in Breadth between *Abbott's Mill* in the said City of *Canterbury* and *Sandwich* Bridge; and shall not exceed Four hundred Feet in Breadth between the said Bridge and the said Harbour; and shall not exceed Two thousand Feet in Length above High Water Mark, and Nine hundred Feet in Breadth at the said Harbour, except in such Places where any Docks or Basins shall be made, and except in such Places where it shall be judged proper by the said Company for Boats or other Vessels to turn, lie, or pass each other, or where any Locks, Quays, Wharfs, or Warehouses may be made or erected by virtue of the Powers hereby given; nor in any such excepted Places more than One hundred Feet more in Breadth, without the Consent of the Owner or Owners of the Lands and Hereditaments adjoining to the said River, Haven, Cuts, New Haven and Harbour, given under his, her, or their Hand and Seal or Hands and Seals: Provided always, that the said Company of Proprietors may extend the said Harbour, and the Piers, Jetties, and other necessary Erections there, any Length they may think proper into the Sea below High Water Mark: And provided also, that the said Company of Proprietors may also take for the Purposes of this Act, or any Purposes connected therewith, or for the Erection of Houses and Buildings at or near the said Harbour, any Quantity of Land not exceeding altogether Three Acres, situate, adjoining, or near to the South or North or both Sides of the said Harbour, in such Direction and with such Abuttals as the said Company of Proprietors shall think fit, paying for the same the Value thereof.

The Company not to interfere with the River Stour before the Completion of the intended Haven and the Cut from Sandwich to the Sea, &c.

XXXVIII. Provided always, and be it enacted, That nothing herein contained shall authorize or empower the said Company of Proprietors to make, do, execute, or perform any of the Works and Improvements in or upon the said River *Stour*, or in or upon the Line thereof from the Bridge in the Town of *Sandwich* aforesaid to *Fordwich* Bridge aforesaid, before or until they shall have made and completed the said intended New Haven or Harbour, and the Cut or Canal from the Sea to *Sandwich* Bridge, and until they shall have made and completed the respective Works, Cuts, and Canals from the said City of *Canterbury* to *Fordwich* Bridge, save and except nevertheless such Works as may be necessary to remove or clear away the Shoals and Obstructions within the Banks of the said River *Stour* between *Sandwich* Bridge aforesaid and the *Stonar* Cut.

Plans and Books of Reference deposited with the Clerks of the Peace for the County, City, and Port.

XXXIX. And whereas a Survey has been made to ascertain the Practicability of improving and making the said River, Haven, Cuts, New Haven, and Harbour, and Maps or Plans, with Books of Reference thereto, have been deposited at the Offices of the Clerks of the Peace of the said County of *Kent*, City and County of the City of *Canterbury*, and Town and Port of *Sandwich*, respectively; be it therefore enacted, That the said Plans and Books of Reference shall remain, and be safely kept in the Custody of the same Clerks of the Peace respectively; and that it shall and may be

lawful for all Persons to resort to any of such Maps, Plans, and Books of Reference, and to examine or make Extracts from, or Copies of the same, as Occasion shall require, paying to the said Clerks for Copies of or Extracts from the said Books of Reference after the Rate of Sixpence for every One hundred Words; and the said Maps or Plans, and Books of Reference, so certified, or true Copies thereof, shall be and are hereby declared to be good Evidence in all Courts of Law or elsewhere; and the Clerks for the Time being to the said Company of Proprietors, upon Seven Days Notice to them given for that Purpose, shall and they are hereby required, from Time to Time, to produce the said Maps or Plans, and Books of Reference, so deposited with them as aforesaid, before any Jury or Juries to be impannelled by virtue of this Act, at the Time and Place to be mentioned in such Notice, in order that the same may be then and there given in Evidence, such Clerks to the said Company of Proprietors having a reasonable Sum of Money allowed for their Travelling Expences, Absence from Home, and Attendance on such Occasions.

Reservoirs to be made pursuant to Plan.

XL. Provided always, and be it further enacted, That the said Company of Proprietors, in making the said Reservoirs, shall not deviate from the Situation thereof, as delineated in the said Map or Plan.

Not to deviate without Consent.

XLI. And be it further enacted, That the said Company of Proprietors, in improving and making the said River, Haven, Cuts, New Haven and Harbour, shall not deviate from the Course or Direction delineated in the said Maps or Plans, and set forth in the said Books of Reference, more than One hundred Yards from the Course or Direction specified in the said Maps or Plans.

Landholders omitted in the Book of Reference not to obstruct the making the Navigation.

XLII. Provided always, and it is hereby further enacted and declared, That the said Company of Proprietors shall and may improve and make the said River, Haven, Cuts, New Haven and Harbour, respectively, or Deviations from the same, into, through, across, or over the Estates, Lands, or Grounds of any Person or Persons whomsoever, into whose Estates, Lands, or Grounds such Deviations as aforesaid shall extend (although their Names be not mentioned in the said Book of Reference), or into the Estate or Estates, Lands, or Grounds of any Person or Persons whose Name or Names appear to the Satisfaction of any Two or more of the Justices of the Peace of the County or Place where the Land shall be situated, and be by them certified under their Hands, to have been by Mistake omitted in the said Book of Reference, or that instead thereof the Name or Names of some other Person or Persons, to whom such last-mentioned Estates, Lands, or Grounds do not belong, hath or have been by Mistake inserted therein; any thing herein contained to the contrary thereof notwithstanding.

Bodies Politic, &c. empowered to sell and convey Lands.

XLIII. And be it further enacted, That after any Lands, Grounds, Tenements, or Hereditaments, shall be set out and ascertained for making the said River, Haven, Cuts, New Haven and Harbour, or any Part or Parts thereof, and for providing and constructing the Basins, Locks, Quays, Wharfs, Warehouses, and other Works and Conveniences

Conveniences herein-before mentioned, or any of them, it shall and may be lawful to and for all Bodies Politic, Corporate, or Collegiate, Corporations Aggregate or Sole, Tenants for Life, or in Fee Tail, General or Special, or for Years determinable on any Life or Lives, and all Husbands, Guardians, Trustees, and Feoffees in Trust for charitable and other Purposes, Committees, Executors, and Administrators, and all other Trustees and Persons whomsoever, not only for and on behalf of themselves, their Heirs and Successors, but also for and on behalf of their Cestuique Trusts, whether Infants, Issue unborn, Lunatics, Idiots, Femes Covert, or other Person or Persons, and to and for all Femes Covert who are or shall be seised, possessed of, or interested in their own Right, or entitled to Dower or other Interest therein, and for every other Person or Persons whomsoever, who is, are, or shall be seised, possessed of, or interested in any Lands, Grounds, Tenements, or Hereditaments which shall be so set out and ascertained for the Purposes aforesaid, to contract for, sell, and convey the same, and every Part thereof, unto the said Company of Proprietors; and all such Sales, Conveyances, and Assurances shall be made at the Expence of the said Company of Proprietors, and shall be made according to the following Form; *videlicet*,

Form of Conveyance to the Company.

'I *A. B.* of in consideration of the Sum
' of to be paid by the *Canterbury*
' Navigation and *Sandwich* Harbour Company, do hereby grant, bar-
' gain, sell, and release to the said Company all [*describing the*
' *Premises to be conveyed*] and all my Right, Title, and Interest to
' and in the same and every Part thereof, to hold to the said Com-
' pany and their Successors for ever, by virtue and according to the
' true Intent and Meaning of an Act of Parliament made in the
' Sixth Year of the Reign of His Majesty King *George* the Fourth,
' intituled [*here insert the Title of this Act*]. In witness whereof I
' have hereunto set my Hand and Seal this
' Day of in the Year of our Lord
'.'

Which said Conveyance shall be enrolled in One of His Majesty's Courts of Record at *Westminster* within Three Calendar Months after the Execution thereof, and the same shall be kept by the Clerks to the said Company of Proprietors, who shall from Time to Time, when required, deliver attested Copies thereof to any Person or Persons requiring the same, and shall have and receive Sixpence for every Seventy-two Words of each such attested Copy, and so in proportion for any less Number of Words, exclusive of the Stamp Duty.

Commons and Waste Lands to be conveyed by the Lords or Ladies of the Manor.

XLIV. And be it further enacted, That in all Cases where in improving and making the said River, Haven, Cuts, New Haven and Harbour, and the Basins, Locks, Quays, Wharfs, Warehouses, or other Works hereby authorized to be made, or any Road or Roads thereto respectively, there shall be occasion to cut through, take, or use any Part of any Commons or Wastes, the Conveyance of such Parts of such Commons or Wastes by the Lord or Lords, Lady or Ladies of the Manor or Manors in which the same are situate, to the said Company of Proprietors, shall be a good and sufficient Conveyance; and the Lord or Lords, Lady or Ladies of such Manor or Manors

Manors respectively, are hereby authorized and required to make and execute such Conveyances accordingly, on the Receipt of his, her, or their Proportion or Proportions of the Purchase Money as herein-after mentioned, or on the same being tendered to him, her, or them, subject to the Rules, Regulations, and Provisions herein contained with respect to the Payment of other Monies for other Lands taken or used by the said Company; and the said Jury shall ascertain what Proportions of the Purchase Money shall be due to the said Lord or Lords, Lady or Ladies, or other Persons interested in such Commons or Wastes, for his, her, or their Interest in such Lands, and such Proportions shall be thereupon paid to him, her, or them, and the Remainder thereof shall be paid to the Surveyors of the Highways of the Parish, Township, or Place in which such Commons or Wastes shall be situated, to be applied and accounted for in like Manner as any other Monies received by such Surveyors.

Satisfaction to be made.

XLV. Provided always, and be it enacted, That all and every Body or Bodies Politic, Corporate or Collegiate, Trustees, or other Persons herein-before capacitated to sell or convey Lands, Tenements, and other Hereditaments, or any other Owner or Owners, and the Occupier or Occupiers of any Lands, Tenements, or other Hereditaments through, in, or upon which the said River, Haven, Cuts, New Haven, Harbour, or other Works hereby authorized are intended to be improved and made, or of any Mills or other Works, or Hereditaments, from which any Water may or shall be taken or diverted, or to which any Injury or Damage shall be done by carrying this Act into Execution, may accept and receive Satisfaction for the Value of such Lands, Grounds, Tenements, Mills, or other Works, Water, and Hereditaments, and for the Damages to be sustained by making and completing the said Works herein-before directed, in gross Sums, as shall be agreed upon by and between the said Parties interested respectively, or any of them, and the said Company of Proprietors; and in case the said Company of Proprietors and the said Parties interested in such Lands, Grounds, Tenements, or other Hereditaments, cannot agree as to the Amount or Value of such Satisfaction, the same shall be ascertained and settled by the Verdict of a Jury as is herein-after directed.

If Parties cannot agree, Price to be settled by a Jury.

Company compellable to purchase small Slips of Land left by the Sides of the Navigation.

XLVI. And be it further enacted, That if in improving and making the said River, Haven, Cuts, New Haven and Harbour, or any of the said Works, any Pieces or Parcels of Land or Ground shall be cut through or divided, so that what shall be left on each or either Side of the said River, Haven, Cuts, New Haven or Harbour, or other Works, shall be less than One Acre in Quantity, or less than Twenty Yards in average Breadth throughout the whole Length thereof, and if the Owner or Owners of any such Pieces or Parcels of Land or Ground shall not have any other Land or Ground adjoining or contiguous to what shall be left on either Side of the said River, Haven, Cuts, New Haven or Harbour, then and in every such Case the said Company shall also take and purchase the Piece or Parcel, Pieces or Parcels of Land or Ground so to be left on each or either Side of the said River, Haven, Cuts, New Haven

and Harbour, being less than One Acre in Quantity, or less than Twenty Yards in average Breadth throughout the whole Length thereof as aforesaid, and shall pay for the same after and in the same Manner as they shall pay for the Land or Ground adjoining thereto, which shall be taken and used for improving and making the said River, Haven, Cuts, New Haven and Harbour, provided the Owner or Owners, or Person or Persons entitled to the Possession or to the Rents and Profits of such small Pieces or Parcels of Land or Ground respectively, shall require the said Company to take and purchase the same, but not otherwise.

If Parties cannot agree, Value to be ascertained by a Jury.

XLVII. Provided always, and be it further enacted, That if any such Body Politic, Corporate, or Collegiate, Trustee or Trustees, or other Person or Persons interested or entitled as aforesaid, shall upon Notice in Writing given to the principal Officer of any such Body Politic, Corporate, or Collegiate, or to such Trustee or Trustees, Person or Persons respectively, or left at the last or usual Place or Places of his, her, or their Abode, or with the Tenant or Tenants, Occupier or Occupiers of any Lands or other Hereditaments to be made use of for the Purposes of this Act, for the Space of Twenty-one Days next after such Notice, neglect or refuse to treat, or shall not agree with the said Company of Proprietors, or by reason of Absence or otherwise shall be prevented from treating, or through Disability by Non-age, Coverture, or other Impediment, cannot treat for themselves, or make such Agreement or Agreements as shall be necessary for the Purposes aforesaid, or shall not within the before-mentioned Space of Twenty-one Days produce and fully disclose the State of the Title to the Premises which he, she, or they are or shall be in Possession of, and to the Interest which he, she, or they claim therein, then and in every such Case the same shall be ascertained and settled by a Jury of Twelve Persons, to be summoned and chosen by the Sheriff of the County in which such Lands, Tenements, or Hereditaments are situate, or by the Lord Warden of the Cinque Ports and Constable of *Dover Castle*, or his Deputy, or the Mayor of the said Town and Port of *Sandwich*, in case such Lands, Tenements, or other Hereditaments are situate in the said Town and Port of *Sandwich* or the Liberties thereof, and which such Sheriff, or Lord Warden and Constable, or his Deputy, or Mayor, is hereby required to summon and choose in the Manner in which Juries are or may be summoned and chosen by Sheriffs of Counties in *England*, when directed so to do by Warrant under the Common Seal of the said Company of Proprietors, particularising the Place and Time; and every such Jury shall be liable and subject to the same Regulations, and to the same Pains and Penalties for Default, as if he or they had been returned for the Trial of any Issue joined in any of His Majesty's Courts at *Westminster;* and all Parties concerned may have their lawful Challenges against any of the said Jurymen, but shall not challenge the Array; and the said Sheriff, or Lord Warden and Constable, or his Deputy, or Mayor, is hereby empowered and required, by a Summons or Notice under his Hand, either previous to or at the Time of any such Meeting or Meetings, to summon and call before him all and every Person or Persons who shall be thought necessary to be examined as a Witness or Witnesses

touching the Matters in question, and to hear and examine such Witness or Witnesses upon Oath; and the said Sheriff, or Lord Warden and Constable, or his Deputy, or Mayor, may order and authorize the said Jury, or any Six or more of them, to view the Place or Places, or Matter or Matters in question; which Jury upon their Oaths (which Oaths, as well as the Oaths to such Person or Persons as shall be called upon to give Evidence, the said Sheriff, or Lord Warden and Constable or his Deputy, or Mayor, is hereby empowered to administer) shall inquire of, assess, and ascertain the Sum of Money to be paid for the Purchase of such Lands, Tenements, or other Hereditaments, or the Recompence to be made for the Damages that shall or may be sustained as aforesaid, and shall assess separate Damages for the same; and the said Sheriff, or Lord Warden and Constable or his Deputy, or Mayor, shall give Judgment for such Purchase Monies or Recompence so to be assessed by such Jury; which said Verdict, and the Judgment thereupon pronounced as aforesaid, shall be signed by the said Sheriff, or Lord Warden and Constable or his Deputy, or Mayor, and shall be binding and conclusive to all Intents and Purposes against all Bodies Politic, Corporate, or Collegiate, and all other Persons, and shall not be removed by Certiorari or other Process into any of His Majesty's Courts of Record at *Westminster*, or any other Court, any Law or Statute to the contrary thereof notwithstanding: Provided always, that Twenty-one Days previous Notice in Writing at the least of the Day, Hour, and Place at which such Jury is required to be returned, be given to the Bodies Politic, Corporate, or Collegiate, or to the Person or Persons interested or entitled, or claiming so to be, by leaving such Notice at the Dwelling House of the Head Office of such Body or Bodies Politic, Corporate, or Collegiate, or at the Place of Residence of such Person or Persons interested or entitled, or claiming so to be, or of some Tenant or Occupier of the Premises respectively intended to be valued.

Fine upon Jurors, &c. making Default.

XLVIII. And be it further enacted, That if any Person so summoned and returned as aforesaid upon such Jury shall not appear, or appearing shall refuse to be sworn or to give his Verdict, or in any other Manner wilfully neglect his Duty, contrary to the true Intent of this Act, having no reasonable Excuse, to be allowed by the said Sheriff, or Lord Warden and Constable or his Deputy, or Mayor or his Deputy; or if any Person so to be summoned to give Evidence as aforesaid shall not appear, on being paid or tendered a reasonable Sum for his, her, or their Costs and Expences, or appearing shall refuse to be sworn or examined, or to give Evidence; then and in such Case every Person so offending shall, for every such Offence, forfeit and pay any Sum not exceeding Five Pounds, to be levied by virtue of any Warrant under the Hand and Seal of the said Sheriff, or Lord Warden and Constable or his Deputy, or Mayor or his Deputy, by Distress and Sale of the Goods and Chattels of the Person so offending, rendering to him or her the Overplus, after such Penalty and the Charges of such Distress and Sale shall be deducted; and every such Penalty shall go and be paid to the Party or Parties who shall appear to the said Sheriff, or Lord Warden and Constable

or

or his Deputy, or Mayor or his Deputy, to be injured by the Default of such Person so offending.

Expences of Juries.

XLIX. And be it further enacted, That in each and every Case where a Verdict shall be given for more Money, as a Recompence or Satisfaction for the absolute Sale of any Lands, Tenements, or other Hereditaments of or belonging to any Body or Bodies Politic, Corporate, or Collegiate, or to any Person or Persons unknown, or as Compensation for any Damages done or to be done to any Lands, Tenements, Hereditaments, or other Property, than had been previously offered by or on behalf of the said Company of Proprietors, or where any Verdict shall be found for any Damages where the Dispute is for Damages only, or where no Compensation or a smaller Sum than shall be given by such Verdict had been previously offered or tendered in respect thereof by or on behalf of the said Company of Proprietors, or where, by reason of Absence in foreign Countries, or other Impediment or Disability as aforesaid, there shall not be found any Person or Persons at hand who may be legally capacitated to enter into a Contract with and make Conveyances to and receive Compensation from the said Company of Proprietors, as herein-before mentioned, then and in all such Cases all the reasonable Costs and Expences of impannelling, summoning, and returning such Jury and taking such Verdict shall be settled by the said Sheriff, or Lord Warden and Constable or his Deputy, or Mayor or his Deputy, and be defrayed by the said Company of Proprietors; and in case such Costs shall not be paid by the said Company of Proprietors or their Directors within Twenty-one Days after the same shall be demanded, the same shall and may be levied, by virtue of any Warrant under the Hand and Seal of any Justice of the Peace acting in and for the County or Place, by Distress and Sale of the Goods and Chattels of the same Company; but if any Verdict shall be given for the same Sum as had been previously offered by or on behalf of the said Company of Proprietors, or for a less Sum than had been so previously offered, or in case of such Refusal or Neglect to enter into Treaty with, or make Conveyances to, or receive Compensation from the said Company of Proprietors, by any Body or Bodies Politic, Corporate, or Collegiate, or by any Person or Persons whomsoever, who is or are by the Provisions of this Act or otherwise legally capacitated to treat and convey or receive such Compensation as aforesaid, then and in all such Cases (except where by reason of Absence or otherwise any Person or Persons shall have been prevented from treating and agreeing as aforesaid, when such Costs and Expences shall be paid by the said Company of Proprietors) the Costs and Expences of impannelling, summoning, and returning such Jury and taking such Verdict shall be settled in like Manner by the said Sheriff, or Lord Warden and Constable or his Deputy, or Mayor, so impannelling, summoning, and returning such Jury and taking such Verdict, and be borne and paid in the Manner following, that is to say, One Moiety or Half Part of such said Costs and Expences shall be borne and paid by the said Company of Proprietors, and the other Moiety or Half Part thereof by the Body or Bodies Politic, Corporate, or Collegiate, or other Person or Persons with whom the said Company of Proprietors shall have such Disputes or Controversies; which

which said Costs and Expences having been so settled shall and may be deducted out of the Money so assessed and adjudged, as so much Money advanced to and for the Use of such Body or Bodies Politic, Corporate, or Collegiate, or other Person or Persons as aforesaid, and the Payment or Tender of the Remainder of such Sum or Sums of Money shall be deemed and taken to all Intents and Purposes to be a payment or Tender of the whole Sum or Sums of Money so assessed and adjudged; and in case no Compensation shall be given by such Verdict, where the Dispute is for Compensation only, such Costs and Expences, after having been so ascertained and settled as aforesaid, shall and may be recovered by the said Company by such Ways and Means as are herein provided for the Recovery of any Penalty or Forfeitures incurred by this Act.

Persons requesting Juries to enter into Bonds to prosecute.

L. And be it further enacted, That all and every Person or Persons making Complaint, and requesting a Jury to be summoned, shall (before the said Sheriff, or Lord Warden and Constable or his Deputy, or Mayor or his Deputy, shall issue out his Summons for that Purpose) enter into a Bond with Two sufficient Sureties, to the Treasurer or Treasurers to the said Company of Proprietors, in a Penalty of One hundred Pounds, with Condition to prosecute his, her, or their Complaint, and to bear and pay the Costs and Expences of summoning such Jury and taking such Verdict, in case the same shall be given for no greater or for a less Sum than had been offered by or on behalf of the said Company of Proprietors, for the Purchase of any Lands, Grounds, Mills, Tenements, or Hereditaments, or as a Compensation for any Damages; or in case no Verdict shall be found for Damages where the whole Dispute was whether any Damage was or was not done as aforesaid.

Notice of Injury to be given to the Company before Appeal to a Jury.

LI. And be it further enacted, That the said Company of Proprietors shall not be obliged by virtue of this Act to receive or take Notice of any Complaint or Complaints to be made by any Person or Persons whomsoever, for any Injury or Damage by him, her, or them sustained, or supposed to be sustained by virtue or in consequence of this Act, unless Notice in Writing shall have been given in relation thereto, by or on behalf of such Person or Persons, to the said Company of Proprietors, in Manner by this Act directed, within the Space of Six Calendar Months next after the Time that such supposed Injury or Damage shall have been sustained, or the doing or committing thereof shall have ceased.

Compensation to be in gross Sums of Money.

LII. And be it further enacted, That the said Company of Proprietors shall make Compensation for any Lands, Tenements, or Hereditaments to be purchased under the Powers of this Act, or for any Damages that may be done thereto by the said Company, in gross Sums of Money, and not by way of Annual Rents.

Verdict for Value of Lands and Damages to be ascertained separately.

LIII. And be it further enacted, That the said Juries shall award all Judgments and Verdicts which they shall make and give in the Execution of the Powers hereby vested in them concerning the Value of Lands, Mills, Tenements, and other Hereditaments, separately and distinctly from the Consideration of any other Damages sustained

sustained or to be sustained by any Person or Persons in consequence of the Execution of any of the Powers of this Act, and shall distinguish the Value set upon the Lands, Tenements, and other Hereditaments, and the Money assessed or adjudged for such Damages as aforesaid, separately and apart from each other, and also shall settle what Shares and Proportions of the whole Value of Lands, Mills, Tenements, and other Hereditaments, or of the whole Compensation for Damages, shall be allowed to any Tenant, or other Person or Persons having a particular Estate, Term, or Interest in the Premises, for his, her, or their respective Estate, Term, or Interest therein, and what Shares and Proportions of such Value or Compensation shall be allowed to the Owner or Owners of the Premises subject to such particular Estates, Term, or Interest.

Power to enter and take Possession of Lands, &c. on Payment or Tender of Purchase Money.

LIV. And be it further enacted, That upon Payment or legal Tender of such Sum or Sums of Money as shall have been contracted or agreed for between the Parties, or assessed by such Juries in Manner aforesaid, for the Purchase of any such Lands, Waters, Mills, Tithes, Tenements, or other Hereditaments, or as a Compensation for Damages as herein mentioned, to the Proprietor or Proprietors of such Lands, Waters, Mills, Tithes, Tenements, or other Hereditaments, or to such other Person or Persons as shall be interested therein or entitled to receive such Money or Compensation respectively, within Three Calendar Months after the same shall have been so agreed for or assessed; or if the Person or Persons so entitled or interested, or any of them, cannot be found, or shall refuse to receive the same, then upon Payment of the said Sum or Sums of Money within the said Three Calendar Months into the Bank of *England*, as herein-after directed and required, for the Use of the Person or Persons entitled thereto, but not before; it shall and may be lawful to and for the said Company of Proprietors and their Agents, Workmen, and Servants, immediately to enter upon such Lands, Grounds, Waters, Mills, Tenements, and other Hereditaments respectively, and then and thereupon such Lands, Grounds, Waters, Mills, Tenements, and other Hereditaments, together with the Yearly Profits thereof, and all the Estate, Use, Trust, and Interest of any Person or Persons therein, shall from thenceforth be vested in and become the sole Property of the said Company of Proprietors and their Successors to and for the Purposes of this Act for ever; and such Payment shall not only bar all Right, Title, Claim, Interest, and Demand of the Person or Persons to whom the same shall or ought to have been made, but also shall extend to and be deemed and construed to bar the Dower of the Wife of every such Person, and all Estates Tail and other Estates in Reversion and Remainder of his, her, or their Issue, and of every other Person whomsoever therein: Provided nevertheless, that before such Payment or Tender as aforesaid, it shall not be lawful for the said Company of Proprietors, or any Person or Persons acting under their Authority, to dig or cut the Lands or Grounds, or to take down, remove, or otherwise affect any Mill, Tenement, or other Hereditament of the Party or Parties entitled to such Payment, for the Purpose of improving and making the said River, Haven, Cuts, New Haven and Harbour, and other Works, without the Leave and Consent of such Party or Parties respectively;

respectively; and in case any Person or Persons shall enter upon any such Premises for the Purposes of this Act, until such Payment or Tender shall have been made, every Person or Persons so offending shall forfeit and pay the Sum of Ten Pounds for every Day he or they shall remain on the said Premises.

Verdicts to be recorded.

LV. And be it further enacted, That each and every Verdict shall be transmitted to and kept by the respective Clerks of the Peace, or other Persons having the Custody of the Records of the Quarter or General Sessions of the Peace for the said Counties or Places respectively wherein the Matter in question shall happen, and shall be deemed to be Records of such Quarter or General Sessions of the Peace to all Intents and Purposes; and the same, or true Copies thereof, shall be allowed to be good Evidence in all Courts whatsoever; and all Persons shall have Liberty to inspect the same, paying for such Inspection the Sum of One Shilling, and to have Copies thereof, paying for every Copy the Sum of Sixpence for every Hundred Words, and so in proportion for any greater or less Number of Words, exclusive of the Stamp Duty.

Application of Compensation when amounting to 200*l.*

LVI. And be it further enacted, That if any Money shall be agreed or assessed to be paid for any Lands, Tenements, or Hereditaments purchased, taken, or used by virtue of this Act, which shall belong to any Body Politic, Corporate, or Collegiate, Corporation Aggregate or Sole, Feoffees in Trust, Guardians, Committees, Trustees, Femes Covert, or any other incapacitated Person or Persons, such Money shall, if the same amount to or exceed the Sum of Two hundred Pounds, with all convenient Speed be paid into the Bank of *England* in the Name and with the Privity of the Accountant General of His Majesty's Court of Exchequer at *Westminster*, to be placed to his Account *exparte* the said Company of Proprietors of the *Canterbury* Navigation and *Sandwich* Harbour, pursuant to the Method prescribed by an Act made in the First Year of the Reign of His present Majesty, intituled *An Act for the better securing Monies and Effects paid into the Court of Exchequer at* Westminster *on account of the Suitors of the said Court, and for the Appointment of an Accountant General and Two Masters of the said Court, and for other Purposes*, and the General Orders of the said Court, and without Fee or Reward, to the Intent that such Money shall be paid, under the Direction and with the Approbation of the said Court, to be signified by an Order made upon a Petition to be preferred in a summary Way by the Party or Parties who would have been entitled to the Rents and Profits of the said Lands, Tenements, or Hereditaments, in the Purchase of the Land Tax, or the Discharge of any Debt or Debts, or such other Incumbrance or Incumbrances, or Part thereof, as the said Court shall authorize to be paid, affecting the same Lands, Tenements, or Hereditaments, or affecting other Lands, Tenements, or Hereditaments standing settled to the same or the like Uses, Intents, or Purposes; or where such Money shall not be so applied, then the same shall be laid out and invested under the like Direction and Approbation of the said Court in the Purchase of other Lands, Tenements, and Hereditaments, which shall be conveyed and settled to, for, and upon such and the like Uses, Trusts, Intents,

1 G. 4. c. 35.

Intents, and Purposes, and in the same Manner as the Lands, Tenements, or Hereditaments which shall be so purchased, taken, or used as aforesaid stood settled or limited, or such of them as at the Time of making such Conveyance and Settlement shall be existing undetermined and capable of taking effect; and in the meantime, and until such Purchase shall be made, the said Money shall, by Order of the said Court of Exchequer, upon Application thereto, be invested by the said Accountant General in his Name in the Purchase of Three Pounds *per Centum* Consolidated or Three Pounds *per Centum* Reduced Bank Annuities; and in the meantime and until the said Bank Annuities shall be ordered by the said Court to be sold for the Purposes aforesaid, the Dividends and Annual Produce of the said Consolidated or Reduced Bank Annuities shall from Time to Time be paid, by Order of the said Court, to the Party or Parties who would for the Time being have been entitled to the Rents and Profits of the said Lands, Tenements, and Hereditaments to be purchased by virtue of this Act, in case such Purchase or Settlement were made.

Application when the Money is less than 200*l.* and exceeding 20*l.*

LVII. Provided always, and be it further enacted, That if any Money so agreed or awarded to be paid for any Lands, Tenements, or Hereditaments purchased, taken, or used for the Purposes aforesaid, and belonging to any Body or Bodies Politic, Corporate, or Collegiate, Corporation or Corporations Aggregate or Sole, or to any Person or Persons under any Disability or Incapacity as aforesaid, shall be less than the Sum of Two hundred Pounds, and shall exceed the Sum of Twenty Pounds, then and in all such Cases the same shall, at the Option of the Party or Parties for the Time being entitled to the Rents and Profits of the Lands, Tenements, or Hereditaments so purchased, taken, or used, or of his, her, or their Guardian or Guardians, Committee or Committees, in case of Infancy, Idiotcy, or Lunacy, to be signified in Writing under his, her, or their respective Hand or Hands, be paid into the Bank of *England* in the Name and with the Privity of the Accountant General of the said Court of Exchequer, and be placed to his Account as aforesaid, in order to be applied in Manner herein-before directed; or otherwise the same shall be paid at the like Option to Two Trustees, to be nominated by the Person or Persons making such Option, and approved of by Three or more of the said Directors, such Nomination and Approbation to be signified in Writing under the Hand or Hands of the nominating and approving Party or Parties, in order that such Principal Money, and the Dividends arising thereon, may be applied in Manner herein-before directed, so far as the Case be applicable, without obtaining or being required to obtain the Direction or Approbation of the said Court of Exchequer.

Application when the Sum is 20*l.* or under.

LVIII. Provided also, and be it further enacted, That when such Money so agreed or awarded to be paid as herein-before mentioned shall amount to the Sum of Twenty Pounds only, or be less than that Sum, then and in all such Cases the same shall be paid to or applied to the Use of the Party or Parties who would for the Time being have been entitled to the Rents and Profits of the Lands,

Tenements, or Hereditaments so purchased, taken, or used for the Purposes of this Act, in such Manner as the said Court of Directors, or any Three or more of them, shall think fit; or in case of Infancy, Idiotcy, or Lunacy, then to his, her, or their Guardian or Guardians, Committee or Committees, to and for the Use and Benefit of such Person or Persons so entitled respectively.

In case of not making out Titles, &c.

LIX. And be it further enacted, That in case the Party or Parties to whom any Sum or Sums of Money shall be awarded or assessed for any Lands, Tenements, or Hereditaments to be purchased by virtue of this Act, shall refuse to accept the same, or shall not be able to make a good Title to the Premises to the Satisfaction of the said Company of Proprietors; or in case the Party or Parties to whom such Sum or Sums of Money shall be awarded or assessed as aforesaid cannot be found; or if the Person or Persons entitled to such Lands, Tenements, or Hereditaments, be not known or discovered; then and in every such Case it shall be lawful for the said Company of Proprietors to order the Sum or Sums of Money so awarded or assessed as aforesaid, to be paid into the Bank of *England* in the Name and with the Privity of the Accountant General of the said Court of Exchequer, to be placed to his Account, to the Credit of the Party or Parties interested in the said Lands, Tenements, or Hereditaments, (describing them), subject to the Order, Controul, and Disposition of the said Court of Exchequer; which said Court, on the Application of any Party or Parties making claim to such Sum or Sums of Money, or any Part thereof, by Motion or Petition, shall be and is hereby empowered, in a summary Way of Proceeding or otherwise, as to the same Court shall seem meet, to order the same to be laid out and invested in the Public Funds, and to order Distribution thereof, or Payment of the Dividends thereof, according to the respective Estate or Estates, Title or Interest of the Party or Parties making claim thereunto, and to make such other Order in the Premises as to the said Court shall seem just and reasonable; and the Cashier or Cashiers of the Bank of *England* who shall receive such Sum or Sums of Money is and are hereby required to give a Receipt or Receipts for such Sum or Sums of Money, mentioning and specifying for what and for whose Use the same is or are received, to such Party or Parties as shall pay any such Sum or Sums of Money into the Bank as aforesaid.

Parties in Possession presumptively entitled.

LX. Provided always, and be it further enacted, That when any Question shall arise touching the Title of any Party or Parties to any Money to be paid into the Bank of *England* in the Name and with the Privity of the Accountant General of the Court of Exchequer, in pursuance of this Act, for the Purchase of any Lands, Tenements, or Hereditaments, or of any Estate, Right, or Interest in any Lands, Tenements, or Hereditaments to be purchased in pursuance thereof, or to any Bank Annuities to be purchased with any such Money, or to the Dividends or Interest of any such Bank Annuities, the Party or Parties who shall have been in Possession of such Lands, Tenements, and Hereditaments at the Time of such Purchase, and all Persons claiming under such Party or Parties, or

under the Possession of such Party or Parties, shall be deemed and taken to be lawfully entitled to such Lands, Tenements, and Hereditaments, according to such Possession, until the contrary shall be shewn to the Satisfaction of the said Court of Exchequer; and the Dividends or Interest of the Bank Annuities to be purchased with such Money, and also the Capital of such Bank Annuities, shall be paid, applied, and disposed of accordingly, unless it shall be made appear to the said Court that such Possession was a wrongful Possession, and that some other Party or Parties was or were lawfully entitled to such Lands, Tenements, or Hereditaments, or to some Estate or Interest therein.

The Court may order reasonable Expences of Purchases to be paid by the Company of Proprietors.

LXI. And be it further enacted, That where by reason of any Disability or Incapacity of the Person or Persons, or Corporation or Corporations, entitled to any Lands, Tenements, or Hereditaments to be purchased under the Authority of this Act, the Purchase Money for the same shall be required to be paid into the said Court of Exchequer, and to be applied in the Purchase of other Lands, Tenements, or Hereditaments, to be settled to the like Uses in pursuance of this Act, it shall be lawful for the said Court to order the Expences of all Purchases from Time to Time to be made in pursuance of this Act, or so much of such Expences as the said Court shall deem reasonable, together with the necessary Costs and Charges of obtaining such Order, to be paid by the said Company of Proprietors, who shall from Time to Time pay such Sums of Money for such Purposes as the said Court shall direct.

Compensation to Messrs. Richard and Charles Emmerson.

LXII. And whereas by the Operation of this Act it may happen that the Works for the Manufactory of Salt in the Parish of *Stonar*, in the said Isle of *Thanet* and County of *Kent*, belonging to *Richard Emmerson* and *Charles Emmerson*, may in the course of Time be deprived of a proper and due Supply of Salt Water for the Use of the same Works, and such Works may thereby be greatly injured or deteriorated in Value; be it therefore enacted, That in case it shall at any Time hereafter happen, that by the Operation of this Act the said Works shall be deprived of a proper and due Supply of Salt Water for the Use thereof, and any Damage or Injury shall be thereby sustained by the Owners or Owner, and their, his, or her Lessees or Lessee, then and in such Case Compensation and Recompence shall be made to such Owners or Owner of such Works, or their, his, or her Lessees or Lessee, by the said Company of Proprietors, for such Damage or Injury, according to the Amount or Value thereof; such Compensation and Recompence to be ascertained, in case of any Difference concerning the same, in like Manner as other Damages to be sustained by the making and completing the Works herein-before directed to be made are by this Act directed to be ascertained.

Compensation to Corporation of Fordwich for Fishery.

LXIII. And whereas the said Mayor, Jurats, and Commonalty of the said Town of *Fordwich* and its Liberties are entitled to the Fishery of the River *Stour* and its Branches within the said Liberties, but their Enjoyment of the Fishery will be greatly injured by the Operation of this Act; be it therefore enacted, That the Recompence

or Satisfaction to be made to the said Mayor, Jurats, and Commonalty, for the Loss or Injury they may sustain as aforesaid, shall be settled and ascertained by a Jury to be impannelled, summoned, and returned in Manner by this Act directed, if not otherwise settled and arranged between the Parties; and in case of Default or Refusal of Payment thereof by the said Company of Proprietors, the same shall and may be recovered from them by the said Mayor, Jurats, and Commonalty of the said Town and Liberties of *Fordwich* and their Successors, by Action of Debt in any of His Majesty's Courts of Record at *Westminster*, wherein no Essoign, Protection, or Wager of Law, or more than One Imparlance, shall be granted or allowed.

Compensation to Owners and Occupiers of Lands in the Parish of Stonar.

LXIV. And whereas by the Operation of this Act it may happen that the Drainage of the Lands in the Parish of *Stonar* aforesaid (which sew and drain into the present Haven of *Sandwich* aforesaid) may in the Course of Time be prevented and stopped, and such Lands may thereby be greatly injured or deteriorated in Value; be it therefore enacted, That in case it shall happen at any Time hereafter that by the Operation of this Act the proper Drainage of any Lands in the said Parish of *Stonar* shall be prevented or stopped, and any Damage or Injury shall be thereby sustained by the Owners or Occupiers thereof, then and in such Case it shall and may be lawful for the said Company of Proprietors, and they are hereby required, at their own Expence, to provide new and ample Drainage for the said Lands, (the said Owners and Occupiers for ever after keeping and maintaining the same in proper Repair,) and Compensation and Recompence shall be made by the said Company of Proprietors to such Owners or Occupiers of the said Lands for such Damage or Injury, according to the Amount or Value thereof; such Compensation and Recompence to be ascertained, in case of any Difference concerning the same, in like Manner as other Damages to be sustained by the making and completing the Works herein-before authorized to be made are by this Act directed to be ascertained.

Empowering the Company to take down the old Brick and Stone Bridge at Fordwich and to erect another in its Place, &c.

LXV. And be it further enacted, That it shall and may be lawful for the said Company of Proprietors, and they are hereby authorized and empowered, to take down or cause to be taken down, at their own Expence, a certain Brick and Stone Bridge, or Part thereof, over the River *Stour* in the said Town of *Fordwich*, and to remove all the Materials thence arising, and to convert the same to such Use or Uses as the said Company of Proprietors shall think proper; provided always, that the said Company of Proprietors and their Successors shall and do, and they are hereby authorized, empowered, and required with all possible Speed to erect and set up a Bridge in the Place of such as shall be taken down by them by virtue of this Act, and to alter, maintain, and repair the same at all Times thereafter, without Charge or Expence to the said Mayor, Jurats, and Commonalty, or their Successors, by Toll or otherwise: Provided always, that nothing herein contained shall extend or be construed to extend to prevent the said Mayor, Jurats, and Commonalty, and their Successors, from collecting and receiving at the Bridge which shall not be taken down by virtue of this Act or either of them, and to apply to their own Use, all the like Tolls and Duties now received by them there

there or at the other Bridge, in such and the same Manner, and with the same Powers and Remedies for the Recovery thereof in case of Refusal or Non-payment, as if this Act had not been made.

The Banks, &c. to be formed so as to keep the Water at its usual Height at the Mills.

LXVI. And whereas by the Operation of this Act it may happen that certain Water Corn Mills and Hereditaments called and known by the Name of *The Barton Mills*, situate and being in the said Parish of *Saint Mary Northgate* in the said City of *Canterbury*, and belonging to *Thomas Kingsford*, *Sampson Kingsford*, *Sarah Maria* the Wife of *Stephen Nicholson*, *Barber Priscilla Kingsford*, *Susanna* the Wife of *John Brent*, *Marianne* the Wife of *Thomas Lever Burch*, and *Selina* the Wife of *John Kingsford*, and also Two other Water Corn Mills and Hereditaments, situate and being in the Parish of *Sturry* in the County of *Kent*, and belonging to the said *Sampson Kingsford*, may respectively be prejudicially affected by the Works hereby authorized; and it has been agreed between the said respective Owners and the said Company of Proprietors, that Provision shall be made for securing the respective Owners and Occupiers for the Time being of the said respective Mills and Premises from Injury; be it therefore enacted, That the said Company of Proprietors and their Servants and Agents shall and they are hereby required so to form the Banks of the said Navigation, and the Locks, Gates, and other Works to be made and constructed under the Authority of this Act, that the Water in the Channel of the said River *Stour* at the said Mills respectively shall be kept and maintained at its usual and customary Height.

The Company to construct Stop Grooves, Sills, and Planks at the Heads of the Mills.

LXVII. And be it further enacted, That the said Company of Proprietors, before they shall divert the Water from the said River *Stour* to and into the said New Cut intended to be made at or near *Cold Harbour*, and to and into the said New Cut intended to be made at or near *Chancery Head* respectively, shall and they are hereby required, at their own proper Costs and Charges, to make and construct, and afterwards to maintain, good and substantial Stop Grooves, Sills, and Planks, at the respective Heads of the said *Barton* Mills and *Sturry* Mills respectively, and so as to clear the Head Aprons respectively of the said several Mills, and so that the Owners and Occupiers for the Time being of the said several Mills may from Time to Time draw down the Head Waters of the said several Mills, without affecting the Height or Heads of Water in the said New Cuts respectively; and it shall and may be lawful to and for the Owners and Occupiers for the Time being of the said Mills respectively, to have and exercise the entire Controul over the said Stop Grooves, Sills, and Planks respectively, so to be respectively made as aforesaid, so that in the Exercise of such a Controul over the said Stop Grooves, Sills, and Planks respectively, the said Owners and Occupiers for the Time being respectively do not unnecessarily obstruct or impede the Navigation.

The Owners and Occupiers to have the Management of the Barton Mill

LXVIII. And be it further enacted, That it shall and may be lawful to and for the respective Owners and Occupiers for the Time being of the said *Barton* Mills and *Sturry* Mills respectively, from Time to Time, and at all Times, to superintend and direct the Management of the *Barton* Mill Lock and the *Sturry* Lock respectively; and the said

said Owners of the said *Barton* Mills and *Sturry* Mills respectively, shall and may from Time to Time, and at all Times, have the Appointment of Lock Keepers to the said Locks respectively, at such Salary as the said Company of Proprietors shall from Time to Time direct and pay; and shall also from Time to Time, and at all Times, have full Authority to discharge any such Lock Keepers respectively, and appoint other or others in his or their Room respectively, so that in the Superintendance and Management of the said Locks respectively the said Owners or Occupiers for the Time being respectively do not unnecessarily obstruct or impede the Navigation.

and Sturry Locks, and the Owners to have the Appointment of Lock Keepers.

LXIX. Provided always, and be it further enacted, That it shall and may be lawful for the said Company of Proprietors, or their Directors, from Time to Time, and at all Times, to discharge any such Lock Keepers respectively for Misconduct or Neglect of Duty.

Lock Keepers may be discharged by Company.

LXX. And be it further enacted, That the said Company of Proprietors shall and they are hereby required to leave a Notice in Writing at the said *Barton* Mills and the said *Sturry* Mills respectively at least Ten Days before they shall require the Water in the said River *Stour* to be drawn through the said *Barton* Mill Lock and *Sturry* Lock respectively for the Purpose of repairing the same respectively or any of the Works hereby authorized; and the said Company of Proprietors shall well and truly pay or cause to be paid to the Occupiers for the Time being of the said *Barton* Mills the Sum of Five Pounds *per* Day, and to the Occupiers for the Time being of the said *Sturry* Mills the Sum of Six Pounds *per* Day, for every Day that the Water shall be so drawn through the said Locks respectively as aforesaid, as a Compensation to the said Occupiers of the said Mills respectively, for the Stoppage of the said Mills respectively during such Time as aforesaid, and so in proportion for any greater or less Time than a Day.

Ten Days Notice to be given before the Water be drawn through the Locks for Repairs, &c. and Compensation to be paid to the Occupiers for each Day the Mills are stopped.

LXXI. And be it further enacted, That no Part of the said River *Stour* lying between *Cold Harbour* Bridge aforesaid, where the said New Cut is hereby authorized to be commenced, and the *Barton* Mills aforesaid, and between the said Mills and the End of the said New Cut below the same Mills, and no Part of the said River *Stour* lying between the beginning of the New Cut at *Chancery Head* and the *Sturry* Great Mill, and between the beginning of the same Cut at *Chancery Head* and the *Sturry* Little Mill respectively, and between the said last-mentioned Mills respectively and the End of the said last-mentioned New Cut, shall respectively be deemed or considered for any of the Purposes of this Act within the Line of Navigation hereby authorized to be made and maintained; and it shall not be lawful for the said Company of Proprietors to demand and take of and from any Person or Persons whomsoever any Rates or Dues whatever for navigating upon the said Parts of the said River respectively; any thing in this Act contained to the contrary thereof in anywise notwithstanding.

Certain Parts of the River not to be within the Line of Navigation.

LXXII. And be it further enacted, That it shall and may be lawful to and for the Owners and Occupiers for the Time being of the said

The Owners and Occupiers of the

Barton Mill Estate to be allowed to cut a Branch Canal from the Tail of the Mills into the New Cut, &c.

Barton Mill Estate, at their own Costs and Charges, to make and maintain a Branch Cut or Canal from the Tail of the *Barton* Mills aforesaid, to and into the said New Cut hereby authorized to be made and maintained near to the said Mills and below the said *Barton* Mill Lock, the said Owners and Occupiers doing no Injury to the Works hereby authorized, and making good the Banks of the said Cut or Canal so to be cut through as aforesaid.

The Company to erect at the Barton Mill Lock a Carriage Bridge for the Use of the Owners, &c. of the Barton Mills Estate and other Lands.

LXXIII. And be it further enacted, That the said Company of Proprietors shall and they are hereby required at their own Costs and Charges to erect, build, construct, complete, and maintain at or near the *Barton* Mill Lock, a good and substantial Carriage Bridge, properly fenced in, for the Use of the Owners and Occupiers of the *Barton* Mills Estate, and also the Owners and Occupiers for the Time being of several Pieces or Parcels of Land and Hereditaments lying and being near to the said *Barton* Mills Estate, belonging to and used by the said *John Brent;* and it shall and may be lawful to and for the said Owners and Occupiers of the said Mills and Estates respectively, to pass and repass with Horses, Carts, and Carriages along the Towing Paths of the said Company of Proprietors, from the said Bridge to and into the respective Lands belonging to the said Owners respectively, without being subject or liable to pay any Rates whatsoever for the Use of the said Bridge and Towing Paths as aforesaid, so that such Owners and Occupiers respectively do no unnecessary Injury to the said Towing Paths upon using the same as aforesaid.

If Company do not make Works, Owners of Mills may do it.

LXXIV. And be it further enacted, That if the said Company of Proprietors shall refuse or neglect to make and maintain the several Works hereby directed to be made and maintained for the Use of the said *Barton* Mills Estate, and *Sturry* Mills, and the Owners and Occupiers of the said Pieces or Parcels of Land and Hereditaments belonging to the said *John Brent* respectively, then and in such Cases respectively, it shall and may be lawful to and for the respective Owners for the Time being of the said *Barton* Mills Estate, *Sturry* Mills, and the said Pieces or Parcels of Land and Hereditaments respectively, to make and maintain the said several Works respectively, and the whole Costs, Charges, and Expences thereof shall be reimbursed and repaid by the said Company of Proprietors or their Treasurer, to the Person or Persons respectively who shall sustain and pay such Charges and Expences respectively; and in Default of Payment thereof respectively, or of any Sum or Sums of Money payable to the Occupiers of the said Mills respectively for Stoppage of the same Mills respectively, pursuant to this Act, within Ten Days next after Demand thereof in Writing shall have been respectively made by the Person or Persons respectively sustaining and paying such Charges and Expences respectively as aforesaid, of the Treasurer of the said Company of Proprietors, or of any One of the Directors of the said Company for the Time being, or at the Dwelling House of such Treasurer, or of any One of the said Directors, or at the Office of the said Company of Proprietors, Proof of such Demand being made by the Oath of One credible Witness before One or more Justice or Justices of the Peace for the said County of *Kent* or City of *Canterbury*, as the Case may require, the Amount of all

all such Costs, Charges, and Expences shall and may be levied and recovered by Distress and Sale of the Goods and Chattels of the said Company of Proprietors, together with the Charges of such Distress and Sale by Warrant under the Hand and Seal or Hands and Seals of any such Justice or Justices of the Peace for the said County of *Kent* or City of *Canterbury*, as the Case may require; and which Warrant such Justice or Justices respectively is and are hereby empowered to grant; and such Sum and Sums of Money respectively shall be paid to the Person or Persons respectively sustaining and paying the Charges and Expences of making and maintaining such Works respectively as aforesaid.

For rebuilding a Bridge over the River Stour, adjoining Mrs. De Coetlogon's Land.

LXXV. And whereas *Mary De Coetlogon*, of *Mitcham* Cottage, in the County of *Surrey*, Widow, hath lately erected a Carriage Bridge over the said River *Stour* in the Parish of *Hackington* otherwise *Saint Stephens*, in the said County of *Kent*, at a Place where an ancient Fordway was had and used as a Road from one Part of the Estate of the said *Mary De Coetlogon* to another Part thereof, lying and being on opposite Sides of the said River; and it may happen that in the Execution of the Works hereby authorized, the said Company of Proprietors may find it necessary to take down the said Bridge, and embank the Sides of the said River; be it therefore enacted, That in case the said Company of Proprietors shall cause the said Bridge to be taken down, removed, or in any way altered, the said Company of Proprietors shall, and they are hereby required, at their own Costs and Charges, forthwith to erect, build, and complete at the same Place a good and substantial Carriage Bridge, for the sole Use and Benefit of the said *Mary De Coetlogon*, and the Owners and Occupiers for the Time being of the said Estate; and if the said Company of Proprietors shall, after Ten Days Notice in Writing given to them by the said *Mary De Coetlogon*, or the Owners and Occupiers for the Time being of the said Estate, refuse or neglect to erect, build, and complete such Bridge in a good and substantial Manner as aforesaid, then and in such Case it shall and may be lawful to and for the said *Mary De Coetlogon*, and the Owners or Occupiers for the Time being of the said Estate, to erect, build, and complete such Bridge as aforesaid, and the whole Costs, Charges, and Expences thereof shall be reimbursed and repaid by the said Company of Proprietors or their Treasurer to the said *Mary De Coetlogon*, or the Owners or Occupiers for the Time being of the said Estate; and in Default of Payment within Ten Days next after Demand thereof in Writing shall have been made by the said *Mary De Coetlogon*, or the Owners or Occupiers for the Time being of the said Estate, or her or their Agents, of the Treasurer of the said Company of Proprietors, or of any One of the Directors of the said Company for the Time being, or at the Dwelling House of such Treasurer, or of any One of the said Directors, or at the Office of the said Company of Proprietors, Proof of such Demand being made by the Oath of One credible Witness, before One or more Justice or Justices of the Peace for the said County of *Kent*, the Amount of all such Costs, Charges, and Expences shall and may be levied and recovered by Distress and Sale of the Goods and Chattels of the said Company of Proprietors, together with the Charges of such Distress and Sale, by Warrant under the Hand

Hand and Seal or Hands and Seals of any such Justice or Justices of the Peace for the said County of *Kent*, and which Warrant such Justice or Justices respectively is and are hereby empowered to grant; and such Sum or Sums of Money shall be paid to the said *Mary De Coetlogon*, or the Owners or Occupiers for the Time being of the said Estate.

Company empowered to sell Lands not wanted for the Purposes of this Act.

LXXVI. And whereas in pursuance of the Provisions of this Act, or to avoid Disputes with the Owners of Lands, Grounds, and Hereditaments, which are or may be affected by improving and making the said River, Haven, Cuts, New Haven, Harbour, and Works, the said Company of Proprietors may purchase Lands and Buildings not necessary to be made use of for the Purposes of this Act; be it further enacted, That it shall be lawful for the said Company of Proprietors, by Indenture under their Common Seal, to grant and convey by way of absolute Sale, for a Consideration in Money, such Part or Parts of the Lands or Buildings which shall be so purchased by and conveyed to them as aforesaid, as shall not be wanted for the Purposes of this Act; and Conveyances from the said Company of Proprietors shall be valid and effectual, any thing in this Act contained, or any other Law, Statute, or Custom to the contrary thereof in anywise notwithstanding; and upon Payment of the Money which shall arise by the Sale or Sales of such Lands or Buildings, it shall and may be lawful for the Treasurers for the Time being to the said Company of Proprietors, or such of them as shall receive the same, to sign and give a Receipt or Receipts for the Money for which the same shall be sold, which Receipt and Receipts shall be a sufficient Discharge and sufficient Discharges to any Person or Persons for the Purchase Money for which such Lands and Buildings shall be so sold, or for so much thereof as in such Receipt or Receipts shall be acknowledged or expressed to be received; and such Person or Persons shall not afterwards be answerable or accountable for any Loss, Misapplication, or Non-application of such Purchase Money or any Part thereof: Provided always, that the said Company of Proprietors, before they shall sell and dispose of such Lands or Buildings, shall first offer to re-sell the same to the Owners of the adjoining Lands, the Price at which the same shall be re-sold being adjusted and settled by a Jury in like Manner as the Price for any Land to be taken in pursuance of this Act is herein-before directed to be settled in case of Difference or Dispute as to the Value thereof; and if such Person or Persons shall not agree, or shall refuse to re-purchase the same, it shall and may be lawful to and for any Person or Persons not interested in the Premises to make an Affidavit, to be sworn before a Master or Masters Extraordinary of the High Court of Chancery, or before One of His Majesty's Justices of the Peace for the County or Place where such Lands or Buildings shall lie or be, stating that such Offer was made by or on Behalf of the said Company of Proprietors, and that such Person or Persons did not agree or refuse to purchase such Lands or Buildings (as the Case may be); and such Affidavit shall in all Courts be sufficient Evidence and Proof that such Offer was made and not agreed to or refused.

Drains, &c. to be made to convey Water from

LXXVII. And be it further enacted, That the said Company of Proprietors shall and they are hereby required, at their own proper Costs and Charges, to make, or cause to be made, such Arches, Tunnels, Culverts,

verts, Drains, Sewers, or other Passages over, under, or by the Side of, or into the said River, Haven, Cuts, New Haven and Harbour, and the Trenches, Streams, and Watercourses communicating therewith, and the Towing Path on the Sides thereof respectively, of such Depth, Breadth, and Dimensions as shall be sufficient at all Times to convey the Water clear from the Lands adjoining or lying near to the said River, Haven, Cuts, New Haven and Harbour, without obstructing or impounding the same, and likewise to make, or cause to be made, such Back Drain or Drains as may be necessary and shall be sufficient to carry off any Water which may ooze or pass through any of the Banks of the said River, Haven, Cuts, New Haven or Harbour, to the Prejudice of any of the Lands or Grounds contiguous thereto; and also to make proper Ponds and Watering Places for Cattle, and for washing of Sheep, in all Cases where, by means of the said River, Haven, Cuts, New Haven and Harbour, or any other of the Works hereby authorized to be improved or made, any Person or Persons occupying Lands adjacent thereto shall be deprived of their ancient Watering Places, and to supply the same at all Times with Water; and that all such Arches, Tunnels, Culverts, Drains, and other Passages, shall from Time to Time be supported, maintained, cleansed, scoured, and kept in good and sufficient Repair by the said Company of Proprietors.

the Lands adjoining.

Watering Places for Cattle to be made.

LXXVIII. And be it further enacted, That if at any Time or Times after Seven Days Notice in Writing shall, by or on the Behalf of any of the said Owners or Occupiers of Lands adjoining or lying near to the said River, Haven, Cuts, New Haven and Harbour, or any other of the Works hereby authorized to be made, be given to the Directors of the said Company, or to their Clerks, known Agent, or Collector, that the said Arches, Tunnels, Culverts, Drains, Back Drains, or other Passages, or any of them, is or are not made, cleansed, maintained, and repaired, according to the true Intent and Meaning of this Act; it shall and may be lawful to and for any Person or Persons to apply for and obtain an Order in Writing from any Two or more Justices of the Peace of the County or Place in which the Lands shall be situate, from Time to Time, as often as there shall be Occasion, and the said Justices are hereby authorized and required at their Discretion to grant such Order as aforesaid, enabling such Person or Persons to make, cleanse, and repair such Arches, Tunnels, Culverts, Drains, Back Drains, or other Passages accordingly, as well as through the Lands or Grounds of the Person or Persons obtaining such Order as aforesaid, as through any other Lands or Grounds in or through which such Arches, Tunnels, Culverts, Drains, Back Drains, or other Passages may by the said Order of such Two or more Justices be directed to be made, and the reasonable Expences thereof (to be ascertained by the said Justices) shall be defrayed by the said Company of Proprietors; and in case of Neglect or Refusal to satisfy and defray such Expences for the Space of Ten Days next after Demand thereof made upon the said Company of Proprietors, such Expences shall and may be recovered and levied in such Manner as any other Money is by this Act directed to be recovered from the said Company of Proprietors: Provided always, that such Owner or

Persons to cleanse Arches, &c. on Neglect of Company.

Owners, Occupier or Occupiers of the said contiguous or adjoining Lands shall, at the Time of making such Complaint, have his, her, or their respective Ditches, Drains, Passages for Water, and Water-courses leading to or from the Drains, Culverts, and Passages of the said River, Haven, Cuts, New Haven and Harbour, and other Works as aforesaid, and each and every of them, sufficiently cleansed and opened to convey Water into the same.

Company to supply Lands in Stonar with Water for Cattle, &c. or make Compensation.

LXXIX. And whereas the Lands in the Parish of *Stonar* aforesaid have hitherto been regularly supplied with fresh Water from the said River and Haven, at certain Places therein, and at convenient Times, by Means of proper Sluices, for the Use and Benefit of the Cattle depasturing or feeding on the same Lands; and it is apprehended that by the Operation of this Act, and particularly in consequence of the intended Diversion and Contraction of the Course of the said River and Haven, the said Lands may be deprived of the above-mentioned Advantage, which is essential to their Value and Occupation; be it therefore enacted, That in case it shall at any Time hereafter happen, that by the Operation of this Act the Lands in the said Parish of *Stonar*, or any Part thereof, shall be deprived of a regular Supply of fresh Water as heretofore enjoyed to the fullest Extent for the Purpose aforesaid, the said Company of Proprietors shall at their own Costs and Charges make, provide, and maintain proper and sufficient Watering Places in convenient Parts of the said Lands, and regularly supply, or cause to be supplied, the same with an adequate Quantity of fresh Water of a good and wholesome Quality, for the Use and Benefit of the Cattle for the Time being depasturing or feeding on the same Lands; and in case of any Default or Neglect in that Behalf, then and so often as the same shall happen, Compensation and Recompence shall be made by the said Company of Proprietors, to the Owners or Occupiers of the said Lands, for such Damage or Injury as shall be thereby sustained, according to the Amount or Value thereof; such Compensation and Recompence to be ascertained, in case of any Difference concerning the same, in like Manner as any other Damage or Injury to be sustained by the Operation of this Act is hereby directed to be ascertained.

For fencing off Towing Paths and making Bridges, &c.

LXXX. And be it further enacted, That the said Company of Proprietors shall at their own Costs (within Twelve Calendar Months next after any Part of the said River, Haven, Cuts, New Haven, Harbour, and Towing Paths thereto belonging shall be improved and formed) divide and separate, and keep constantly divided and separated, the Towing Paths on each Side of the said River, Haven, Cuts, New Haven and Harbour, and the Trenches or Passages hereby authorized to be made on such Part or Parts thereof respectively, as shall be declared necessary by the said Justices, in case there shall be any Doubt or Dispute about the same, from the adjoining Lands or Grounds, by Posts and Rails, Hedges, Ditches, Trenches, Banks, or other Fences sufficient to keep off Sheep and other Cattle, the same to be set out and made on the Lands or Grounds which shall be purchased by, conveyed to, or vested in the said Company of Proprietors as aforesaid; and the said Company of Proprietors shall at their own proper

proper Costs and Charges from Time to Time maintain and support the said Towing Paths, and the said Posts, Rails, Hedges, Ditches, Trenches, Banks, and other Fences so set up and made as aforesaid; and also shall, at their own like Costs and Charges, make, erect, and set up, and from Time to Time maintain and support, such and so many convenient Gates, Bridges, and Stiles in, over, and through all the Hedges and Fences to be by them so made on the Sides of such Towing Paths as aforesaid; and also such Bridge over the Old Haven, where the said Lock, Tumbling Bay, and Sluices is or are intended to be made across the same as aforesaid; and also all such Bridges, Fording Places, Arches, Culverts, and Passages by the Side of the said River, Haven, Cuts, New Haven, and Harbour, and all such Passages into, over, under, or by the Side of or into the Feeders, Trenches, and Aqueducts communicating therewith, and the Towing Paths on the Sides thereof, of such Dimensions and in such Manner as the said Justices shall from Time to Time judge necessary and appoint, in case there shall be any Dispute about the same, for the Use of the Owners and Occupiers of the Lands and Grounds, Mills, or Hereditaments adjoining to such River, Haven, Cuts, New Haven and Harbour, and other Works, or any of them respectively; and the said Company of Proprietors shall not make the said River and Cuts across the Turnpike Road from *Canterbury* to *Sarr*, or the High Road from *Fordwich* to *Sturry*, or any Trench or Watercourse belonging to the said River, Haven, Cuts, New Haven and Harbour, in or across any common Highway, public Bridleway or Footpath, until they shall at their own proper Costs and Charges have made and perfected such Bridge or Bridges, Fording Place or Fording Places, Passage or Passages, Arch or Arches, over, across, or under the same Turnpike Road, Highway, public Bridleway or Footpath, of such Dimensions and in such Manner as the said Justices shall from Time to Time judge necessary and appoint, or being contrary to the true Intent and Meaning of this Act; and all such Gates, Stiles, Bridges, Arches, and other Works and Conveniences so to be made as aforesaid, shall from Time to Time and at all Times thereafter be supported, maintained, and kept in sufficient Repair by the said Company of Proprietors.

If Company do not fence off Towing Paths and make Bridges, &c. Land Owners may do it at the Company's Expence.

LXXXI. And be it further enacted, That in case the said Company of Proprietors or their Agents shall refuse or neglect to divide and separate, and to keep divided and separated, the Towing Paths of the said Navigation in Manner herein-before directed, or to make, erect, and set up such Gates, Bridges, and Stiles, in, over, and through the Fences on the Sides of the said Towing Paths, or such Bridges, Fording Places, Arches, Tunnels, Culverts, Drains, Back Drains, or other Passages, over, under, or by the Sides of or into the said River, Haven, Cuts, New Haven, and Harbour, and the said Trenches, Streams, and Watercourses as aforesaid, or to make such Watering Places for Cattle as herein-before directed for the Use and Convenience of the respective Owners or Occupiers of the Lands, Mills, Tenements, or Hereditaments adjoining or near to the said River, Haven, Cuts, New Haven, and Harbour, or to maintain and support such Gates, Stiles, Bridges, Arches, Passages, and Watering Places when erected, set up, and made, of such Dimensions

Dimensions and in such Manner as aforesaid, for the Space of Thirty Days next after the Time to be appointed for those Purposes by the said Justices, or after Notice shall be given by or on the Behalf of the Owners or Occupiers of any such Lands or other Hereditaments who may be aggrieved by any such Refusal or Neglect; and in every such Case, it shall and may be lawful to and for every or any of the Owners or Occupiers of the said adjacent Lands, Grounds, Mills, Tenements, or Hereditaments, who shall find himself, herself, or themselves aggrieved by such Refusal or Neglect, to make, erect, and set up all such Gates, Stiles, Bridges, Fording Places, Arches, Passages, Watering Places, and other Conveniences as the said Justices shall have before directed or appointed to be made, erected, and set up by the said Company of Proprietors as aforesaid, and to maintain, repair, and support the same from Time to Time as Occasion shall require, so that in making and maintaining such Works as aforesaid, the said River, Haven, Cuts, New Haven and Harbour, or the Banks thereof, or the Feeders or Aqueducts belonging thereto, shall not be stopped or injured for any longer Space of Time or in any other Manner than shall be necessary for the doing thereof; and all the reasonable Costs and Charges thereof, (to be settled and allowed by the said Justices,) shall be repaid to the respective Owners or Occupiers of the said adjacent Lands, Grounds, Mills, Tenements, or other Hereditaments, who shall have so erected and made, repaired or maintained such Works as aforesaid, by the said Company of Proprietors, within the Space of Thirty Days next after the same shall have been so settled and allowed, and an Account and Demand in Writing shall have been delivered and made thereof to and from the said Company of Proprietors, or their Clerks for the Time being; and in Default of Payment of the said Costs and Charges within the Time aforesaid, the said Justices shall and they are hereby required, by Warrant under their Hands and Seals, to levy the said Costs and Charges by Distress and Sale of any of the Goods and Chattels of the said Company of Proprietors, which shall be found in or upon the said River, Haven, Cuts, New Haven and Harbour, or the Wharfs, Quays, or Warehouses adjoining or near to the same, belonging to the said Company, to be applied to and for the Use of such Person or Persons who shall have so incurred such Costs and Charges as aforesaid, rendering to the said Company of Proprietors, or to some of their known Agents or Collectors, the Overplus (if any) after deducting the reasonable Charges of making such Distress and Sale, to be settled by the said Justices; and all or any of the said Owners or Occupiers, upon Refusal or Neglect of the said Company of Proprietors to pay the said Costs and Charges as aforesaid, shall and may also have such and the like Remedy against the said Company of Proprietors for the Recovery thereof, by Action at Law, to be commenced and prosecuted in such Manner as in other Cases is in and by this Act directed.

Thistles growing on the Towing Paths, and

LXXXII. And be it further enacted, That the said Company of Proprietors shall at their own Costs Twice in every Year, once in the Month of *June*, and once in the Month of *September*, cut or mow down

down the Thistles and other noxious Weeds growing on the Towing Paths, or on the Sides thereof, of the said Harbour, New Cut, and River, to be made by virtue of this Act; and in case the said Company of Proprietors shall neglect or refuse to do the same, it shall and may be lawful to and for the Owners or Occupiers of the Lands next adjoining, who shall find themselves aggrieved thereby, to cut or mow down the Thistles and other noxious Weeds as aforesaid.

the Sides thereof, may be cut or mown down.

LXXXIII. Provided always, and be it further enacted, That no Bridge or Bridges shall at any Time or Times hereafter be erected or built over or across the said River, Haven, or New Haven, below *Fordwich* Bridge, unless the same shall be a Draw-Bridge or Swing-Bridge of a proper Construction, the clear Distance between the Piers, or the Distance between the two principal Piers thereof, shall be Twenty-two Feet at the least, so as to admit of Vessels, Barges, or Boats, of any less Breadth than Twenty Feet Beam, passing through the same with their Rigging standing, with Safety and Convenience; and the Person or Persons, Body or Bodies Politic or Corporate, or other Party or Parties building any such Bridge or Bridges, as aforesaid, over the said River, Haven, or New Haven, below *Fordwich* Bridge, shall from Time to Time, and at all Times afterwards, at his or their Expence, provide and keep proper Persons in Attendance at all Times to open and draw up and let down such Bridge or Bridges, for the Passage of Vessels, Barges, or Boats through the same, without putting the said Company to any Expence about the same.

No Bridge to be erected below Fordwich Bridge unless so constructed as not to prejudice Navigation for Shipping.

LXXXIV. Provided always, and be it further enacted, That if the Owners or Occupiers of any Lands, Mills, Tenements, or other Hereditaments, through which the said River, Haven, Cuts, New Haven, and Harbour shall be made, do or shall at any Time or Times hereafter apprehend that any of the Gates, Stiles, Bridges, Fording Places, Passages, Arches, Tunnels, Drains, Back Drains, Trenches, or other Passages, Watering Places, and other Conveniences respectively, which the said Justices shall have so directed or appointed to be made by the said Company of Proprietors, are insufficient either in Number or Situation for the commodious Use and Occupation of the respective Lands, Grounds, Mills, Tenements, or Hereditaments on both Sides, or on either Side thereof, then and in every such Case it shall and may be lawful to and for all or any such Owners or Occupiers, with the Consent and Approbation of the said Company of Proprietors, upon Request made to them for that Purpose, or in case of their Refusal for the Space of Twenty-one Days next after such Request, then with the Consent and Approbation of the said Justices, to make, fix, and erect, at their own Costs and Charges, any such other Gates, Stiles, Bridges, Fording Places, Passages, Arches, Culverts, Watering Places, or other Conveniences of the same or the like Construction with those made and erected by the said Company of Proprietors by the Side of the said River, Haven, Cuts, New Haven and Harbour, and over, under, or by the Side of or into the Feeders, Trenches, and Aqueducts communicating therewith, in such Places as shall be found and adjudged necessary and convenient for the better Use, Cultivation, Improvement, or Occupation

If Bridges, &c. made by the Company are insufficient, Land Owners may make others at their own Expence.

of such Lands and other Hereditaments, and to repair and support the same at their like Costs and Charges as Occasion shall require, so as that the Navigation be not prevented or obstructed thereby for any longer Space of Time or in any other Manner than the same would necessarily have been if such Gates, Stiles, Bridges, Fording Places, Passages, Arches, Watering Places, or other Conveniences had been made or erected by the said Company of Proprietors.

Ascent to Bridges, and Height of Fences on Side thereof.

LXXXV. Provided always, and be it enacted, That the Ascent to every Bridge to be made for the Purpose of any public or private Road as aforesaid, shall not be more than One Foot in Thirteen Feet; and that the Fence on each Side of such Bridge shall not be less than Four Feet above the Surface of the Bridge; and that no Swing or Swiveled Bridge or Drawbridge shall be erected at any Place or Places across the Road leading from *Canterbury* to *Ramsgate*, without the Consent of the Trustees of the said Road, or of the major Part of them, at a Meeting duly convened for that Purpose, being first had and obtained.

Company empowered to get Materials from adjoining Lands to repair Works damaged by Floods.

LXXXVI. And whereas it may happen from Floods or from some unexpected Accident, that the Locks, Weirs, Flood Gates, Dams, Banks, Basins, Trenches, or other Works of the said River, Haven, Cuts, New Haven, and Harbour may be injured or destroyed, and the adjacent Lands may thereby suffer Damage, and that it may be necessary that the same should be immediately repaired or rebuilt to prevent further Damage; be it therefore further enacted, That when and as often as any such Case shall happen, it shall and may be lawful to and for the said Company of Proprietors from Time to Time, or for their or any of their Servants, Agents, or Workmen, without any Delay or Interruption from any Person or Persons whomsoever, to enter into any Lands, Grounds, or Hereditaments adjoining or near to the said River, Haven, Cuts, New Haven and Harbour, and other Works or Conveniences, or any of them, (not being the Ground whereon any House or other Building stands, or an Orchard, Garden, Pleasure Ground, Park, Paddock, planted Walk, Nursery for Trees, or Avenue to a House,) and to dig for, work, get, and carry away and use all such Stones, Gravel, and other Materials, as may be necessary for the Purposes aforesaid, without any previous Treaty whatsoever with the Owner or Owners, Occupier or Occupiers of, or other Person or Persons interested in such Lands, Grounds, or Hereditaments, or any of them, doing as little Damage thereby as the Nature of the Case will permit, and making Recompence for the same to the Owner or Owners, and Occupier or Occupiers thereof, or other Person or Persons interested in such Lands, Grounds, or Hereditaments within the Space of Ten Days next after the same shall be demanded; which Damage, and the Compensation to be made in respect thereof, shall be settled and determined, or assessed and recovered by the Ways and Means herein-before prescribed and directed with respect to other Damages to be done in or about the making and maintaining the said River, Haven, Cuts, New Haven and Harbour.

LXXXVII. And

Lords of Manors and Land Owners may erect Wharfs, &c.

LXXXVII. And be it further enacted, That the Lord or Lords, Lady or Ladies of any Manor or Manors, and the Owner or Owners of any Lands or Grounds near to, through, or by which the said River, Haven, Cuts, New Haven, and Harbour, shall be made, may build, construct, or use any Wharfs, Quays, Landing Places, Cranes, Weigh Beams, or Warehouses, in or upon his, her, or their respective own proper Lands, Grounds, or Wastes adjoining or near to the said River, Haven, Cuts, New Haven, and Harbour, with the necessary Ways and Roads to the same, and may land any Goods or Merchandize, Coal, Lime, or other Things, upon such Wharfs, Quays, or Landing Places, or upon the Banks lying between the same and the said River, Haven, Cuts, New Haven, and Harbour, and may make and use proper and convenient Places for Boats and other Vessels to lie and turn in, and pass by each other, so that the making, constructing, or using thereof respectively do not obstruct or prejudice the said River, Haven, Cuts, New Haven or Harbour, or any Towing Path on the Sides thereof respectively; and such and the same Rates and Duties shall and may be taken by the Owners of such Wharfs, Quays, and Landing Places, for Goods, Wares, and Merchandize brought upon the same, as shall be from Time to Time taken for Goods, Wares, and Merchandize brought upon the Wharfs, Quays, and Landing Places belonging to the said Company of Proprietors, by virtue of this Act, but no other or greater Rates or Duties; and such Rates and Duties for Goods, Wares, and Merchandize brought upon the Wharfs, Quays, and Landing Places of such Lord or Lords, Lady or Ladies of such Manor or Manors, or of the Owner or Owners of such Lands, Grounds, or Wastes, who shall make, construct, and erect the same respectively as aforesaid, are hereby vested in such Lord or Lords, Lady or Ladies of such Manor or Manors, of in the Owner or Owners of such Lands, Grounds, or Wastes respectively, and his, her, and their Representatives.

If not done by Land Owners within a certain Time, Proprietors may build Wharfs, &c.

LXXXVIII. Provided always, and be it further enacted, That if any Lord or Lady of a Manor, or Land Owner, shall not within the Space of Six Calendar Months next after Notice given in Writing to him, her, or them, or left at his, her, or their usual Place or Places of Abode, by or on behalf of the said Company of Proprietors, and that any Part or Parts of such Lands, Grounds, or Wastes is or are necessary or proper to be used for the Purpose of making and erecting any Wharfs, Warehouses, Buildings, or other Conveniences as aforesaid, for the Use of the said Navigation, lay out, construct, and make, and from Time to Time maintain and keep in good and substantial Repair, such proper and sufficient Wharfs, Quays, Warehouses, Buildings, and other Conveniences as aforesaid, for the Use of the said Navigation, as the said Company of Proprietors shall think necessary on the respective Parts of the Lands, Grounds, or Wastes described in such Notice, then and in such Case it shall and may be lawful to and for the said Company of Proprietors, without any Hindrance or Restraint whatsoever, to make use of any such Lands, Grounds, or Wastes, (not being the Ground whereon any House or other Building stands, or any Garden, Orchard, Yard, Park, Paddock, planted Walk, Nursery of Trees, or an Avenue to any House,) for erecting and constructing proper and sufficient Wharfs,

Wharfs, Warehouses, Buildings, and other Conveniences as aforesaid, agreeably to such Notice to be delivered as aforesaid, they the said Company of Proprietors first making Satisfaction for the same, in such Manner as is and hath been herein-before directed with respect to other Lands or Grounds which shall be taken or used for the Purposes of this Act: Provided also, that it shall not be lawful for the said Company of Proprietors to make use of any Lands, Grounds, or Wastes, situated within the Parish of *Stonar* aforesaid, for erecting or constructing any Warehouses or Buildings as aforesaid; any thing herein-before contained to the contrary notwithstanding.

Company of Proprietors not to use private Wharfs.

LXXXIX. Provided always, and be it further enacted, That nothing herein contained shall extend or be construed to extend so as to empower the said Company of Proprietors, or any other Person or Persons, to make use of any Wharf, Quay, Landing Place, Crane, Weigh Beam, or Warehouse which shall be set out, erected, or made by the Lord or Lords, Lady or Ladies of any Manor, or the Owner or Owners of any Lands or Grounds adjoining or near to the said River, Haven, Cuts, New Haven or Harbour, for his, her, or their private Use only, nor to set up, erect, repair, or use any Crane or Weigh Machine in or upon any such Wharf, Quay, or Landing Place, without the Consent of the Owners or Occupiers thereof respectively; any thing herein contained to the contrary notwithstanding.

Commencement of Harbour Dues.

XC. And be it further enacted, That it shall and may be lawful to and for the said Company of Proprietors, by such Person or Persons as they shall appoint, and they are hereby authorized and empowered from Time to Time, and at all Times from and after the Time that the said New Haven and Navigation shall have been completed, which Fact shall be ascertained by a Certificate under the Hands of Two Justices of the Peace assembled at the Quarter Sessions for the Eastern Division of the County of *Kent*, holden at the Sessions House at *Saint Augustines*, near *Canterbury*, and be published in the *London Gazette*, and in One Newspaper circulating in the Eastern Division of the said County of *Kent*, to ask, demand, take, collect, receive, and recover, to and for the Use and Benefit of the said Company of Proprietors, of and from all and every the Masters, Commanders, Owner or Owners, or other Person or Persons having the Rule or Command, or navigating any Vessel or Ship coming into or going out of the said New Haven or Harbour, or importing into or exporting from the same any Kind of Goods, Wares, Merchandize, or Passengers, the several Rates and Duties set forth or specified in Schedules B., C., and D., to this Act annexed.

Exemption for Arundel to continue.

XCI. Provided always, and be it further enacted, That nothing herein contained shall extend, or be deemed or construed to extend, to take away, lessen, or abridge the Exemption given to Ships and Vessels belonging to the Port of *Arundel* in the County of *Sussex*, the Owner or Owners of the whole or major Part of such Vessels being Inhabitants of the said Port of *Arundel*, and producing the

the Certificate thereof, in the Form and Manner directed by an Act passed in the Thirty-third Year of the Reign of His late Majesty King *George* the Third, intituled *An Act to explain and amend an Act made in the Sixth Year of the Reign of His late Majesty King* George *the Second, intituled* '*An Act for erecting Piers in, and for* '*repairing and keeping in Repair the Harbour of* Littlehampton, *called* 'Arundel Port, *in the County of* Sussex;' *and for empowering the Commissioners acting under the said Act to improve the Navigation of the River* Arun *from the said Harbour to the Town of* Arundel *in the said County:* Provided always, that nothing herein-before contained shall extend or be construed to extend to the aforesaid Exemption to and over the New Haven and Harbour to be made by virtue of this Act. 33G.3.c.100.

XCII. Provided always, and be it further enacted, That any Ship or Vessel, Bark or Boat, importing into the present *Sandwich* Haven, or landing upon any Part of the Sea Shore between *Cliffs End*, in the Parish of *Saint Lawrence*, in the Isle of *Thanet*, in the County of *Kent*, and *Sandown Castle*, or exporting from the said present Haven, or from any Part of the Sea Shore within the Limits last herein specified, any Goods, Wares, or Merchandize which shall be afterwards carried, or which shall have been previously carried upon the said River, Haven, Cuts, and New Haven, or any Part thereof, or brought or carried by Land into or out of the said Town and Port of *Sandwich*, or into any of the Parishes or Places on the Line of the said River, Haven, Cuts, or New Haven, shall be charged with and subject to the Payment of the same Rates or Duties as if such Ship or Vessel, Bark or Boat, had come into or gone out of the said Harbour, or imported such Goods, Wares, or Merchandize into the said Harbour, or exported such Goods, Wares, or Merchandize from the same. Vessels and Goods liable to Tonnage Duties, in certain Cases, although not coming into or going out of the Harbour.

XCIII. And be it further enacted, That there shall be paid to the said Company of Proprietors, or to such Person or Persons as they shall appoint to collect and receive the same, for and upon the Tonnage of Vessels, and for all Goods, Wares, and Merchandize conveyed Inwards, Outwards, or Coastwise, or imported or exported to or from the said Harbour, or carried upon the said River, Haven, Cuts, or New Haven, such Rates or Duties as the said Company of Proprietors shall order or direct to be paid, not exceeding the Rates or Duties contained in the Schedules to this Act annexed, marked B. and C., which said Rates and Duties shall be paid by the Master or Commander, or other Person or Persons having the Command or Charge of any Ship or Vessel, Bark or Boat, in which the same shall be imported, exported, or carried, the Merchant or Merchants, or other Person or Persons conveying, exporting, or importing, or carrying such Goods, Wares, and Merchandize, or into whose Custody or Possession the same shall be delivered, or by whom the same shall be shipped respectively, upon the Delivery or Shipping of the same respectively: Provided always, that where any Rates or Duties have been paid for Passengers, Goods, Wares, and Merchandize brought or imported into the said Harbour, or for the Ship or Vessel, Bark or Boat, carrying the same, such Rates or Duties shall not be Duties on Exports and Imports.

be again payable for the same Passengers, Goods, Wares, and Merchandize being afterwards conveyed or carried on the said River, Haven, Cuts, or New Haven; and where any Rates or Duties have been paid for Passengers, Goods, Wares, and Merchandize conveyed or carried on the said River, Haven, Cuts, or New Haven, such Rates or Duties shall not be again payable for the same Passengers, Goods, Wares, and Merchandize being afterwards taken or exported from the said Harbour.

Power to reduce Dues on Foreign Ships and Goods.

XCIV. Provided always, and be it further enacted, That it shall and may be lawful to and for His Majesty, in and by an Order in Council, or to and for the Lords Commissioners of His Majesty's Treasury, or any Three or more of them, from Time to Time, and at all Times when and so often as he or they shall deem fit so to do, in and by his or their Order in Writing, to reduce the Duties hereby made payable on all, or on such or so many of the Foreign Ships or Vessels, and on all, or on such or so many of the Goods and Merchandizes imported or exported in Foreign Bottoms, as he or they in their Judgment shall deem expedient, to the same and like Duties as are hereby, and hereafter shall, in pursuance of the Powers herein contained, be made payable in respect of the *British* Ships or Vessels, or the Goods and Merchandizes imported or exported in or by them.

A Flag to be hoisted by Day when Water is at a certain Depth, and a Light to be kept at Night.

XCV. And be it further enacted, That the said Directors shall and may cause to be hoisted on the intended Lighthouse, or near thereto, a Flag or Ensign, for and during such Time in each and every Day as any Ship or Vessel drawing Eleven Feet Water may with Safety, as to the Draught of Water, enter the Channel between the Jetties and the said Basin or Harbour; and when and so soon as, and for and during such Time as such Ship or Vessel cannot with Safety enter the said Channel and Harbour, to cause to be taken down and removed such Flag or Ensign, and again to cause to be rehoisted the same in Manner aforesaid, when and as soon as there shall be such sufficient Water as aforesaid; and the said Directors shall and may cause to be burnt some Light or Lights in the aforesaid Lighthouse, near the Entrance of the Channel to the said Harbour, in each and every Night, or when such Flag or Ensign cannot be easily seen from Sea, for and during such Time as any Ship or other Vessel drawing Eleven Feet Water may with Safety, as to the Draught of Water, enter the said Channel and Harbour; and when and as soon as, and for and during such Time as such Ship or Vessel cannot with Safety enter the said Channel and Harbour, to extinguish or cause to be extinguished such Light or Lights, and again to burn or cause to be burnt such Light or Lights in Manner aforesaid, when and so soon as there shall be sufficient Water as aforesaid; and in case it shall become expedient to exhibit the said Light and Flag upon any other Place or Situation than aforesaid, it shall and may be lawful to and for the said Directors, or Five or more of them, to alter and remove the same accordingly, after Three Months previous Notice thereof given in the *London Gazette*, and in Two Newspapers circulating in the Eastern Division of the County of *Kent*, twice at least in each of the said Papers, of the Time and Place of such intended Alteration and Removal.

Exempting Vessels in His Majesty's Service.

XCVI. Provided always, and be it further enacted, That nothing in this Act contained shall extend to charge His Majesty, or any other Person on his behalf, with the Payment of any of the Rates or Duties under this Act, in respect of any of His Majesty's Ships of War, or any other Ship, Transport, or Packet of His Majesty, His Heirs and Successors; or any Vessel employed in His Majesty's Revenues of Customs or Excise, or in the Service or Employ of the Ordnance, or any Ship, Transport, or Packet employed in carrying the Mails of Letters and Expresses under the Authority of His Majesty's Postmaster General; or any Vessel employed in or upon His Majesty's Service, or in the Conveyance of any Officers or Soldiers, or any Horses, Arms, Ammunition, or Baggage to them or any of them belonging; and if any Person or Persons shall claim and take the Benefit of any such Exemption as aforesaid, without being entitled thereto, every such Person shall for every such Offence forfeit and pay the Sum of Five Pounds.

Edward Kingsford only to pay certain Dues in certain Cases.

XCVII. Provided always, and be it further enacted, That *Edward Kingsford* of *Littleborne* in the County of *Kent*, Owner of a certain Water Corn Mill, Wharfs, and Warehouses situate and being at a Place called *Seaton* in the Parish of *Ickham*, in the said County of *Kent*, and the Owners and Occupiers for the Time being of the said Mill, Wharfs, and Warehouses, shall pay the Rates and Dues stated in Schedule B.; and as to the Rates in Schedule C., that for a Period of Twenty-one Years from the Commencement of such Rates, One-half only of the said Rates in the said Schedule C. shall be paid and payable by the said *Edward Kingsford*, or the Owners and Occupiers for the Time being of the said Mill, Wharfs, and Warehouses for or in respect of Cargoes belonging to them or either of them, and not to any other Person or Persons whomsoever, and conveyed in Barges or Vessels not drawing more than Three Feet Six Inches Water when laden, and loaded or discharged in the *Little Stour* or *Seaton* Navigation; and further, that the said *Edward Kingsford*, and the Owners and Occupiers for the Time being of the said Mill, Wharfs, and Warehouses, shall pay the whole of the said Rates comprised in the said Schedules B. and C. after the said Period of Twenty-one Years, for and in respect of all Goods wherever loaded or discharged, or in whatever Vessels conveyed, and, within the said Period of Twenty-one Years, upon all Goods conveyed in Barges drawing more than Three Feet Six Inches, or loaded and discharged elsewhere than in the *Little Stour* or *Seaton* Navigation.

But other Rates when passing up the River above Entrance of Little Stour Navigation.

XCVIII. And be it further enacted, That from and after the passing of this Act, the said *Edward Kingsford*, and the Owner and Occupier for the Time being of the said Mill, Wharfs, and Warehouses, or any other Person or Persons, shall pay for and in respect of any Boats, Barges, or Vessels belonging to him, them, or either of them, and for and in respect of any Goods or Merchandize laden on board thereof, the whole of the Rates chargeable by the said Schedules B. and C. whenever the same shall pass higher up the said River *Stour* than the Entrance into the said *Little Stour* or *Seaton* Navigation.

XCIX. And

Vessels not to be cleared till Duties paid.

XCIX. And be it further enacted, That for the more effectually securing the Payment of the said Rates and Duties herein-before granted and authorized to be taken, no Collector or Comptroller of His Majesty's Customs, Receiver of Entries or Ships Surveyor or Searcher, Waiter, or other Officer of the Customs whatsoever, shall at any Time after the said Harbour shall be made, give or make out any Cocket, or other Discharge, or take any Report Outwards for any Ship or other Vessel within the said Harbour, or permit any Ship or other Vessel to go out of the said Harbour, or from any Landing Place within the Limits thereof, until the Master or Owner, or other Person having the Rule or Command of such Ship or Vessel, shall produce a Certificate from the Collector or Collectors who shall be appointed in pursuance of this Act, that the Rates or Duties by this Act herein-before granted and imposed are paid or secured to be paid, which said Certificate the said Collector or Collectors is and are hereby required to give without Fee or Reward.

Ships to be reported on arriving in the Harbour.

C. And be it further enacted, That every Master or Commander, or Person having the Rule or Command for navigating any Ship or Vessel which shall arrive in the said Harbour, with any Goods, Wares, or Merchandize, shall in every Case make his Report of such Ship or Vessel, and of her Cargo, to the Harbour Master for the Time being of the said Harbour, or to such other Person as the said Company of Proprietors shall appoint from Time to Time for that Purpose, within Six Hours next after her Arrival within the said Harbour; and shall also, within Six Hours after such Ship or Vessel and Cargo shall be so reported, deliver, or cause to be delivered, a true Copy of the Manifest of the Cargo of such Ship or Vessel at the principal Office or House near to the said Harbour, or at the Town and Port of *Sandwich*, used for the Time being for the Management of the Affairs of the said Company of Proprietors, to such Officer or Servant of the said Company of Proprietors as shall be appointed for the Receipt thereof; and every such Master or Commander, or Person having the Rule or Command of or navigating such Ship or Vessel, refusing or neglecting to make such Report, or to deliver a true Copy of such Manifest within the respective Times and in the Manner before directed, shall for every such Offence (upon being convicted thereof) forfeit and pay any Sum not exceeding Twenty Pounds Sterling.

How Tonnage Duties for the Harbour shall be ascertained.

CI. And be it further enacted, That the Master or other Person having the Rule or Command of any Ship or other Vessel lying within the said Harbour, shall and he is hereby required to produce and shew on Demand, to the Person or Persons appointed to collect the Rates and Duties aforesaid, the Custom House Register of the Burthen or Tonnage of such Ship or Vessel; and in case of Refusal, Failure, or Delay in producing and shewing the same, or in case there be no such Register, or in case the said Company of Proprietors, or such Person or Persons appointed to collect the Rates and Duties aforesaid, shall not be satisfied therewith, or shall entertain any Doubt of the Correctness thereof in regard to the Tonnage of such Ship or Vessel, it shall and may be lawful for the Person or Persons appointed to collect the Rates and Duties aforesaid to detain, and to enter,

enter, either alone, or with any Person or Persons for his or their Assistance, into such Ship or Vessel, and admeasure the same in Manner directed by an Act passed in the Fourth Year of the Reign of His present Majesty, intituled *An Act for the registering of Vessels*, and which shall be deemed to give the true Contents of the Tonnage; according to which Rule or Method, all Ships and Vessels using the said Harbour shall be measured, for computing, ascertaining, and collecting the said Rates or Duties of Tonnage, any Custom, Practice, or Usage to the contrary notwithstanding; and in case the same shall, upon such weighing, measuring, or gauging, appear to be of greater Tonnage than shall be set forth and contained in the Account which shall have been given thereof, then the Master or Person giving in such Account, shall pay the Costs and Charges of such weighing, measuring, or gauging; all which said Costs and Charges, upon Refusal of Payment thereof on Demand, shall and may be recovered and levied by such Ways and Means, and in such Manner as the said Rates are hereby appointed to be recovered and levied; but if any such Ship or other Vessel shall be found to be of the same or of less Tonnage than the same shall by such Account appear to be of, then the said Collector or Collectors, or such other Person or Persons respectively, shall pay the Costs and Charges of such weighing, measuring, or gauging, and shall also pay such further Damages as shall appear to any One or more Justices of the Peace acting in or for the said County or Place, on the Oath of any credible Witness, to have arisen from such Detention, and in Default of immediate Payment thereof by the Collector or Collectors, the same shall and may be recovered from the said Company of Proprietors by Distress and Sale of the Goods and Chattels of the Company, or of their Collector or Collectors; and if any Master, Commander, or other Officer of any Ship or Vessel, or any other Person or Persons, shall obstruct or hinder any Person or Persons so employed from weighing, measuring, or gauging any Ship or Vessel in pursuance of this Act, every such Master, Commander, or other Person, shall for every such Offence forfeit any Sum not exceeding Five Pounds, over and above the said Rates.

4 G. 4. c. 41.

Penalty on any Person obstructing the measuring of Vessels.

CII. And for the more orderly Government of the said Harbour, and for the better preserving the same, and the Works to be erected there from Injury or Damage, as well as for the Accommodation of Ships or Vessels coming into or going out of the said Harbour; be it enacted, That the said Company of Proprietors may, and they are hereby authorized and empowered to nominate and appoint such Person as they shall think proper to be a Harbour Master, with such Annual Allowance or Salary, payable out of the Rates or Duties by this Act granted and made payable, as they shall think fit; and such Harbour Master shall from Time to Time order and require all and every Person having the Rule or Command of any Ship or other Vessel entering into, lying, being, or abiding within the said Harbour, to lie, anchor, moor, and ballast, load, and unload such Ship or Vessel in such proper Place or Places within the same, as such Harbour Master shall assign or direct for those Purposes (having due regard that to the best of his Skill and Knowledge such Ship or other

Power to regulate Vessels lying within the Harbour.

other Vessel shall be ordered to lie, anchor, moor, ballast, load, or unload in a Place of Safety); and in case the Person or Persons having the Rule or Command of any such Ship or other Vessel, shall refuse or neglect to obey the Orders so given, every Person so offending, for every such Refusal or Neglect, shall forfeit and pay any Sum not exceeding Ten Pounds to the said Company of Proprietors.

Recovery of Rates and Duties authorized to be collected.

CIII. And be it further enacted, That all the Rates and Duties authorized by this Act to be received, collected, and taken, shall be paid to such Person or Persons, at such Place or Places, in such Manner and under such Regulations as the said Board of Directors of the said Company of Proprietors shall from Time to Time direct or appoint; and in case any Owner or Master, or any other Person or Persons having the Rule or Command of any Ship or other Vessel coming into or going from the said Harbour or Dock, or any Factor, Consignor, or Consignee of any Goods, Wares, or Merchandize, or any Person or Persons having the Charge or Command of any Boat or other Vessel using the said River, Haven, Cuts, New Haven, or Harbour, shall neglect or refuse to pay any such Rates or Duties, or any Part thereof on Demand, to the Person or Persons appointed to receive the same, then and in such Case it shall and may be lawful for the Collector or Collectors, or other Person or Persons appointed in pursuance of this Act to receive the same, to go on board such Ship, Boat, or other Vessel, to demand, collect, and receive the said Rates or Duties; and on Nonpayment thereof to take and distrain every such Ship, Boat, or other Vessel, and all the Tackle, Apparel, and Furniture thereto belonging, or any Part thereof, and all or any Part of the Goods, Wares, or Merchandize in respect whereof such Rates or Duties shall be payable, either on board such Ship, Boat, or other Vessel, or on Land, and the same to detain until the respective Rates or Duties shall be satisfied and paid; and in case of any Neglect or Default in Payment of the said Rates or Duties for the Space of Seven Days after any Distress or Distresses so made or taken, exclusive of the Day of taking the same, that then it shall and may be lawful to and for the said Company of Proprietors, or such Collector or Collectors, or other Person or Persons appointed as aforesaid, to cause the same to be appraised by One or more Sworn Appraisers, or other sufficient Persons, and afterwards to sell the said Distress or Distresses, and out of the Produce of the Sale thereof, first to pay all Duties of Customs or Excise due in respect of the said Ship or Goods, and then to satisfy themselves or himself as well for and in respect of the Rates or Duties so neglected or delayed to be paid, as also for and in respect of their or his reasonable Charges in taking, keeping, appraising, and selling the same, rendering the Overplus (if any such there be) to the Owner, Master, or Commander, or Person or Persons having the Rule or Command of such Boat, Ship, or Vessel, upon Demand; and it shall and may be lawful for the said Company of Proprietors, in case of Nonpayment of the Rates and Duties as aforesaid, instead of recovering the same in Manner aforesaid, or in case the whole thereof shall not be so recovered, to proceed for the Recovery of the same, or so much thereof as shall not be

so

so recovered, by Action of Debt or Trespass on the Case, in any Court of Record at *Westminster*.

Persons eluding Payment to continue chargeable.

CIV. And be it further enacted, That if any Master, Owner, or other Person having the Rule or Command of any Ship, Boat, or other Vessel, or the Owner, Factor, or Consignee of any Goods, Wares, or Merchandize, shall by any Means whatsoever, at any Time or Times, elude, evade, or avoid the Payment of the Rates or Duties hereby made payable, or any Part of the same, each and every Person eluding, evading, or avoiding Payment as aforesaid, shall forfeit and pay to the said Company of Proprietors a Sum equal to the Amount of such Rates and Duties; and shall also stand charged with and be liable to the Payment of the said Rates and Duties, which shall and may be recovered from such Master or Owner, Factor or Consignee, or such other Person having such Rule or Command respectively, at any Time or Times, either by the Means herein-before prescribed for the levying of the said Rates and Duties, or by the same Method and in such Manner as is hereinafter directed for levying and recovering the Fines, Forfeitures, and Penalties imposed by this Act, and with the like Costs.

Collectors of Rates not to be incompetent Witnesses.

CV. And be it further enacted, That in case any Dispute, Suit, or Litigation shall arise touching or relating to the said Rates or Duties, or any of them, the Person or Persons appointed to collect the said Rates or Duties, under the Authority of the said Directors or Company of Proprietors, shall not be disqualified from giving Evidence in any such Dispute, Suit, or Litigation, by reason of his, her, or their Appointment and Office to collect such Rates or Duties.

Rates may be altered.

CVI. And be it further enacted, That it shall and may be lawful for the Directors of the said Company of Proprietors from Time to Time to lower or reduce all or any of the Rates and Duties by this Act granted, and again to raise the same to such Sum or Sums of Money as they shall think proper, not exceeding the Sums by this Act allowed to be taken, as often as it shall be deemed necessary for the Benefit of the said Undertaking.

Wharfage Duties to be paid.

CVII. And be it further enacted, That if any Goods, Wares, Merchandize, or other Things, shall be brought upon any Pier or Piers, Jetty or Jetties, Wharf or Wharfs, Quay or Quays, Landing Place or Landing Places, or be deposited in any Warehouse or Warehouses belonging to the said Company of Proprietors or their Lessees, then and in such Case there shall be paid to the said Company of Proprietors or their Lessees, or to the Collector or other Person or Persons whom they shall appoint to demand, receive, and recover the same, over and above the Rates and Duties herein-before granted and authorized to be taken, and in such and the same Manner as such Rates and Duties are hereby directed and appointed to be paid and recovered, such Sum *per* Ton or otherwise, as the said Company of Proprietors, or their Directors, shall from Time to Time fix and appoint, not exceeding the Rates and Charges in Schedules D. and E. to this Act annexed and particularly specified and set forth.

CVIII. And

Masters of Boats to give an Account of their Lading.

CVIII. And for the better ascertaining and more easy, effectual, and just Collection of the said Rates hereby directed to be paid to the said Company of Proprietors for Goods, Wares, and Merchandize, carried on the said River, Haven, Cuts, and New Haven; be it further enacted, That the Person having the Care of every Boat, Barge, Keel, or other Vessel navigating upon the said River, Haven, Cuts, and New Haven, shall give to the Collector of the said Rates, or to any other Officer to be appointed for such Purpose, at the Place or Places where he shall attend for that Purpose, a just Account in Writing, signed by the Person or Persons sending or consigning such Goods and other Things as shall be embarked in each such Boat, Barge, Keel, or other Vessel, or by his or their Clerk or Agent, which Account shall contain a Statement of the Quantities and Weight of such Goods and other Things, and of their Nature, Sort, or Kind, which shall be embarked in each such Boat, Barge, Keel, or Vessel; and in case the Person having the Care of such Boat, Barge, Keel, or Vessel shall neglect or refuse to give such Account, or shall refuse to produce his or their Invoice or Bill of Lading to the Officer demanding the same, or shall wilfully or knowingly give a false Account, or shall wilfully do any other Act whereby the Payment of the said Rates or any Part thereof shall be avoided; or if the Person or Persons sending or consigning such Goods or Things, or his or their Clerk or Agent, shall sign a false Account thereof, every Person so offending shall forfeit and pay the Sum of Ten Shillings for every Ton of Goods or other Things (and so in proportion for any less Quantity than a Ton), which shall be in or be conveyed by such Boats, Barges, Keels, or other Vessels respectively, over and above the Rates which shall be payable for the same by virtue of this Act.

What Quantities of Goods shall be deemed a Hundred Weight.

CIX. And be it further enacted, That the Tonnage of Timber, and all other Goods, Merchandize, Articles, and Things whatsoever conveyed inward or outward, or coastwise, or imported or exported to or from the said Harbour, or conveyed upon and along the said River, Haven, Cuts, and New Haven, shall be ascertained and charged according to the real Weight thereof, and that One hundred and twelve Pounds Weight Avoirdupois shall be deemed and taken as and for One Hundred Weight, any Usage to the contrary thereof notwithstanding; and if any Difference shall arise between any Collector of the said Rates and the Master or other Person having the Care or Charge of any Ship, Boat, Barge, Keel, or other Vessel entering or leaving the said Harbour, or navigating the said River, Haven, Cuts, and New Haven, or the Owner, Factor, Consignor or Consignees of any Goods, Wares, Merchandize, or other Things loaded or embarked therein, concerning the Weight or Quantities of the Goods, Wares, or other Matters or Things therein embarked or contained, it shall be lawful for any such Collector to stop and detain any such Ship, Boat, Barge, Keel, or other Vessel, and to weigh or gauge, or cause to be weighed or gauged, such Ship, Boat, Barge, Keel, or other Vessel, and all such Goods, Wares, and Merchandize, or other Matters or Things as shall be therein embarked or contained; and in case the same shall, upon any such weighing or gauging, appear to be of greater Weight or Quantity than the Account given thereof by such Master, Owner, or other Person having the Care or Charge of such Ship, Boat, Barge,

In case of Difference concerning the Weight, Collector may weigh them.

Keel, or other Vessel, then it shall and may be lawful to and for the said Directors of the said Company of Proprietors, or their said Collector or Collectors, and he and they are hereby authorized and empowered to charge for such Goods and Things according to the Weight thereof found upon such Weighing, or declared by the Gauge of such Ship, Boat, Barge, Keel, or other Vessel, and the graduated Index thereon; and the Master, Owner, or other Person giving in such Account, shall pay the Costs and Charges of such weighing or gauging, all which Costs and Charges, upon Refusal of Payment upon Demand, shall and may be recovered and levied in the same Manner as the said Rates are hereby appointed to be recovered and levied; but if such Timber, Goods, Wares, Merchandize, or such other Matters or Things shall appear to be of the same or of a less Weight or Quantity than the Account given thereof by the said Master, Owner, or other Person, then the said Company of Proprietors shall pay the Costs and Charges of such weighing or gauging, and shall also pay to such Master or other Person, or to the Owner or Owners of such Goods, Wares, Merchandize, or other Things, such Damages as shall have arisen from such Detention; and in Default of Payment thereof, the same shall be recovered from the said Company of Proprietors by Distress and Sale of the Goods and Chattels of the Company or of their Collector or Collectors.

Masters to put their Names on the Outside of Boats.

CX. And be it further enacted, That every Owner, Master, or other Person, having the Care or Command of any Boat, Barge, Keel, or other Vessel passing upon or using the said River, Haven, Cuts, New Haven and Harbour, or any of them, shall cause his Name and Place of Abode, and the Number of his or her Boat, Barge, Keel, or other Vessel, to be entered with the Clerks to the said Company of Proprietors, and shall also cause such Name and Number to be painted and continually kept painted, so that the same may be distinctly seen, in large White Capital Letters and Figures on a Black Ground, Three Inches high at the least, and of a proportionable Breadth, on the Outside of the Head or Stern of every such Boat or other Vessel, higher than the Place to which the same shall sink into the Water when fully laden; and also shall fix on each Side thereof respectively, and continually keep and continue so fixed, correct Indexes of Copper, Lead, or other Metal of such graduated Dimensions, and of such convenient Height, and under such Regulations as the Directors of the said Company of Proprietors shall from Time to Time order and direct, so that the true Weight of the Lading on board may at all Times be thereby clearly ascertained and shewn; and shall permit and suffer every such Boat, Barge, Keel, or other Vessel to be gauged, weighed, or measured at the Expence of the said Company of Proprietors, whenever it shall be required by them, or any Person or Persons appointed for that Purpose, at such Place or Places on the said River, Haven, Cuts, New Haven and Harbour, or any of them, as they shall appoint; and every Owner, Master, or other Person having the Care or Command of any Boat, Barge, Keel, or other Vessel, who shall navigate the same upon the said River, Haven, Cuts, New Haven, or Harbour, without having and keeping such Name, Figures, and Index thereon, as are herein-before directed, or shall alter, erase, deface, or destroy the same or any Part thereof,

Weight of the Lading of Vessels to be marked.

or shall fix any false Name, Figures, or Index, or who shall refuse to permit and suffer the same to be gauged and measured, shall, for every such Offence, forfeit and pay any Sum not exceeding Twenty Pounds.

Owners of Ships and Boats to be accountable in certain Cases for Damages done to the Harbour, &c.

CXI. And be it further enacted, That every Master, Owner, or other Person having the Rule or Command of any Ship or other Vessel entering into, or departing from, or lying or being in the said Harbour, or having the Charge or Care of any Boat, Barge, Keel, or other Vessel navigating upon the said River, Haven, Cuts, and New Haven, or any of them, shall be and is hereby made answerable for any Damage, Spoil, or Mischief which shall be done to the said River, Haven, Cuts, New Haven, and Harbour, or any of the Works to be constructed under this Act, through Wilfulness, Unskilfulness, or Negligence of him, or by any of the Mariners, Boatmen, Servants, or Crew on board of or employed in or about the same, or by or in the navigating, loading, or unloading of such Ship, Boat, Barge, Keel, or other Vessel, or by any other Means whatsoever, and also for any Trespass, Damage, Spoil, or Mischief which may be done by him, or by any such Person and Persons as aforesaid, to the Owner or Owners, Proprietor or Proprietors, Occupier or Occupiers of any Buildings or other Erections, Lands, Tenements, or Hereditaments, adjoining to the said River, Haven, Cuts, New Haven and Harbour, or other Works, or to any of them; and the said Master or Owner, or other Person having the Rule or Command of such Ship, Boat, Barge, Keel, or other Vessel, shall and may be sued and prosecuted for the same in any of His Majesty's Courts of Record at *Westminster*; and if a Verdict or Judgment shall be given against him, either on Proof made, or by Default, or upon Demurrer, the Plaintiff in any such Case shall recover his Damages thereby sustained with full Costs of Suit, or such Damages, in case the same shall not exceed Ten Pounds in Amount, shall and may be recovered of the Person or Persons herein-before made liable to pay the same, or of the Person or Persons by whom the Trespass, Damage, Spoil, or Mischief shall have been done, as in the Nature of a Penalty, in the same Manner as any Penalty is hereby directed to be recovered.

Masters to recover from their Servants any Sums for their Defaults.

CXII. And be it further enacted, That in case the Owner or Owners of any Ship, Boat, Barge, Keel, or other Vessel using the said River, Haven, Cuts, New Haven or Harbour, or any Basin or Dock, or other Work therein, or adjoining thereto, or passing through any of the Locks therein, shall be compelled to pay any Penalty, or to make Satisfaction for any Damages by reason of any Neglect or Default done or committed by his or their Servants, Boatmen, or Watermen, or by any other Person or Persons on board such Ship, Boat, Barge, Keel, or other Vessel, or any of them, such Servants, Boatmen, Watermen, or other Person or Persons as aforesaid, and each and every of them, shall be liable to repay such Penalty or Damages (with the Costs thereof) to such Owner or Owners; and in case of Nonpayment upon such Demand thereof, and Oath made by such Owner or Owners of the Payment

made by him or them of such Penalty, Satisfaction, or Damages, and that the same and the Costs thereof have not been repaid to him or them by such Servants, Boatmen, Watermen, or other Person or Persons as aforesaid, or any of them, although demanded (such Oath to be made before any One Justice of the Peace for the County or Place where such Penalty or Satisfaction shall have been recovered), the Amount thereof shall be recovered in like Manner as any Penalty is hereby directed to be recovered.

Places to be made for Boats to turn or lie in, or for other Boats to pass.

CXIII. And be it further enacted, That the said Company of Proprietors shall and may, and they are hereby empowered, in such Parts of the said River, Haven, Cuts, and New Haven as shall not be of sufficient Breadth for admitting a Boat, Barge, Keel, or other Vessel to turn about, or lie whilst another Boat, Barge, Keel, or Vessel shall pass by, or to admit Three Boats, Barges, Keels, or other Vessels to pass each other, to make and cut proper Spaces or Openings into the Lands adjoining to the said River, Haven, Cuts, and New Haven, at convenient Distances from each other, for the turning, lying, or passing by of any such Boat, Barge, Keel, or other Vessel; and all such Boats, Barges, Keels, and other Vessels, which shall be haled or navigated upon the said River, Haven, Cuts, and New Haven, or any of them, shall, upon meeting any other Boat, Barge, Keel, or Vessel navigating thereupon, stop at or go back to and lie in the said Spaces or Openings, in such Manner as the said Company of Proprietors, or their Directors, shall from Time to Time direct or appoint: And if any Boat, Barge, Keel, or other Vessel shall be placed or lie abreast in any Part of the said River, Haven, Cuts, and New Haven, or any of them, not being moored at both Ends; or if any Person or Persons shall obstruct the Navigation of the said River, Haven, Cuts, and New Haven, or any of them, by means of loading, unloading, misplacing, or otherwise misconducting any Boat, Barge, Keel, or other Vessel, and shall not immediately, upon Request made, alter the Situation of such Boat, Barge, Keel, or other Vessel, or alter or lessen the Loading thereof, as the Case shall require, so as that the said Obstruction shall cease and be removed; or if any Person or Persons shall float any Timber upon the said River, Haven, Cuts, and New Haven, or any of them, or throw any Trees, Ballast, or other Thing or Things into any Part of the said River, Haven, Cuts, and New Haven, or any of them, or shall wilfully obstruct the Navigation thereof in any other Manner, every Person so in any such Cases offending shall for every such Offence forfeit a Sum not exceeding Five Pounds; and it shall be lawful for the Directors of the said Company of Proprietors, or their Servants, to cause any such Boat, Barge, Keel, or other Vessel to be reloaded or unloaded if necessary, or to be removed, and also to remove such Timber or other Thing or Things in such Manner as shall be proper for preventing such Obstruction in the Navigation, and to keep and detain such Boat, Barge, Keel, or other Vessel, and the Loading thereof, or any Part of such Loading, Timber, or other Thing or Things, until the Charges occasioned by such Reloading, Unloading, or Removal shall be paid, or otherwise to recover

Obstructions of the Navigation to be removed;

recover the Expences incurred thereby, in like Manner as any Penalty is hereby directed to be recovered.

and Vessels sunk to be weighed up.

CXIV. And be it further enacted, That if any Boat, Barge, or other Vessel shall be sunk in any Part of the said River, Haven, Cuts, New Haven, or Harbour, or any of the Locks or Entrances thereof respectively, and the Person or Persons having the Care of such Boat, Barge, Keel, or other Vessel shall not without Loss of Time weigh or draw up the same, it shall be lawful for the Agents or Servants of the said Company of Proprietors, or any of them, to cause such Boat, Barge, Keel, or other Vessel to be weighed or drawn up, and to detain and keep the same until Payment shall be made of all the Expences thereby necessarily incurred and occasioned; and if the same shall not be paid within Ten Days after Notice given to any Owner of such Vessel of such Offence, exclusive of the Day of giving such Notice and of the Day of Sale, then to sell the same for the Payment thereof, rendering the Overplus, if any, after Payment of such Expences, and the Expence of the Detention and Sale, to the Owner or Owners thereof.

Penalty for destroying the Ropes, &c. of Vessels,

CXV. And be it further enacted, That in case any Person or Persons shall wilfully or maliciously cut, break, or in any Manner destroy or injure any Rope, Chain, or other Thing by which any Ship or other Vessel lying in the said Harbour, or within any Part of the Entrance Pier or Jetties thereof, shall be moored and fastened, such Person or Persons shall for every such Offence forfeit and pay any Sum not exceeding Five Pounds; provided always, that such Penalty shall not in any Manner preclude or bar or affect the Recovery of any Damages in any Action which may be brought for any Injury which may arise from cutting, breaking, destroying, or injuring any such Rope, Chain, or other Thing as aforesaid: Provided also, that nothing herein contained shall hinder or restrain any Harbour Master or Masters to be appointed in pursuance of this Act, or his or their Assistant or Assistants, from exercising in a due and reasonable Manner any of the Powers and Authorities hereby vested in them; or to hinder or restrain the Owner or Owners, Occupier or Occupiers of any of the Quays or Wharfs, from casting off any Rope or Ropes that may be fastened to any Post or Posts, or other Fixture or Fixtures on such Quays or Wharfs, without the Licence and Consent in Writing of such Owner or Owners, Occupier or Occupiers, for that Purpose had and obtained.

or misusing the Locks, or doing other Damage to the Navigation.

CXVI. And be it further enacted, That if any Person or Persons shall wantonly or unnecessarily open or cause to be opened any Lock, Paddle, Valve, or Clough, belonging to the said River, Haven, Cuts, and New Haven, or any of them, or any of the Works thereto belonging; or when necessarily emptying a Lock for the Purpose of passing into or entering the same, shall neglect to shut the Top Gate or Gates thereof, and the Paddles, Valves, or Cloughs thereto belonging, before he or they shall draw the Paddles, Valves, or Cloughs of or belonging to the Bottom Gates thereof, or any of them; or shall suffer any Boat, Barge, Keel, or other Vessel to strike

or

or run upon any of the Bridges or Locks thereof; or shall flush or draw off, or cause to be flushed or drawn off, the Water from any Part of the said River, Haven, Cuts, or New Haven; or shall leave any Gate or Gates, Paddle, Valve, or Clough of any Lock open and running after any Boat, Barge, Keel, or other Vessel, shall have passed through the same (except in such Cases as are otherwise ordered); or shall draw, or cause to be drawn any Paddle, Valve, or Clough on the said Navigation, so as to mispend or waste the Water thereof, or shall wilfully obstruct, hinder, or prevent any Person or Persons in the Execution of this Act; every Person offending in any of the Cases aforesaid, shall forfeit and pay for every such Offence any Sum not exceeding Ten Pounds.

Persons destroying the Works to be deemed guilty of Felony.

CXVII. And be it further enacted, That if any Person or Persons shall wilfully or maliciously demolish, break down, or damage any Quays, Wharfs, Piers, Jetties, or any of the Works which shall be constructed in, or which shall belong to the said River, Haven, Cuts, New Haven or Harbour; or if any Person or Persons shall wilfully and designedly break, throw down, destroy, or damage any Bridges, Locks, Tunnels, Banks, or other Works to be erected and made by virtue of this Act, or any Part thereof, every such Person shall be subject and liable to the like Pains and Penalties as in Cases of Felony; and the Court, by and before whom such Person or Persons shall be tried, shall have Power and Authority to cause such Person or Persons to be punished by Transportation for Seven Years, or in such other Manner as any Felons may be punished by the Laws and Statutes of this Realm.

Regulations of Vessels passing the Locks.

CXVIII. And be it further enacted, That every Boatman or other Person navigating or having the Care of any Boat, Barge, Keel, or other Vessel upon the said River, Haven, Cuts, and New Haven, which shall pass through any Lock to be made thereon, shall under the Direction and Supervision of any Lock-keeper to be appointed by the said Company of Proprietors, in going upon the said River, Haven, Cuts, and New Haven, and other Works, from a higher to a lower Level, previously to his bringing his Boat, Barge, Keel, or Vessel into any Lock, carefully shut the Lower Gates of such Lock, and the Paddles or Sluices thereto belonging, before he shall draw the Paddles or Sluices of the Upper Gates thereof; and after he shall have guided or brought his Boat, Barge, Keel, or Vessel into the said Lock, he shall then shut the Upper Gates thereof, and the Paddles or Sluices thereof, before he shall draw the Paddles or Sluices belonging to the Lower Gates thereof; and in going up the said River, Haven, Cuts, and New Haven, from a lower to a higher Level, such Boatman or other Person shall first guide his Boat, Barge, Keel or Vessel into the said Lock, and carefully shut the Lower Gates thereof, and the Paddles or Sluices thereto belonging, before he shall draw the Paddles or Sluices of the Upper Gates thereof; and as soon as he shall have passed with his Boat, Barge, Keel, or Vessel out of the said Lock, such Boatman or other Person shall securely shut the Upper Gates thereof, and the Paddles or Sluices thereof; and at all Times Boats, Barges, Keels, or Vessels going up the said River, Haven, Cuts, and New Haven, if within Sight of any Boat or Vessel coming down and

at a Distance not exceeding One hundred Yards below any Lock, shall pass through such Lock before the Boat, Barge, Keel, or Vessel coming down, and then the Boat, Barge, Keel, or Vessel above such Lock shall come down, and if there shall be more Boats, Barges, Keels, or Vessels than One below, and One above any Lock at the same Time within the Distance aforesaid, such Boats, Barges, Keels, or Vessels shall go up and come down through such Locks by Turns as aforesaid, until all the Boats, Barges, Keels, or Vessels going up or coming down shall have passed the same, in order that One Lock-full of Water may serve Two Boats, Barges, Keels, or Vessels; and if any Person or Persons shall offend against any such Provision or Provisions, Rule or Rules, Regulation or Regulations, for entering or passing any such Lock or Locks, or for opening or shutting any Gate or Gates thereof, or for drawing or shutting the Paddles or Sluices thereof, or any of them, then and in every such Case every such Person shall for every such Offence forfeit any Sum not exceeding Five Pounds.

Preventing Dogs being landed from Vessels.

CXIX. And be it further enacted, That if any Person shall permit or suffer any Dog to go on Shore from any Boat, Barge, or other Vessel during the Time the same shall be navigating or passing along the said River or Cut, every Person so offending shall forfeit and pay any Sum not exceeding Ten Shillings.

Punishment of Persons damaging Fences.

CXX. And be it further enacted, That in case any Person or Persons shall break down, destroy, carry away, or damage any Gate, Stile, Post, Rail, or other Fence to be put up or placed under the Authority of this Act, for the Fencing of the Towing Paths of the said River, Haven, Cuts, and New Haven, in any and every Case where the Damage occasioned by the Offence shall not amount to more than Twenty Pounds, every Person so offending, and being thereof convicted before any One or more Justice or Justices of the Peace (not interested in the Premises), for the County, City, or Place where the Offence shall be committed, on the Confession of the Offender or Offenders, or on Proof of the Offence on the Oath of One or more credible Witness or Witnesses (which Oath such Justice or Justices is and are hereby empowered to administer), shall for every such Offence forfeit and pay any Sum not exceeding Twenty Pounds; and no Person shall be deemed incompetent to give Evidence of such Offence by reason of his or her being a Proprietor of the said Navigation and Harbour Company, or the Owner of such Gate, Stile, Post, Rail, or other Fence; and in case any such Offender or Offenders shall not immediately pay such Penalty or Penalties, or find Sureties to the Satisfaction of such Justice or Justices for the Payment thereof at such future Day as he or they shall think proper to appoint, it shall be lawful for such Justice or Justices to cause the same to be forthwith levied by Distress and Sale of the Goods and Chattels of the Offender or Offenders by Warrant under his or their Hand and Seal, or Hands and Seals, returning the Overplus, if any, to the Owner or Owners of such Goods and Chattels, after deducting the Costs and Charges of such Distress and Sale, the whole of which Penalty or Penalties shall be paid to the Owner or Owners of such

Gate, Stile, Post, Rail, or Fence so broken, destroyed, or carried away; but if the Owner of such Gate, Stile, Post, Rail, or Fence shall be the Informer, and shall give Evidence of the Offence, then the whole of such Penalty or Penalties shall be paid to the Overseers of the Poor of the Parish where such Offence shall be committed, for the Benefit of such Poor; and in that Case the Offender or Offenders shall (over and above the Payment of such Penalty as last aforesaid) make such Recompence and Satisfaction to the Owner or Owners of such Gate, Stile, Post, Rail, or Fence, for the Damage done by such Offender or Offenders, as the Justice or Justices before whom he or they shall be convicted of such Offence shall think fit to allow in respect thereof, such Allowance for Damage to be added to such Penalty or Penalties, and levied therewith in Manner above mentioned; and for Want of such Distress, such Justice or Justices shall and may commit the Offender or Offenders to the Common Gaol, or House of Correction, there to be kept to hard Labour for any Space of Time not exceeding Three Calendar Months, or until such Penalty and Damage shall be sooner paid.

Beach not to be taken within certain Limits without Consent of Company.

CXXI. And be it further enacted, That no Person or Persons shall take away any of the Beach, Shingle, Sand, Gravel, or Earth from any Part of the Strand or Sea-shore within Five hundred Yards at the least from the Outsides of either of the Piers or Jetties measuring along the Coast from such Pier or Jetty, either for the Purpose of ballasting any Ship or Vessel, or for any other Purpose whatsoever, without the Consent of the said Company of Proprietors, or their principal Officer at the said Harbour, or at the said Town and Port of *Sandwich*, on pain of forfeiting Twenty Shillings for every Ton so taken; nor shall any Person or Persons discharge the Ballast of any Ship or Vessel between or within the same Distances from the said Piers or Jetties, on pain of forfeiting Five Pounds for every Offence: Provided always, that it shall be lawful for the said Company of Proprietors to take for their own Use and Disposal all the Beach, Shingle, Sand, Gravel, and Earth, which may be dug up, dug out, or excavated within the Pier Heads or Jetties, or in the making of the said Harbour, Basins, or other Works authorized to be made by this Act; and it shall also be lawful for the said Company of Proprietors to take and use any Quantity of the Beach, Shingle, Sand, Gravel, or Earth, from any Part of the Shore along the Coast from *Sandown Castle* to the Cliff at *Pegwell*, for making, maintaining, and repairing any of the approach Roads to be made by the said Company of Proprietors, or for any other Purpose whatsoever appertaining to the making, maintaining, or repairing of the said Harbour, Docks, Basins, Cuts, New Haven, or other Works, without being subject to any Penalty for the same, so as that they do not thereby endanger the Safety of the adjoining Lands, and pay to the Owners of such Beach, Shingle, Sand, Gravel, or Earth, as they may take from above High Water Mark, the Value thereof, and the Damage occasioned thereby.

Power to provide an Office and Warehouses.

CXXII. And be it further enacted, That it shall be lawful for the said Company of Proprietors to erect or otherwise provide any Warehouses or other Buildings for depositing or keeping any Goods,

Goods, Merchandize, or other Things carried or conveyed, or intended to be carried or conveyed upon the said River, Haven, Cuts, New Haven, and Harbour, or for an Office or Offices for transacting the Business of the said Company of Proprietors therein, at any Distance from the said Navigation and Harbour, not exceeding One hundred Yards, which they shall judge necessary or convenient; and for that Purpose the said Company of Proprietors may and are hereby authorized and empowered to purchase, lease, or hire any Ground or Buildings where they shall think proper, provided the Owners and Proprietors of, and other Persons interested in such Grounds or Buildings, shall be consenting to sell or let the same, but not otherwise.

Company empowered to lease the Rates.

CXXIII. And be it further enacted, That it shall and may be lawful to and for the said Company of Proprietors, and they are hereby authorized and empowered, at any of the General or Special General Assemblies, by Writing under their Common Seal at any Time or Times, to let to farm the Rates hereby made payable or any Part or Parts thereof, upon the Whole or any Part or Parts of the said River, Haven, Cuts, New Haven and Harbour, or other Works, to any Person or Persons, for any Time or Term they shall think proper, not exceeding Three Years from the Commencement of any Lease; and every such Lease shall be valid and effectual; and the Lessee or Lessees thereof, and also such Person or Persons as such Lessee or Lessees shall appoint to collect and receive the Rates so let, shall, during the Continuance of every such Lease, be deemed Collectors of the Rates so let, and shall have the same Power and Authority for collecting and recovering the same as if he, she, or they had been appointed for that Purpose by the said Company of Proprietors; provided public Notice of the Intention to let the said Tolls or any Part thereof be given by the Directors or the Clerks to the said Company by Advertisements published in the *London Gazette* and One Newspaper circulating in the Eastern Parts of the said County of *Kent*, at least Ten Days prior to any such General Assembly, at which the said Rates or any Part thereof are proposed to be let as aforesaid.

Vessels of small Tonnage not to pass through Locks.

CXXIV. And be it further enacted, That no Boat, Barge, or other Vessel of less Burthen than Twenty-five Tons, or with less Burthen of Goods than Twenty Tons, unless such last-mentioned Boat, Barge, or Vessel shall be returning after the Delivery of her Lading, or proceeding to receive such Lading, shall pass through any of the Locks intended to be made by virtue of this Act, without the Consent of the said Company of Proprietors, or of their principal Agent at *Canterbury* or *Sandwich*, for the Time being, in Writing first had and obtained, on paying the same Tolls as if fully laden with Twenty-five Tons.

Power to divert certain Roads.

CXXV. And whereas the Line of the said New Haven and Harbour will cross certain Roads and Ways leading to the Lands, Tenements, and Hereditaments situate between the said Line of the said New Haven and Harbour, and the said Old Haven, and to the Sea Shore; and it will not be practicable to build Bridges over, or to make Roads

Roads or Ways under the said New Haven and Harbour, but at a very heavy Expence, but the Convenience of the Owners and Occupiers of the said Lands, Tenements, and Hereditaments, and of the Public, will be sufficiently provided for in Manner herein-after mentioned; be it therefore further enacted, That the said Company of Proprietors shall make and form a good and sufficient Road or Way for Carriages from *Sandwich* Bridge to the said Lands, Tenements, and Hereditaments, and to the Sea Shore on the North Side of the Part of the Old Haven used for the Purposes of the said Navigation, and of the said New Haven, with a convenient Bridge for Carriages over the Old Haven, where the said Lock, Floodgate, or Sluice, or Tumbling Bay shall be made and erected across the same as hereinbefore mentioned, or near thereunto, and do and shall at their own Costs and Charges for ever maintain and keep in good and sufficient Repair the said Road and Bridge so to be formed and made by them, and do and shall suffer the Owners and Occupiers of the said Lands, Tenements, and Hereditaments, and their Servants and Workmen, and all Persons necessarily going to or from the said Lands, Tenements, and Hereditaments, or to and from the Sea Shore, to have the free Use of the said Road or Way, for the more convenient and better Occupation and Enjoyment of such their respective Lands, Tenements, and Hereditaments, and otherwise jointly with themselves for the Use of the said Navigation and Works.

Owners, &c. of Lands lying between New Haven and Harbour and Old Haven not to pay Toll.

CXXVI. Provided always, and be it further enacted, That the Owners and Occupiers of the Lands, Tenements, and Hereditaments, lying between the said New Haven and Harbour, and the said Old Haven, and their Servants and Workmen, and all Persons necessarily going upon the said Road or Way so to be formed, to or from any of the said Lands, Tenements, and Hereditaments, or to or from the Part of the said Old Haven between *Sandwich* Bridge and the said New Haven, or any Quays or Wharfs which may be made or erected by the Side thereof, or to or from the said New Haven, Harbour, and other Works, or any Part thereof, or to or from the Sea Shore between the Old and New Haven, and passing *Sandwich* Bridge aforesaid, with Carriages, Horses, and Cattle, or on Foot, shall be exempted, for themselves, their Carriages, Horses, and Cattle, from paying any Toll now chargeable at *Sandwich* Bridge.

Power to divert certain Highways.

CXXVII. And be it further enacted, That it shall and may be lawful to and for the said Company of Proprietors to divert and turn a certain Highway leading from *Word* otherwise *Worth* aforesaid, to a certain Place within the same Parish called the *Blue Pigeons*, and to the Commencement of a private Road adjoining thereto, and communicating therewith; and also a certain other Highway leading from the said Town and Port of *Sandwich* to the Town of *Deal* in the said County of *Kent*, where the Line of the said New Haven will intersect the same respectively, the said Company of Proprietors making a New Road or Roads, of not less Width than the Roads so diverted along the South Side of the said New Haven and Harbour, from the Place where the Line of the said New Haven shall intersect the said Old Roads respectively to the Place in which the said Old Road from *Word*

otherwise *Worth* aforesaid, to *Blue Pigeons* aforesaid, again leaves the Line of the said New Haven, so as to continue and preserve the said Communication thereof with the said private Road, and also to the Place in which the said Old Road, from the said Town and Port of *Sandwich* to the said Town of *Deal*, again leaves the Line of the said New Haven; and that the said Company of Proprietors shall, at their own Costs and Charges, for ever maintain and keep in good and sufficient Repair the said Roads so to be made by them as aforesaid, and shall suffer all Persons entitled to use the said Old Roads, to have the free Use and Enjoyment of the said New Roads, in the same or the like Manner, and for all such Purposes as they are entitled to use the said Old Roads.

Power to divert Roads, &c. on making others, and vesting Old Roads in the Company.

CXXVIII. And whereas the said Company of Proprietors, in improving, making, and forming the said River, Haven, Cuts, New Haven, and Harbour, may have Occasion to divert and turn several Roads and Ways, besides those herein-before mentioned, and in lieu of such Old Roads and Ways, at a considerable Expence, make other more or equally convenient Roads and Ways; be it therefore enacted, That where it shall appear necessary that any Road or Way shall be diverted or turned in the Line or Track of the said River, Haven, Cuts, New Haven, and Harbour, then and in such Case it shall and may be lawful to and for the said Company of Proprietors to divert and turn such Road or Way, an Order in Writing from any Two or more of His Majesty's Justices of the Peace for the County or Place within which the Road or Way to be turned shall be situate, (which Order such Two or more Justices are hereby authorized and required, at their Discretion, to grant,) being first obtained for that Purpose; and the said Company of Proprietors first making a New Road or Way of not less Width than the former; and when such New Road or Way shall be completed and finished, the Part of the Old Road or Way so to be diverted and turned, shall be and become vested in Fee Simple in the said Company of Proprietors, as shall also the said Parts of the said Roads from *Word* otherwise *Worth*, to the said Place called the *Blue Pigeons*, and from the said Town and Port of *Sandwich* to the said Town of *Deal*, which shall be diverted as aforesaid, with full Power for them to sell or dispose of the same, in such Manner and Form and under such Regulations as are herein-before directed with respect to Lands which shall be purchased by the said Company of Proprietors, and not found necessary to be made use of for the Purposes of this Act, or as near thereto as the Circumstances of the Case will admit; and the Land constituting the New Road or Way shall from thenceforth for ever be vested in or belong to such Person or Persons, and be subject and liable to such and the same Laws, Rules, and Regulations, in every respect, as the Old Road or Way so to be diverted or turned shall have been subject and liable to immediately prior to such Diversion or Turning: Provided always, that in case any such New Road or Way shall be made within the said Parish of *Word* otherwise *Worth* (which is not at present liable to the Repairs of any Road in the Direction of the said New Haven, beyond the said Place called the *Blue Pigeons*), the same shall be for ever maintained and kept in

good and sufficient Repair by the said Company of Proprietors at their own Costs and Charges.

Roads not to be turned without Notice pursuant to 55 G. 3. c. 68.

CXXIX. Provided always, and be it enacted, That no Road or Way shall be diverted or turned without Notice thereof being given, pursuant to an Act made in the Fifty-fifth Year of the Reign of His late Majesty, intituled *An Act to amend an Act of the Thirteenth Year of His present Majesty, for the Amendment and Preservation of the Public Highways, in so far as the same relates to Notice of Appeal against turning or diverting a Public Highway, and to extend the Provisions of the same Act to the stopping up of unnecessary Roads;* and the Order for diverting or turning the same shall be subject to Appeal to the Quarter Sessions in Manner directed by the said Act.

If Old Roads are destroyed, New Ones to be made.

CXXX. And be it further enacted, That when and as often as it shall be found necessary by the said Company of Proprietors to make or cut through any Carriage or Horse Road, be the same public or private, or so much injure the same as to render the same impassable or inconvenient for Carriages or Horses, or the Persons entitled to the Use and Benefit thereof, the said Company of Proprietors shall at their own Expence, before any such Road shall be taken, cut through, or injured as aforesaid, cause a good and sufficient Carriage or Horse Road (as the Case may be) to be set out and made instead thereof, and shall put, or cause to be put, the same in good and sufficient Repair and Condition.

Owners of adjoining Lands to have the first Offer of the Old Road.

CXXXI. Provided always, and be it further enacted, That wherever the Course of any Road or Way shall be altered in pursuance of this Act, and a New Road or Way opened and made in and upon the adjoining Land, the Offer of the Purchase of such Old Road or Way shall be first made to the Owner or Owners of the adjoining Land, and in the next place, to his, her, or their Lessee or Lessees; and in case such Owner or Owners, or his, her, or their Lessee or Lessees, shall be desirous of becoming the Purchaser or Purchasers of such Old Road or Way, and shall not agree with the said Company of Proprietors, or with their Directors, for the Price to be paid for the Purchase of the same, then and in such Case the Value thereof shall be settled and ascertained in such and the like Manner as the Price for any Land to be taken in pursuance of this Act is herein-before directed to be settled and ascertained; and such Owner or Owners, or his, her, or their Lessee or Lessees, shall be deemed the Purchaser or Purchasers thereof at the Sum to be ascertained by a Jury; and in case such Owner or Owners, or his, her, or their Lessee or Lessees so purchasing shall refuse to pay such Money upon Demand made thereof by the Clerks to the said Company of Proprietors, or either of them, and Tender of the Conveyance of such Old Road or Way, the same shall and may be recovered by the said Company of Proprietors by Action of Debt or on the Case in any of His Majesty's Courts of Record at *Westminster;* and in case any such Owner or Owners, or his, her, or their Lessee or Lessees, shall not agree, or shall refuse to purchase any such Old Road or Way for Twenty-one Days next after the Offer thereof shall be made to him, her, or them, it shall and may be lawful

to

to and for any Person or Persons not interested in the Premises to make an Affidavit, to be sworn before a Master or Master Extraordinary of the High Court of Chancery, or before One of His Majesty's Justices of the Peace for the County or Place where such Old Road or Way shall lie, stating that such Offer has been made by or on behalf of the said Company of Proprietors, and that such Owner or Owners, or his, her, or their Lessee or Lessees, has or have not agreed, or has or have refused to purchase such Old Road (as the Case may be); and such Affidavits shall in all Courts whatsoever be sufficient Evidence and Proof that such Offer was made and not agreed to, or refused by such Owner or Owners, or his, her, or their Lessee or Lessees.

Collectors, &c. to give Possession of Toll Houses, &c. when discharged.

CXXXII. And be it further enacted, That if any Harbour Master, Toll Collector, Wharfinger, Lock Keeper, or other Agent or Servant of the said Company of Proprietors, occupying any House, Offices, or Buildings belonging to the said Company of Proprietors, without paying Rent for the same, shall be discharged from his Office by or by the Order of the said Company of Proprietors, or the Directors of the said Company of Proprietors, and shall not deliver up the Possession of such House, Offices, Buildings, and Appurtenances, together with the Books, Papers, and other Matters and Things belonging to the said Company of Proprietors in his Custody, Power, or Possession, within Twenty-one Days next after Notice in Writing of such Discharge shall be given to him, or left at such House, Offices, or Buildings; or if the Wife or Family of any such Harbour Master, Toll Collector, Wharfinger, Lock Keeper, or other Agent or Servant, as shall happen to die while in the Service of the said Company of Proprietors, shall refuse to deliver up the Possession of such House, Offices, Buildings, and Appurtenances as aforesaid, together with the Books, Papers, and other Matters and Things belonging to the said Company of Proprietors in his, her, or their Custody, Power, or Possession, within Twenty-one Days after another Person shall have been appointed in the Place and Stead of the Person so dying; then, and in either of the said Cases, it shall be lawful for any Justice or Justices of the Peace for the County or Place where such House, Offices, and Buildings shall be, and he is hereby required, by Warrant under his or their Hand and Seal or Hands and Seals, to order the Constable or other Peace Officer, with such Assistance as shall be necessary, to enter such House, Offices, and Buildings in the Daytime, and to remove the Person or Persons who shall be found therein, together with his, her, or their Goods and Chattels, out of such House, Offices, and Buildings, and to take Possession of all the Books, Papers, Matters, and Things belonging to the said Company of Proprietors which shall be found therein, and to deliver Possession of such House, Offices, and Buildings, together with the Books, Papers, Matters, and Things found therein belonging to the said Company of Proprietors, to the new-appointed Harbour Master, Toll Collector, Wharfinger, Lock Keeper, or other Agent or Servant, or to such other Person or Persons as the said Company of Proprietors or their Board of Directors shall appoint to receive the same.

CXXXIII. And

Power to re-enter.

CXXXIII. And be it further enacted, That in case all or any of the Rates or Duties arising by virtue of this Act shall be demised or let to farm to any Person or Persons in Manner whatsoever, and the Lessee or Lessees thereof shall neglect or refuse to perform the Terms and Conditions on which the same shall be so demised or let; or in case the Rent or Rents agreed to be paid by such Lessee or Lessees, or any Part or Instalment thereof, shall be in arrear or unpaid for the Space of Fourteen Days next after any of the Days on which the same ought to be paid, pursuant to the Lease, Agreement, or Contract for demising or letting the same Rates or Duties; or in case such Lessee or Lessees shall refuse to deliver up the Possession of any Toll House or Toll Houses, Weighing Machine or Weighing Machines, or other Building or Buildings, with the Gardens and other Appurtenances thereto respectively belonging, to be erected, built, constructed, or set up by virtue of this Act, for the Space of Four Days after Demand thereof made in Writing, given or left at such Toll House, Weighing Machine, or Building, or at any One of such Toll Houses, Weighing Machines, or Buildings, which shall be or have been in the Possession or Occupation of such Lessee or Lessees, such Demand in Writing to be signed in Writing by any Three or more of the Directors of the said Company (although not assembled in Meeting), or by the Clerk or Treasurer for the Time being of the said Company; or in case any such Lease, Agreement, or Contract, shall in any other Manner become void, then and in any of the said Cases it shall be lawful for any Two or more Justices of the Peace for the said County of *Kent*, upon Application made by the said Directors, or any Three or more of them, or by the Treasurer for the Time being of the said Company, by Warrant under their respective Hands and Seals, to order any Constable or other Peace Officer, with such Assistance as shall be necessary, to enter upon and take Possession of every or any such Toll House, Weighing Machine, or other Building, with the Garden and all other the Appurtenances thereto belonging, and to remove and put such Lessee or Lessees, or other the Person or Persons who shall be found therein, together with his, her, or their Goods, from and out of the same, and the Possession thereof, and from the Collection of such Rates and Duties, and to put the said Company, or any One of them, or their new Lessee or Collector, Lessees or Collectors, into the Possession thereof; and thereupon it shall be lawful for the said Directors, or any Three or more of them, if they shall see fit, to vacate and determine the Lease, Contract, or Agreement (if any) which was previously existing, and the same shall accordingly be utterly void to all Intents and Purposes (save as to the Covenants and Agreements for Payment of the Rent or Rents thereby reserved, or other unperformed or broken Obligations, Covenants, or Agreements on the Lessee's Part), as if such Lease, Contract, or Agreement had never been made; and it shall be lawful for the said Directors, or any Three of them, in every such Case, again to demise or let to farm the said Rates and Duties to any other Person or Persons, or cause them to be collected in such and the same Manner as if no former Demise, Contract, or Agreement had been made relative thereto.

Proceedings entered in the Books of the Company to be Evidence.

CXXXIV. And be it further enacted, That all Orders and Proceedings of the said Company of Proprietors at their several and respective General or Special Assemblies, or of their Board of Directors or Committees at their several Meetings, which shall be entered in a Book or Books to be kept for such Purposes, and to be signed either by the Chairman of such General or Special Assemblies, or by the Governor or Deputy Governor, or by the Clerks of the said Company of Proprietors, or either of them, shall be deemed and taken to be Originals, and shall be admitted in Evidence in all Courts and Places whatsoever.

Powers given by this Act to cease, if Works not completed within Ten Years.

CXXXV. Provided always, and be it further enacted, That in case the several Works herein-before described, and intended to be carried into Effect under the Authority of this Act, shall not have been completed so as to answer the Purposes aforesaid within the Space of Ten Years from the passing of this Act, then and from thenceforth all the Powers and Authorities given by this Act shall cease and determine, save only as to such or so much of such Works as shall have been completed within such Time, and save also as to such Matters as shall have been transacted, and such Agreements as shall have been made in pursuance of the Powers herein contained.

Certain Duties on Coals authorized to be taken by 27 G. 3. c. 14. to be collected by Company in the same Manner as Duties authorized by this Act.

CXXXVI. And whereas by an Act made in the Twenty-seventh Year of His late Majesty's Reign, intituled *An Act for paving, cleansing, lighting, and watching the Streets, Lanes, and other Public Passages and Places within the Walls of the City of* Canterbury, *and the Liberties thereof; and also several Streets and other Places near or adjoining to the said City; and for removing and preventing Encroachments, Obstructions, Nuisances, and Annoyances therein,* it was (amongst other Things) enacted, for raising an additional Fund for the Purposes of the said Act, that from and after the passing of the said Act, for all Coal, Coke, or Cinder which should be brought or conveyed through any of the Turnpikes to be erected or appointed by virtue of the said Act, for the Purposes of collecting a Duty on such Coal, Coke, or Cinder, there should be paid to the respective Collectors to be appointed by virtue of the said Act, the Sum of One Shilling *per* Chaldron for such Coal, Coke, or Cinder as had been usually sold by Admeasurement, (every such Chaldron containing Thirty-six Bushels *Winchester* Measure,) and the Sum of One Shilling *per* Ton for all such Coal, Coke, or Cinder as had been usually sold by Weight, and brought through such respective Turnpikes, (every such Ton containing Twenty Hundred,) and so in proportion for every greater or less Quantity than a Chaldron or Ton; and the Commissioners appointed for putting the said Act into Execution, or any Nine or more of them, were thereby empowered to erect and appoint any Number of Turnpikes which they should think necessary or expedient within the Liberties of the said City, or at any of the Avenues leading into the said City, at any Distance not exceeding Three Miles from the said City, for the Purpose of collecting the said Duty on Coal, Coke, or Cinder, and the said Duty is thereby directed and required to be paid at the respective Turnpikes so to be erected or appointed; and it is by the said recited Act provided,

vided, that so soon as the Sum of Four thousand Pounds, Part of the Money to be borrowed on the Credit of the said recited Act, should be paid off and discharged, the Duty therein-before granted upon or in respect of Coal, Coke, or Cinder, should from thenceforth cease and determine; but such Sum of Four thousand Pounds, Part of the Money which has been borrowed on the Credit of the said recited Act, hath not yet been paid off and discharged: And whereas after the said River, Haven, Cuts, New Haven, Harbour, and other Works to be made by virtue of this present Act, shall be completed, considerable Quantities of Coal, Coke, or Cinder, will be brought or conveyed to the said City of *Canterbury* and the Neighbourhood thereof upon the said Navigation, without passing through any of the Turnpikes which have been erected or appointed by virtue of the said recited Act, whereby the Payment of the Duty imposed by the said Act, which would otherwise be paid upon such Coal, Coke, or Cinder, will be avoided, and the additional Fund thereby provided will be materially lessened, and will become inadequate for the Purposes of the said Act; for Remedy whereof be it further enacted, That from and after the said River, Haven, Cuts, New Haven and Harbour, and other Works, shall be improved, made, and completed, and the Navigation thereof shall be opened for Barges, Boats, or other Vessels, for all Coal, Coke, or Cinder, which shall be carried or conveyed through the Lock nearest to the said City intended to be made by virtue of this Act, within the Distance of Three Miles from the said City, into the upper Level of the said River, there shall be paid to and for the Use and Behoof of the Commissioners for the Time being acting in Execution of the said last-recited Act, for the Purposes of the same Act, the like Duty or Sum of One Shilling *per* Chaldron for such Coal, Coke, or Cinder, as have been usually sold by Admeasurement, (every such Chaldron containing Thirty-six Bushels *Winchester* Measure,) the Sum of One Shilling *per* Ton (every such Ton containing Twenty Hundred) for all such Coal, Coke, or Cinder, as have been usually sold by Weight, and carried or conveyed through such Lock into the upper Level of the said River, and so in proportion for every greater or less Quantity than a Chaldron or Ton; which last-mentioned Duty upon Coal, Coke, or Cinder shall, in the first Instance, be paid to such Person or Persons as the Directors of the said Company of Proprietors shall from Time to Time direct or appoint, in the same Manner as the Rates and Duties mentioned in Schedule C. to this Act annexed, are hereby directed to be paid; and all and every the Powers, Authorities, Fines, Forfeitures, Penalties, and Provisions herein-before given, enacted, and provided for or touching the Payment, Collecting, or Recovery of the said Rates and Duties mentioned in the said Schedule, shall apply and extend, and shall be deemed to apply and extend to the Payment, Collecting, and Recovery of the said last-mentioned Duty upon Coal, Coke, or Cinder, carried or conveyed through the said Lock into the upper Level of the said River.

Application thereof.

CXXXVII. Provided always, and be it further enacted, That all the Monies which shall from Time to Time be paid to such Person or Persons so to be appointed by the Directors of the said Company of Proprietors

Proprietors to collect and receive the said Duty upon Coal, Coke, or Cinder, carried or conveyed through the said Lock into the upper Level of the said River as aforesaid, shall from Time to Time be accounted for and paid over by such Person or Persons to the Commissioners for the Time being acting in Execution of the said last-recited Act, or any Nine or more of them, or to such Person or Persons as they, or any Nine or more of them, shall appoint to receive the same, for the Purposes of the said last-recited Act; and all such Monies shall be accounted for and paid over or recovered by or from such Person or Persons in like Manner as any Monies received by any Officer or Officers appointed by virtue of the said last-recited Act are directed to be accounted for and paid, or can or may be recovered by or by virtue of the said last-recited Act; and every such Person or Persons duly accounting for and paying over such Monies as aforesaid, shall be allowed and paid by the Commissioners for the Time being acting in Execution of the said last-recited Act, or any Nine or more of them, for his or their Pains and Trouble in receiving, accounting for, and paying over the same, upon the full Amount of the Monies so by him or them received, at and after the Rate mentioned in the said Act of the Twenty-seventh Year of the Reign of His late Majesty.

In certain Cases such Duty on Coals not to be paid.

CXXXVIII. Provided always, and be it further enacted, That if the Commissioners for the Time being acting in Execution of the said last-recited Act, or any Nine or more of them, or their Collectors or Collector, appointed or to be appointed by virtue of the same Act, shall collect or receive at any of the Turnpikes erected or appointed, or to be erected or appointed by virtue of the said last-recited Act, the Duty upon Coal, Coke, or Cinder granted or imposed by the said Act upon any Coal, Coke, or Cinder which shall be carried or conveyed through the said Lock into the upper Level of the said River, then and in such Case the Duty upon Coal, Coke, or Cinder made payable by this present Act upon such Coal, Coke, or Cinder as shall be carried or conveyed through the said Lock into the upper Level of the said River, shall from thenceforth cease and determine.

When 4000*l.* paid, this Duty to cease.

CXXXIX. Provided also, and be it further enacted, That when and so soon as the said Sum of Four thousand Pounds, Part of the Money borrowed on the Credit of the said last-recited Act, shall be paid off and discharged, the Duty herein-before granted upon or in respect of Coal, Coke, or Cinder carried or conveyed through the said Lock into the upper Level of the said River, shall from thenceforth cease and determine, any thing in this Act to the contrary thereof notwithstanding.

Sandwich Bridge and Pavement Acts to remain in Force. 28 G. 2. c. 55.

CXL. Provided always, and be it further enacted, That nothing in this Act contained shall extend, or shall be construed or taken to extend to alter or vary the Enactments and Provisions contained in an Act passed in the Twenty-eighth Year of the Reign of His late Majesty King *George* the Second, intituled *An Act for building a Bridge over the Water or Haven between the Town of* Sandwich *and the opposite Shore in the County of* Kent; or in another Act passed in the Twenty-seventh Year of the Reign of His late Majesty King

King *George* the Third, intituled *An Act for the better repairing, paving, cleansing, lighting, and watching the Highways, Streets, and Lanes of and in the Town and Port of* Sandwich, *in the County of* Kent, *and in the several Parishes of* Saint Peter the Apostle, Saint Mary the Virgin, *and* Saint Clement, *in the said Town and Port and County; and for removing and preventing Incroachments, Nuisances, Obstructions, and Annoyances in the said Highways, Streets, and Lanes, and on the common Quay belonging to the said Town and Port, and in the Haven adjoining to the said Quay, and the Bridge built over the said Haven; and for regulating the Births and Mooring Places of Vessels at the said Quay, and the proper Times for Vessels to pass through the said Bridge;* or in either of those Acts, farther or otherwise than as is in this Act expressly declared or enacted. 27 G. 3. c. 67

Coal landed below Grove Ferry to pay same Duty as under 27 G. 3. c. 67.

CXLI. Provided always, and be it further enacted, That all Coal, Culm, Cinders, or Breeze, brought into and carried on the New Haven, and landed below *Grove Ferry*, shall pay the same Duty as by the said last-mentioned Act is directed to be paid.

Power to apply the Annual Sum of 200*l.* paid by the Trustees of Ramsgate Harbour for the Preservation of Sandwich Haven, for the Maintenance of the New Haven and Harbour.

CXLII. And whereas by an Act made and passed in the Thirty-second Year of the Reign of His late Majesty King *George* the Third, intituled *An Act for the Maintenance and Improvement of the Harbour of* Ramsgate *in the County of* Kent, *and for cleansing, amending, and preserving the Haven of* Sandwich *in the said County*, it was enacted, amongst other Things, that out of the Monies arising by the Rates and Duties thereby granted and imposed, the Sum of Two hundred Pounds Sterling *per Annum* should during the Continuance of the said Act be paid by the Committee of Treasury therein mentioned for the Time being, into the Hands of the Mayor and Jurats of the said Town and Port of *Sandwich* for the Time being, or into the Hands of such Person or Persons as they or the major Part of them should by Writing under their Hands and Seals authorize and appoint to receive the same, by Four equal Quarterly Payments as therein mentioned, which Money when received should, after the Payment and Discharge of the Expences therein mentioned, be applied and disposed of in cleansing, scouring, depthening, preserving, and maintaining the said Haven, or in erecting a Pier, or such other Works as the said Mayor and Jurats for the Time being, or the major Part of them, should from Time to Time judge necessary, and by Writing under their Hands and Seals should order and direct to be erected and maintained for preserving and improving the same Haven of *Sandwich;* now it is hereby enacted, That the said Mayor and Jurats for the Time being, or the major Part of them, if they shall see fit, shall and may from Time to Time apply and dispose of the said Annual Sum of Two hundred Pounds, or any Part thereof, in cleansing, scouring, depthening, preserving, and maintaining the said New Haven, Harbour, Piers, or Jetties to be made by virtue of this Act, instead of applying and disposing of the same upon the Old Haven and Harbour of *Sandwich*, as directed by the said Act.

Damages and Charges, in Cases of

CXLIII. And be it further enacted, That where by this Act any Damages or Charges are directed or authorized to be paid or recovered,

Dispute, to be settled by Justices.

recovered, in addition to any Penalty or Penalties for any Offence or Offences, the Amount of such Damages or Charges, in case of Dispute respecting the same, shall be settled, ascertained, and determined by the Justice or Justices of the Peace by or before whom any Offender shall be convicted of any such Offence or Offences, who is hereby authorized and required on Nonpayment thereof to levy such Damages or Charges by Distress and Sale of the Offender's Goods and Chattels, in Manner hereby directed for the levying of any Penalties or Forfeitures.

Act not to prejudice the Rights of the Commissioners of Sewers.

CXLIV. And be it further enacted, That nothing herein contained shall extend or be construed to extend to prejudice, lessen, alter, or take away any of the Rights, Privileges, Powers, or Authorities of the Commissioners of Sewers for the several Limits in or through or near to which the said River, Haven, Cuts, New Haven and Harbour, and other Works, will lie or pass, by virtue of the general Laws relating to Sewers, but that such Rights, Privileges, Powers, and Authorities of the said Commissioners of Sewers shall remain, continue, and be in full force and effect; and also that nothing in this Act contained shall extend or shall be construed or taken to extend to alter or vary the Enactments and Provisions contained in an Act passed in the Sixteenth Year of the Reign of King *George* the Third, intituled *An Act to enable the Commissioners of Sewers for several Limits in the Eastern Parts of the County of* Kent, *more effectually to drain and improve the Lands and Grounds within the General Vallies*, in any Manner whatsoever, except as appears by this Act: Provided always, that nothing herein contained shall extend or be construed to extend to enable the said Commissioners of Sewers to interrupt or hinder the Execution of this Act, the said Company of Proprietors erecting or making no Locks, Flood Gates, or other Works, and doing no other Matter or Thing to prevent or hinder the Enactments and Provisions contained in the said Act, passed in the Sixteenth Year of the Reign of King *George* the Third, from being observed and acted upon, and the said Lands and Grounds within the General Vallies receiving the full and whole Benefit thereof, and the said Company of Proprietors also from Time to Time making, and erecting, and maintaining all such Drains, Tunnels, Culverts, Sluices, and other Works, and doing all such other Things as may be necessary for preventing the Drainage and Sewage of the said Levels from being injured or impeded by means of the Improvement and making and maintaining of the said River, Haven, Cuts, New Haven and Harbour, and other Works by this Act authorized to be made and maintained, or any of them, and for preventing the said Levels from being injured by the Influx of the Sea into the said New Harbour and Haven.

16 G. 3. c. 62.

For making Tide Gates on the River Stour, or New Cut to the Sea.

CXLV. And be it further enacted, That the said Company of Proprietors shall and they are hereby required to make and construct good and sufficient Tide Gates, so as that the Waters of the said River *Stour* shall be discharged, and immediately follow the Tide Waters on and during each and every Ebb Tide, and so as that the Tide Water shall go no further up the Country and remain no

higher in the Channel of the said River than at present in ordinary Spring Tides, and so as that the same can be effected without producing Inundation upon the Lands adjoining, and without Injury, Impediment, or Damage to the Drainage and Sewage of the Lands and Levels draining or sewing into the said River *Stour*, and without damaging or injuring the Supply of fresh Water for the Cattle depastured upon the said Lands and Levels; and that the said Tide Gates shall be fixed at such Place as shall hereafter be determined on by the Commissioners of Sewers at any Meeting to be especially convened and holden for that Purpose; and it shall not be lawful for the said Company of Proprietors or their Successors to erect or set up in the Channel of the said River *Stour* between the Sea and *Fordwich* Bridge any other Gates or any Locks or other such Works whatever, or to contract or lessen the Capacity of the Channel of the said River *Stour*, except at the said Gates or Locks, or other Works, but with the Consent of the said Commissioners of Sewers; nor shall the said Company of Proprietors, or their Successors, be authorized to raise the Surface of the Water in the said River *Stour* above its present usual Height in ordinary Spring Tides as aforesaid, but all and every additional Depth of Water which shall or may from Time to Time be required for the Purposes of Navigation, shall be obtained by lowering the Bed or Bottom of the Channel of the said River *Stour*, and by no other Ways or Means whatsoever, unless by the Consent of the Commissioners of Sewers; any thing in this Act contained to the contrary thereof in anywise notwithstanding.

Height and Width of the Banks of the Cut or Canal from the River Stour to the Sea.

CXLVI. And be it further enacted, That the said Company of Proprietors shall and they are hereby required to raise, make, construct, and maintain the Banks of the Cut or Canal from the Channel of the said River *Stour* to the Sea, of the full Width at the Top of Eighteen Feet at the least, and of the Height of Three Feet at the least at the East End thereof, and Six Feet at the least at the West End thereof, above the Level of the highest known Flood Tide at that Part of the said County of *Kent*, within the Distance of Four Miles of the said Town of *Sandwich*.

For making a New Cut for the Purpose of draining, &c.

CXLVII. And whereas a certain Cut called *The Stonar Cut* has been made between one Part of the Channel of the said River *Stour* into another Part of the said Channel, where by the Windings of the said River the said Parts approach near to each other, for the Purpose of assisting the Drainage and Sewage of the Lands and Grounds within the General Vallies: And whereas the Works by this Act authorized may occasion Difficulty in such Drainage and Damage to the said Lands; for Remedy whereof be it further enacted, That whenever any such Damage shall arise, or be reasonably apprehended, or in the Opinion of the Commissioners of Sewers for several Limits in the Eastern Parts of the County of *Kent*, at a Sessions of Sewers assembled in and for the said Limits, be likely to occur, the said Company of Proprietors shall and they are hereby required, upon the Requisition in Writing of the Clerk to the said Commissioners, by and under their Authority, to make and construct a Cut or Channel for the Purpose of the Drainage and Sewage of the said Lands from the said Cut called *The Stonar Cut* to, into, and below

below the Tide Gates in the Cut or Canal hereby authorized to be made from the said River *Stour* to the Sea; and such Cut or Channel shall be so made and constructed as to afford an effectual Drainage and Sewage as well to the Lands and Grounds within the said General Vallies as to all the Lands and Grounds which before the passing of this Act drained and sewed into the said River *Stour* or Haven between the said Cut called *The Stonar Cut* and the Sea.

Commissioners of Sewers enabled to open the Stonar Cut under certain Circumstances.

CXLVIII. And whereas it may be necessary in order to preserve the Drainage and Sewage of the Lands and Grounds which before the passing of this Act drained and sewed into the River *Stour* through the said Cut called *The Stonar Cut*, that the said Commissioners acting under and by virtue of an Act passed in the Sixteenth Year of the Reign of His late Majesty King *George* the Third, intituled *An Act to enable the Commissioners of Sewers for several Limits in the Eastern Parts of the County of* Kent, *more effectually to drain and improve the Lands and Grounds within the General Vallies*, should have the Power to open the said Cut called *The Stonar Cut* oftener than they are authorized to do by the said recited Act; be it therefore further enacted, That the said Commissioners of Sewers shall have full Power and Authority, in addition to the Powers granted by the said recited Act, whenever they shall deem it necessary for the proper Drainage and Sewage of the adjacent Lands, to open the Sluices in the said Cut called *The Stonar Cut*, but so as that the same shall not be opened for a longer Period than Eighteen Hours in any One Day, and that Day being *Sunday*, nor more than Eighteen Hours in any One Week, and so as that the Use of the Cuts, Canals, and Works hereby authorized to be made and constructed for the Purposes of Navigation, be impeded as little as may be; any thing in the said recited Act of the Sixteenth Year of His late Majesty King *George* the Third to the contrary thereof in anywise notwithstanding.

To enable the Commissioners of Sewers to lower the Mark for running the Stonar Cut, under certain Circumstances.

CXLIX. Provided always, and be it further enacted, That if the Works hereby authorized shall at any Time or Times hereafter lower the Water in the Channel of the said River *Stour* at or near the said Cut called *The Stonar Cut*, so as to prevent the Water in the said River rising to the Mark defined and placed for running the said Cut, under and by virtue of the said recited Act of the Sixteenth Year of the Reign of His said late Majesty King *George* the Third, and so as to prejudice the Drainage of the Lands and Grounds which before the passing of this Act drained and sewed through the said *Stonar* Cut, then and in such Case it shall be lawful for the said Commissioners of Sewers from Time to Time to lower and refix the said Mark, so as to produce an Effect upon and assist the Drainage of the said Lands and Grounds equal to the Effect produced upon running the said *Stonar* Cut according to the present Mark; any thing in the said recited Act of the Sixteenth Year of His late Majesty King *George* the Third to the contrary thereof in anywise notwithstanding.

New Channel for Sewage may be made.

CL. Provided always, and be it further enacted, That if the said Commissioners of Sewers shall deem it proper to discharge the Waters

Waters of the *Lydden* Valley by means of a New Channel and Sluice leading into the Upper End of the Basin hereby authorized to be made and maintained at or near the said Harbour, the said Company of Proprietors shall and they are hereby required to make such New Channel and Sluice, so that in so doing the said Commissioners of Sewers shall sustain and pay all the Costs and Charges of the said Work over and above the Costs and Charges which the said Company of Proprietors would be subject to in making a Channel and Sluice at the Upper Part of the said New Haven.

Company to invest 5000*l.* Sterling in the Funds, to accumulate.

CLI. And be it further enacted, That the said Company of Proprietors, before they shall begin to execute any of the Powers and Authorities of this Act relative to the making of the said Navigation, shall and they are hereby required to invest the full Capital Sum of Five thousand Pounds Sterling in the Purchase of Three Pounds *per Centum* Consolidated Bank Annuities, in the Names of *William Henry Baldock* of *Petham*, in the County of *Kent*, Esquire, *John Godfrey* of *Statenborough House*, in the Parish of *Eastry*, in the said County of *Kent*, Esquire, and *Charles Emmerson* of the said Town and Port of *Sandwich*, Esquire; which said Sum of Five thousand Pounds, with the Dividends thereon, shall remain invested to accumulate until the same shall amount to Twenty thousand Pounds Sterling; and such Sum shall stand as a Security for the due Execution of such Works as may from Time to Time become necessary to be done and constructed for the Purposes of Drainage, Sewage, and Embankments against the Sea and River Water, and also for the due Completion of the Works hereby authorized, and also for the Repair of any Damage which may be done or may arise during or in consequence of the Execution of the several Works hereby authorized.

Commissioners of Sewers enabled to do certain Works for the Purposes of Drainage and Embankment, to be defrayed out of the Sums invested in the Funds by Company.

CLII. And be it further enacted, That in case the said Company of Proprietors hereby established shall, after commencing the several Works hereby authorized, not proceed with due and reasonable Dispatch in the Completion thereof, or in case the same shall have been completed, the said Company of Proprietors shall not keep the said several Works hereby authorized in a proper State and Condition, so as to keep open the same for all the necessary Purposes of Navigation, Drainage, and Sewage, and so as that proper Drainage and Sewage be not effected, then in any or either of the said Cases the said Commissioners of Sewers for several Limits in the Eastern Parts of the said County of *Kent* shall be at liberty to use and employ the said Sum of Five thousand Pounds herein-before directed to be invested in the Three Pounds *per Centum* Consolidated Bank Annuities, with all the Accumulations thereof, or such Part or Parts thereof as may be sufficient for the Purpose, in order to do and execute such Works as may in the Judgment of the said Commissioners be necessary for effecting good and efficient Embankments against the Sea and River *Stour*, and the due and proper Drainage and Sewage of the several Lands and Grounds adjacent to the said River *Stour* and Harbour, and draining and sewing into the same in as good and efficient a Manner as before the passing of this Act; and the several Persons in whose Names such Sum of Five thousand Pounds, with the Accumulations, shall be standing in the Books of the Governor and Company

of the Bank of *England*, shall and they are hereby authorized and required to sell out the same, or such Part thereof as may be required for the Purposes aforesaid, and to disburse and pay the same in discharge of the Expences to be incurred by the said Commissioners of Sewers as aforesaid.

Company to make New Sluices, &c. and to repair present Sluices, Sewers, &c.

CLIII. And be it further enacted, That the said Company of Proprietors shall and they are hereby required, at their own Costs and Charges, to make and complete all such New Sluices, Sewers, and other Works, and all such Alterations of existing Sluices, Sewers, and other Works, as shall be requisite in consequence of the Execution of the several Works hereby authorized; and that such New Sluices, Sewers, and Works, or Alterations of existing Sluices, Sewers, and Works, shall be made and executed at such Places and in such Manner as shall be directed by the said Commissioners of Sewers, or their Surveyor; and in case of Default by the said Company in making and executing the same at such Places and in such Manner as shall be directed by the said Commissioners of Sewers, it shall be lawful for the said Commissioners of Sewers to make and execute the same; and the said Company of Proprietors shall pay and make good to the said Commissioners of Sewers all such Costs and Expences as shall be incurred by them in and about the making and executing the same; and in case of Neglect or Refusal to satisfy and defray such Costs and Expences for the Space of Six Calendar Months next after Demand thereof made upon the said Company, or their Clerk or other known Agent or Collector, such Costs and Expences shall and may be recovered and levied in such Manner as any other Money is by this Act directed to be levied and recovered from the said Company.

New Sluices, &c. to be under the Management of Commissioners of Sewers.

CLIV. And be it further enacted, That such New Sluices, Sewers, and other Works to be made under the Direction of the said Commissioners of Sewers shall, when made, be under the Care and Management of the said Commissioners of Sewers, in the same Manner and for the same Purposes as the existing Sewers now are under their Management.

Lock at Pluck's Gutter to be altered if necessary.

CLV. And whereas by the Operation of this Act it may happen that the Works hereby authorized may render it necessary to alter the Lock or Floodgate erected by the said *Edward Kingsford* on the Little River *Stour* or *Seaton* Navigation at or near *Pluck's Gutter*; be it therefore enacted, That in case it shall at any Time hereafter happen that by the Operation of this Act the said Lock or Floodgate shall require any Alteration for the Purpose of obtaining as good and efficient a Navigation into and through the said *Seaton* Navigation as heretofore, then and in such Case the said Company of Proprietors shall and they are hereby required, upon receiving One Month's Notice from the said *Edward Kingsford*, or the Owner for the Time being of the *Seaton* Mill and Estate, for such Purpose, to make a sufficient and substantial Alteration in the said Lock or Floodgate; so as to allow of a good and efficient Navigation into and through the said *Seaton* Navigation or Little River *Stour*.

CLVI. And

For Recovery of Penalties.

CLVI. And be it further enacted, That all Complaints and Informations of Offences against this Act, or any Rule, Bye Law, or Order to be made in pursuance thereof (except in Cases where the Manner of hearing and determining thereof is herein-before otherwise directed), shall and may be made before One or more Justice or Justices of the Peace for the County, City, or Place wherein the Offence shall be committed; and such Justice or Justices is and are hereby authorized and empowered to take Cognizance thereof, and to summon the Person or Persons complained of to appear before him or them, or upon Complaint upon Oath, to issue his or their Warrant or Warrants for the Apprehension of any such Person or Persons; and upon the appearing or not appearing of such Person or Persons pursuant to such Summons, or upon such Person or Persons being apprehended with such Warrant, to hear the Matter of every such Complaint and Information, by Examination of any Witness or Witnesses upon Oath, and to make such Determination thereon as such Justice or Justices shall think proper; and upon Conviction of any Person such Justice or Justices shall and may issue a Warrant under his or their Hand and Seal, or Hands and Seals, for levying the Fine, Penalty, or Forfeiture, by virtue of this Act, or of any Regulation made in pursuance thereof, imposed for such Offence, by Distress and Sale of the Goods and Chattels of the Person so convicted; and it shall and may be lawful for any such Justice or Justices to order any Person so convicted to be detained and kept in the Custody of any Constable or other Peace Officer until it can be ascertained whether such Person hath any Goods and Chattels whereon such Fine, Penalty, or Forfeiture can be levied; and in case sufficient Goods or Chattels of any Person liable to pay any such Fine, Penalty, or Forfeiture cannot be found whereon to make such Distress, and such Fine, Penalty, or Forfeiture shall not be forthwith paid, or in case it shall appear to the Satisfaction of such Justice or Justices, either by the Confession of the Offender or Offenders, or otherwise, that the Offender or Offenders hath or have not sufficient Goods and Chattels whereon such Penalties, Forfeitures, Fines, Costs, and Charges may be levied were a Warrant of Distress issued, such Justice or Justices shall not be required to issue such Warrant of Distress, and thereupon it shall be lawful for such Justice or Justices, and he or they is and are hereby authorized and required, by Warrant under his or their Hand and Seal or Hands and Seals, to commit such Offender to the Common Gaol or House of Correction for any Term not exceeding Six Calendar Months, unless and until such Penalty or Forfeiture, and all reasonable Charges attending the Recovery thereof, shall be sooner paid and satisfied; and all such Fines, Penalties, and Forfeitures, when recovered, shall, where the Application is not otherwise directed by this Act, be paid into the Hands of the Treasurer to the said Company, and shall be applied and disposed of towards defraying the Expences of the said Navigation, Harbour, and other Works, and the Overplus (if any) arising from such Distress and Sale, after Payment of the Penalty and the Costs and Charges attending the same, shall be returned upon Demand to the Owner of the Goods and Chattels so distrained.

CLVII. And

For Apprehension of Offenders in certain Cases.

CLVII. And be it further enacted, That it shall be lawful for any Person or Persons who shall see any Offence committed against this Act by any Person destroying or doing any wilful Damage to the said Navigation or any other Works by this Act authorized to be made, contrary to any of the Provisions herein-before contained, to apprehend and detain any such Offender without any Warrant or other Authority than this Act, and to convey such Offender, or cause him to be conveyed by some Constable or other Peace Officer before any Justice of the Peace for the said County, City, or Place where the said Offence shall be committed, who shall forthwith proceed against such Offender according to the Provisions in this Act contained.

Power to give Informer Part of the Penalties.

CLVIII. Provided nevertheless, and be it further enacted, That it shall be lawful for the Directors of the said Company of Proprietors, from Time to Time, if they shall see Cause, to pay and apply such Part of the said Penalties, Forfeitures, and Fines, or any of them, to and for the Use of the Informer or Informers or other Person or Persons aiding or assisting in the Apprehension of any Offender or Offenders therein, or any of them, who shall not have been a Witness on the Trial of the Information; any thing herein contained to the contrary thereof in anywise notwithstanding.

Appeal.

CLIX. And be it further enacted, That if any Person or Persons shall think himself, herself, or themselves aggrieved by any Order or Judgment made or given in pursuance of any Rule, Bye Law, or Order of the said Company of Proprietors or their Directors, or Committee or Committees, or by any Order, Judgment, or Determination of any Justice or Justices of the Peace relating to any Matter or Thing in this Act mentioned or contained, then and in every such Case the said Company of Proprietors or such Person or Persons may, within Three Calendar Months next after such Order, Judgment, or Determination shall have been made or given, appeal to the Justices of the Peace at the General Quarter Sessions of the Peace to be held in and for the said County, City, Town, or Place in which the Cause of Appeal shall arise, such Person or Persons having first given Fourteen Days Notice of such Appeal, and of the Nature and Matter thereof, to the Person or Persons appealed against, or to the Clerks to the said Company of Proprietors, or one of them, and forthwith after such Notice of Appeal entering into a Recognizance before some Justice or Justices of the Peace for such County, City, or Place, with Two sufficient Sureties, conditioned to try such Appeal, and to abide the Order and Award of the said Court thereon; and the said Justices shall in a summary Way either hear and determine the said Appeal at such General Quarter Sessions or General Sessions of the Peace, or if they think proper, may adjourn the Hearing thereof to the next General Quarter Sessions or General Sessions of the Peace to be holden for such County, City, or Place; and the said Justices at such General Quarter Sessions or General Sessions may, if they see Cause, mitigate any Forfeiture or Fine, and may order any Money to be returned which shall have been levied in pursuance of such Rule, Bye Law, Order, Judgment, or Determination, and may also order and award such further Satisfaction to be made to the Party injured as they shall judge reasonable; but no

Proceedings to be had and taken in pursuance of this Act, shall be quashed or vacated for Want of Form, or be removed by Certiorari, or by any other Writ or Process whatsoever, into any of His Majesty's Courts of Record at *Westminster* or elsewhere, any Law or Statute to the contrary notwithstanding.

Directing what shall be deemed Service of Notice on the Company.

CLX. And be it further enacted, That in all Cases where it may be deemed requisite or necessary for any Person or Persons, or Party or Parties, to serve any Notice or Notices upon the said Company, or any Writ or Writs, or other legal Proceedings, or Proceedings in Equity, the Service upon any One of the said Directors, or left at his last or usual Place of Abode, or on any One of the Clerks of the said Company, or at their respective Offices, or left at his last or usual Place of Abode, or in case the same should not be known, on any Agent or Officer of the said Company, or left at his last or usual Place of Abode, shall be deemed good and sufficient Service of the same respectively on the said Company.

Compelling Witnesses to attend.

CLXI. And be it further enacted, That if any Person or Persons who shall be summoned as a Witness or Witnesses to attend and give Evidence before any Justice or Justices of the Peace touching any Matter of Fact contained in any Information or Complaint for any Offence against this Act, either on the Part of the Prosecutor, or the Person or Persons accused, shall refuse or neglect to appear at the Time and Place to be for that Purpose appointed, having been paid or tendered a reasonable Sum for his, her, or their Costs and Charges, without a reasonable Excuse for his, her, or their Refusal or Neglect, or appearing shall refuse to be examined or shall not answer upon Oath, (or in case of a Quaker or Quakers, on solemn Affirmation,) and to give Evidence before such Justice or Justices of the Peace, then and in either of the said Cases, every such Person shall forfeit and pay for every such Offence any Sum not exceeding Ten Pounds.

Conviction of Offenders.

CLXII. And for the more easy and speedy Conviction of Offenders against this Act, be it further enacted, That all and every the Justice and Justices of the Peace before whom any Person or Persons shall be convicted of any Offence against this Act, shall and may cause the Conviction to be drawn up in the following Form of Words, or in any other Form of Words to the same Effect, as the Case shall happen; (that is to say,)

Form of Conviction.

'BE it remembered, That on the Day of
' in the Year of our Lord
' , is convicted before me
' [*or* before us] and
' One [*or* Two] of His Majesty's Justices of
' the Peace for the County, City, Town, Port, and Liberties, or Town
' and Liberty of [*specifying the Offence, and Time and*
' *Place when and where the same was committed, as the Case shall be.*]
' Given under my Hand and Seal, [*or* our Hands and Seals,] the
' Day and Year first above-mentioned.'

Distress not unlawful for Want of Form.

CLXIII. And be it further enacted, That when any Distress shall be made for any Sum of Money to be levied by virtue of this Act, the Distress itself shall not be deemed unlawful, nor shall the Party or Parties making the same be considered a Trespasser or Trespassers, on account of any Defect or Want of Form in the Information, Summons, Conviction, Warrant of Distress, or the Appointment of the Collector or Collectors, Receiver or Receivers, or any other Agent of the said Company of Proprietors, or in any other Proceedings relating thereto; nor shall the said Party or Parties distraining be deemed or considered a Trespasser or Trespassers *ab initio* on account of any Irregularity which shall afterwards happen to be done by the Party or Parties so distraining; but the Person or Persons aggrieved by such Irregularity shall and may recover full Satisfaction for special Damage which he, she, or they shall have sustained thereby, with the usual Costs and no more, in an Action of Trespass on the Case.

Plaintiff not to recover without Notice, or after Tender of Amends.

CLXIV. Provided always, and be it further enacted, That no Plaintiff or Plaintiffs shall recover in any Action or Suit to be commenced against any Person or Persons for any thing done in pursuance of this Act, unless Notice in Writing shall have been given to the Defendant or Defendants, or left at his, her, or their last or usual Place or Places of Abode, Twenty-one Days before such Action or Suit shall be commenced, of such intended Action or Suit, signed by the Attorney for the Plaintiff or Plaintiffs, specifying the Cause of such Action or Suit; nor shall the Plaintiff or Plaintiffs recover in such Action or Suit if Tender of sufficient Amends shall have been made to him, her, or them, or to his, her, or their Attorney, by or on behalf of the Defendant or Defendants, before such Action or Suit brought; nor if such Tender of Amends shall be made at any Time after the said Action or Suit brought, and before the Trial thereof, together with Costs of Suit to the Time of such last-mentioned Tender; but on Proof of such Tender on any Trial to be had in such Action or Suit, the Plaintiff or Plaintiffs shall be nonsuited, and shall pay Double Costs, to be recovered in the same Manner as any Defendant or Defendants may recover Costs in any other Case by Law; or in case no such Tender shall have been made, it shall and may be lawful to and for the Defendant or Defendants in any such Action or Suit, by Leave of the Court where such Action or Suit shall be depending, at any Time before Issue joined, to pay into Court such Sum of Money as he, she, or they shall think fit, whereupon such Proceedings, Order, and Judgment shall be had, made, and given in and by such Court, as in other Actions or Suits where the Defendant is allowed to pay Money into Court.

Limitation of Actions.

CLXV. Provided always, and be it further enacted, That no Action or Suit shall be brought against any Person or Persons, Body or Bodies Politic, Corporate, or Collegiate, or Corporation or Corporations Aggregate or Sole, for any thing done in pursuance of this Act, after Six Calendar Months next after the Fact committed, or in case there shall be a Continuation of Damages, then after Six Calendar Months next after the doing or committing

mitting of such Damage shall have ceased, and not afterwards; and every such Action or Suit shall be laid and brought in the County, City, or Place in which the Matter in dispute shall arise, and not elsewhere; and the Defendant or Defendants in every such Action or Suit may, at his, her, or their Election, plead specially or the General Issue, and give this Act and the special Matter in Evidence at any Trial to be had thereupon, and that the same was done in pursuance and under the Authority of this Act; and if the same shall appear to have been so done, or that such Action or Suit shall have been brought before Twenty-one Days Notice shall have been given, or after a sufficient Satisfaction has been made or tendered as aforesaid, or after the Time limited for bringing the same as aforesaid shall have expired, or shall be brought in any other County, City, or Place than as aforesaid, then and in every such Case the Jury shall find for the Defendant or Defendants; and upon such Verdict, or if the Plaintiff or Plaintiffs shall be nonsuited, or shall discontinue his, her, or their Action or Suit after the Defendant or Defendants shall have appeared, or if upon Demurrer or otherwise Judgment shall be given against the Plaintiff or Plaintiffs, then the Defendant or Defendants shall recover Treble Costs, and shall have such Remedy for recovering the same as any Defendant or Defendants hath or have for his, her, or their Costs in any other Cases by Law.

General Issue.

CLXVI. Provided always, and be it further enacted, That nothing in this Act contained shall extend or be deemed or construed to extend, or to take away, lessen, or abate any Power, Right, Privilege, Immunity, Jurisdiction, or Authority granted or belonging to, or enjoyed, or legally claimed by the Mayor and Commonalty of the said City of *Canterbury*, or the Mayor, Jurats, and Commonalty of the said Town of *Fordwich*, or the Mayor, Jurats, and Commonalty of the said Town and Port of *Sandwich*, or by any Officer or Officers of or belonging to those Corporate Bodies respectively, or by the Lord Warden of the Cinque Ports and Constable of *Dover Castle*, the Deputy Warden of the Cinque Ports, or the Judge Official or Commissary, or his Surrogate or Surrogates of the Court of Admiralty of the Cinque Ports, Two Ancient Towns and the Members thereof, or the Members or Inhabitants of the Cinque Ports, Two Ancient Towns and the Members thereof, or by the Lord of the Manor of *Minster*, all and every of them for the Time being, except only in such Cases as are specially mentioned and contained in this Act.

Saving Rights of the City of Canterbury, &c.

CLXVII. Provided always, and be it further enacted, That after the said New Haven and Harbour to be made by virtue of this Act shall be completed, the same and the Banks thereof shall for ever afterwards be and be deemed to be within and part of the Liberties of the said Town and Port of *Sandwich*, and the Liberties of the Cinque Ports, as fully and to and for all the same Intents and Purposes as the said Old Haven and Harbour of *Sandwich*, and the Banks thereof, at the Time of the passing of this Act, are and are deemed to be within and Part of such respective Liberties; and that the Lord Warden of the Cinque Ports and Constable of *Dover Castle*, and other Officers of the Cinque Ports, and the Mayor, Jurats, and Commonalty of the said

The Lord Warden of the Cinque Ports, and the Mayor, Jurats, and Commonalty of Sandwich, to have Jurisdiction over the New Haven and Harbour.

said Town and Port of *Sandwich* and its Liberties, and His Majesty's Justices of the Peace of the said Town and Port and its Liberties, and all and every Officer and Officers of the said Town and Port and its Liberties, shall and may from Time to Time and at all Times hereafter have, hold, and enjoy all the same Royalties, Rights, Titles, Interests, Privileges, Usages, and Jurisdictions into and over the said New Haven and Harbour to be made by virtue of this Act, and the Banks and Sides thereof, as they, every or any or either of them, now have, hold, or enjoy, ought to have, hold, or enjoy in, to, and over the said Old Haven and Harbour of *Sandwich* and the Sides and Banks thereof, any thing herein contained to the contrary thereof in anywise notwithstanding; provided always, that nothing hereinbefore contained shall extend or be construed to extend to interrupt or hinder the Execution of this Act.

New Harbour to be under Provisions of former Laws concerning Sandwich Harbour.

CLXVIII. Provided also, and be it further enacted, That when the said New Harbour to be made by virtue of this Act shall be completed, the same shall be within the Provisions of, and under and subject to the same Statutes, Laws, Jurisdictions, Usages, and Customs relating to Pilots and Pilotage, or any Matters and Things concerning Pilots and Pilotage, as are now in force and apply to the said Old Harbour of *Sandwich*, to the Cinque Ports, or to the Harbours of *Dover*, *Ramsgate*, *Margate*, and *Folkstone*.

Boatmen to be licensed.

CLXIX. And be it further enacted, That in addition to the Number of Boatmen to be licensed pursuantly to the Directions of a certain Act made and passed in the Fifty-third Year of the Reign of His late Majesty King *George* the Third, intituled *An Act to amend an Act passed in the last Session of Parliament, intituled 'An Act for the more 'effectual Regulation of Pilots, and of the Pilotage of Ships and Vessels 'on the Coast of* England,' *and for the Regulations of Boatmen employed in supplying Vessels with Pilots licensed under the said Act, so far as relates to the Coast of* Kent *within the Limits of the Cinque Ports*, there shall be Twenty additional Boatmen, licensed by the Lord Warden of the Cinque Ports, or by his Lieutenant, or by the Deputy Lieutenant, Governor of *Dover Castle*, or such other Person or Persons as shall be from Time to Time specially authorized by the Lord Warden for granting Licences by virtue of the said recited Act within the Jurisdiction of the Cinque Ports, for the Purposes of the said recited Act; and that the Mayor and Jurats of *Sandwich* shall be and they are hereby appointed Commissioners jointly with the Commissioners of Salvage of the Lord Warden, mentioned in the said recited Act, for the Purpose of examining such additional Boatmen, and granting Certificates to them for Licences under the said Act; and the Examination of such additional Boatmen shall in every Case take place at a Meeting to be held at the Guildhall of the said Town and Port of *Sandwich*, for the Purpose, or at such other Place in the said Town and Port as the Mayor or his Deputy shall appoint for the Purpose, in the Presence of (and the Certificates of such additional Boatmen shall in every Case be signed by) the Mayor of *Sandwich* or his Deputy, and Two of the Jurats of the said Town and Port, not being Commissioners of Salvage, at least, and Two of the said Commissioners of Salvage,

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at least, present at the Examination; and such additional Boatmen shall constantly reside at *Sandwich* or at the said Harbour to be made by virtue of this Act; and all the Provisions of the said recited Act, with regard to the Boatmen thereby directed to be licensed, except so far as the same are hereby expressly altered, shall apply to the said additional Boatmen to be licensed by virtue of this Act.

Act not to prejudice the Rights of the Trinity House.

CLXX. Provided always, and be it enacted, That nothing herein contained shall prejudice or derogate from any of the Rights and Privileges of the Master, Wardens, and Assistants of the Trinity House of *Deptford Strond*.

Public Act.

CLXXI. And be it further enacted, That this Act shall be deemed and taken to be a Public Act, and shall be judicially taken Notice of as such by all Judges, Justices, and others, without being specially pleaded.

SCHEDULES to which this Act refers.

SCHEDULE A.

A Schedule of Property to be taken by virtue of this Act.

Nos. on the Plan.	Owners.	Occupiers.	Parishes or Places.	Description of Property.
	Rt. Hon. the Earl of Guilford -	Chs. Emmerson, Esq. -	- -	Cottage.
9 & 12	Wm. Henderson	Wm. Henderson	- -	Cottage and Garden.
	Mayor, Jurats, and Commonalty of the Town and Port of Sandwich	Henry Ewell -	St. Clement Sandwich	A Piece or Parcel of Pasture Ground or Ground commonly called the Vigo Piece, with the Rights of Way over the same, on Lease for the Term of Fourteen Years from 10th October 1821.
	Ditto - -	Jos. Stewart, Esq.	Ditto -	A Piece or Parcel of Pasture or fresh Marsh Land called Cold Harbour.
	Ditto - -	Assignees of Isaac Chandler, a Bankrupt -	Ditto	Two Pieces or Parcels of Land or Ground, a Dock with the Gate, Gate Posts, and other Conveniencies; a Kiln, Pitch-house, Forge and long Lodge, with other Buildings.
	Ditto - -	Isaac Slaughter, Esq. for the Use of the Hon. the Commissioners of Customs -	Ditto	A Piece or Parcel of Land or Ground, and a Building thereon, used as a Boat-house, with Rights of Way, on Lease for Fourteen Years from 10th October 1813.
	Ditto - -	Israel Wellard -	Ditto -	A Piece or Parcel of Land or Ground used as a Wharf or Quay, on Lease from 10th October 1819, for Seven Years.

SCHEDULE A.—*continued.*

Nos. on the Plan.	Owners.	Occupiers.	Parishes or Places.	Description of Property.
	Mayor, Jurats, and Commonalty of the Town and Port of Sandwich	Themselves, William Miles, Edward Miles, John Hills, and others -	Saint Clement Sandwich -	All the Gardens, Lands, and Grounds from the Lower or Southern Eastern Side of the Land held by the Assignees of Isaac Chandler, to Lower Head, (except the Premises on Lease to Isaac Slaughter and Israel Wellard,) with the Old Town Ditch adjoining and extending to Sandown Bridge, and the Ways or Passages from the same to Vigo Piece and Sandwich Bridge respectively; and also a Right of Way to and from Sandwich Bridge, and the Town at that Spot, and Fisher's or Quay Gate respectively; and all the public and private Wharfs, Quays, and Warehouses for all Persons, Horses, Beasts, Cattle, and Carriages, reserving to the Corporation their Right of Sewage.
140	Thomas Denne and John Paramor	Robert Parsons -	Chislet -	Cottage and Garden.
190	Thomas Denne -	Robert Matson -	Ditto -	Cottage and Garden.
322	John Sneller, Jun.	Thomas Howard	- -	Garden.
324	St. John's Hospital	Joseph Ovendon and Charles Welby	- -	Garden.
325	Elizabeth Hawker	James Gilman -	- -	Garden.
326	Thomas Marsh -	Himself - -	- -	Garden.
327	John Philpot -	Himself - -	- -	House and Garden.
328	The Mayor and Commonalty of the City of Canterbury -	James Large -	- -	Houses and Garden.
329	Ditto - -	Ditto -	- -	Building and Garden.
334	Ditto - -	John Minter -	- -	Piece or Parcel of Meadow or Pasture Land, called King's Mead.
342	Jesus Hospital -	John Gouldin -	- -	House.
343	George Eastes -	Himself - -	- -	House.
344	Elizabeth Ann Farbrass -	George and Wm. Eastes	Black Princes Chantry -	House and Garden.
345	Edward Harnett	John Bright, William Pollard, and Edward Bright	- -	Cottages and Gardens.

SCHEDULE B.

A Schedule of Harbour Dues on the Tonnage of Vessels frequenting the Port and River.

			£	s.	d.
Traders.	Foreign Vessels to load or unload - - - -	per Ton	0	1	6
	British Ditto from Foreign Countries - - -	Do.	0	1	3
	Ditto Coastwise - - - - - - - -	Do.	0	0	9
	Ditto Colliers, laden ditto - - - - -	Do.	0	0	9
	Ditto Vessels laden with Limestone, Lime-chalk, Sand, Manure, Ballast, or any Description of Compost for the Land - - - - - - - -	Do.	0	0	3
Packets, Yachts, &c.	Passage Vessels, Keels and Boats - - - -	Do.	0	0	6
	Pleasure Yachts under 30 Tons, and Boats in the Harbour, or on the River belonging to the Port and River - - - - - - - - -	per Ann.	1	1	0
	The same Description of Vessels or Yachts exceeding 30 Tons Burthen, either belonging to the Port or entering the Harbour or River from any other Port	per Ton	0	0	9
Fishing Boats.	Every Fishing Boat (Foreign) - - - -	Do.	0	0	4
	Ditto (British) - - - -	Do.	0	0	3
	Every Vessel entering and using the Harbour, Basin, or Wet Docks, from Stress of Weather, or Outward bound, waiting for a Wind, or for Repairs - -	Do.	0	0	6
	Every Vessel remaining in the Harbour or Basin more than 12 Days after the Weather abates, or the Wind permits, unless for Repair, per Diem - - -	Do.	0	0	2

SCHEDULE C.

A Schedule of Harbour and River Rates on Cargoes.

		£	s.	d.
Corn and Seeds.	For every Quarter (containing 8 Bushels Winchester Measure) of Wheat, Barley, Malt, Beans, Pease, Tares, Canary, Mustard and other Seeds	0	0	3
	For every Quarter of Oats	0	0	2
	Sack containing 5 Bushels of Flour	0	0	2
	Quarter of Meal, Middlings, and Sharps	0	0	2
	Ditto of Pollard and Bran	0	0	2
	Sack of Clover, Trefoil, and other heavy Seeds	0	0	3
	Ditto of Potatoes, Onions, &c.	0	0	1
	Bushel of Apples, Pears, &c.	0	0	1
	Bag of Hops	0	0	6
	Pocket of Ditto	0	0	3
	Thousand of English Oil Cakes	0	2	0
	Ditto of Foreign Ditto	0	2	0
	Pack of Wool, Cotton, &c. containing 240 lbs.	0	0	4
Leather. Hides and Skins.	For every Hundred Weight of Tanned Hides and Calf-skins	0	0	2
	Raw Hide	0	0	1
	Hundred of Pelts	0	0	9
	Ton of Tan or Bark	0	1	8
Groceries.	For every Ton of Sugar, Fruits, Bacon, Cheese, Butter, Pork, Hams, Tongues, Salt, Salted Fish, Tallow, Soap, Candles, and all heavy Grocery Goods, not here specified	0	1	8
	Hundred Weight of Tea, Coffee, and Spices	0	0	3
	Chest of Oranges, Lemons, &c.	0	0	2
	Puncheon of Molasses	0	1	0
Ale, Porter, Cyder, Perry, Vinegar, and Oil.	For every Butt	0	1	0
	Puncheon	0	0	9
	Hogshead	0	0	6
	Barrel	0	0	4
	Kilderkin or Runlet	0	0	2
	Per Dozen, in Hampers	0	0	2
Madder.	At per Cask, per Cwt.	0	0	2
	Pipe Clay, at per Ton	0	1	6
Spirits and Wines.	For every Pipe or Butt	0	3	6
	Hogshead	0	2	6
	Half Ditto	0	1	6
	Quarter Ditto	0	1	0
	Under 20 Gallons, at per Gallon	0	0	1
	Per Dozen in Hampers	0	0	3
	Passenger	0	0	6
	For every Four-wheeled Carriage	0	7	0
	Two-wheeled Carriage	0	3	6
	Horse, Mare, or Gelding	0	7	0
	Other Beast	0	3	0

SCHEDULE C.—*continued.*

		£	s.	d.
Coal, &c.	For every Chaldron (containing 36 Bushels Winchester Measure) of Coal, Coke, Culm, Cinders, or Breeze - - -	0	2	0
Hay and Straw.	For every Ton of Hay, Cinquefoil, Clover, or Straw - -	0	2	0
Timber and Deals.	For every Load of Oak, Elm, Pine, Beech, and Fir Timber -	0	2	0
	Load of Deals, Battens, and Lathwood - -	0	2	0
Mahogany, &c.	For every Cubic Foot of Mahogany, Teak Wood, or other valuable Woods - - - - - - - - -	0	0	1
	For every Ton of Hemp, Cordage, and Yarn - - -	0	2	0
	Barrel of Pitch, Tar, Grease, Rosin, &c. - -	0	0	3
Stone, Slate, &c.	For every Ton of Stone, Slate, Plaister of Paris, Alum, unwrought Iron, Bar Iron, Lead, &c. - - - - -	0	2	0
	For every Cubic Foot of Marble - - - - -	0	0	3
	1000 of Gutter, Pan, Mathematical, and Plain Tiles	0	3	0
	1000 of Bricks, and Paving Tiles - - -	0	4	0
	Crate of Glass or Earthenware - - - -	0	0	9
	Carboy of Vitriol or Oil - - - - -	0	0	3
	Corpse - - - - - - - - -	1	1	0
	Organ - - - - - - - - -	1	0	0
	Pianoforte, Harpsichord, Harp, or Base Viol - -	0	5	0
	100 Pipe Staves - - - - - -	0	2	0
	Ton of Copper, Pewter, Brass, or Metals, (except Lead and Iron) - - - - - -	0	2	0
	For every Ton of Ballast - - - - - - -	0	1	0
	For Bale Goods, and all other Articles, Wares, or Merchandize not specified in this Schedule, according to the Amount of the Freight, at per Cwt. - - - - - -	0	0	2

SCHEDULE D.

Rates of Wharfage at the Harbour and all other Places throughout the Line of Navigation respectively.

		For any Time not exceeding the first 24 Hours.		
		£	s.	d.
Corn and Seeds.	For every Quarter (containing 8 Bushels Winchester Measure) of Wheat, Barley, Malt, Beans, Pease, Tares, Canary, Mustard, and other Seeds	0	0	0½
	For every Quarter of Oats	0	0	0½
	Sack containing 5 Bushels of Flour	0	0	0½
	Quarter of Meal, Middlings, and Sharps	0	0	0½
	Ditto of Pollard and Bran	0	0	0½
	Sack of Clover, Trefoil, and other heavy Seeds	0	0	0½
	Ditto of Potatoes, Onions, &c.	0	0	0½
	Bushel of Apples, Pears, &c.	0	0	0½
	Bag of Hops	0	0	1
	Pocket of Ditto	0	0	0½
	Thousand of English Oil Cakes	0	0	6
	Ditto of Foreign ditto	0	0	6
	Pack of Wool, Cotton, &c. (containing 240 lbs.)	0	0	1
Leather. Hides and Skins.	For every Hundred Weight of Tanned Hides and Calf Skins	0	0	0½
	Raw Hide	0	0	0½
	Hundred of Pelts	0	0	2
	Ton of Tan or Bark	0	0	4
Groceries.	For every Ton of Sugar, Fruit, Bacon, Cheese, Butter, Pork, Hams, Tongues, Salt, Salted Fish, Tallow, Soap, Candles, and all heavy Grocery Goods, not here specified	0	0	4
	Hundred Weight of Tea, Coffee, and Spices	0	0	0½
	Chest of Oranges, Lemons, &c.	0	0	1
	Puncheon of Molasses	0	0	3
Ale, Porter, Cyder, Perry, Vinegar and Oil.	For every Butt	0	0	3
	Puncheon	0	0	2
	Hogshead	0	0	1½
	Barrel	0	0	1
	Kilderkin or Runlet	0	0	0½
	Per Dozen, in Hampers	0	0	0½
Madder.	At per Cask, per Cwt.	0	0	0½
	Pipe Clay, at per Ton	0	0	4

SCHEDULE D.—*continued.*

		For any Time not exceeding the first 24 Hours.		
		£	s.	d.
Spirits and Wines.	For every Pipe or Butt	0	0	6
	Hogshead	0	0	4
	Half Ditto	0	0	3
	Quarter Ditto	0	0	2
	Under 20 Gallons, at per Gallon	0	0	0½
	Per Dozen in Hampers	0	0	0½
Coal, &c.	For every Chaldron, containing Thirty-six Bushels Winchester Measure, of Coal, Coke, Culm, Cinders, or Breeze	0	0	3
Hay and Straw.	For every Ton of Hay, Cinquefoil, Clover, or Straw	0	0	6
Timber and Deals.	For every Load of Oak, Elm, Pine, Beech, and Fir Timber	0	0	6
	For every Load of Deals, Battens, and Lathwood	0	0	6
Mahogany.	For every Cubic Foot of Mahogany, Teak Wood, or other valuable Woods	0	0	0½
	For every Ton of Hemp, Cordage, and Yarn	0	0	6
	Barrel of Pitch, Tar, Grease, Rosin, &c.	0	0	1
Stone, Slate, &c.	For every Ton of Stone, Slate, Plaister of Paris, Alum, unwrought Iron, Bar Iron, Lead, &c.	0	0	6
	For every Cubic Foot of Marble	0	0	1
	1000 of Gutter, Pan, Mathematical, and Plain Tiles	0	0	9
	For every 1000 of Bricks and Paving Tiles	0	1	0
	Crate of Glass or Earthenware	0	0	3
	Carboy of Vitriol or Oil	0	0	1
	For every Corpse	0	5	0
	Organ	0	5	0
	Piano Forte, Harpsichord, or Harp	0	1	0
	For every 100 Pipe Staves	0	0	6
	For every Ton of Copper, Pewter, Brass, and other Metals, except Iron and Lead	0	0	6
	For Bale Goods, and all other Articles, Wares, or Merchandize, not specified in this Schedule, according to the Amount of Freight, at per Cwt.	0	1	6
	And an additional Rate or Duty to the same Amount for every 48 Hours beyond the first 24 Hours, or for any shorter Period of Time after the first 24 Hours, or after any one complete Term of 48 Hours.			

SCHEDULE E.

Schedule of Rates on Goods warehoused in the Warehouses at the Harbour, or on the Line of Navigation.

		For any Time not exceeding the first 24 Hours, and at per Week exceeding the first 24 Hours.		
		£	*s.*	*d.*
Corn and Seeds.	For every Quarter (containing Eight Bushels Winchester Measure) of Wheat, Barley, Malt, Beans, Pease, Tares, Canary, Mustard, and other Seeds	0	0	0½
	For every Quarter of Oats	0	0	0½
	Sack containing Five Bushels of Flour	0	0	0½
	Quarter of Meal, Middlings, and Sharps	0	0	0½
	Ditto of Pollard and Bran	0	0	0½
	Sack of Clover, Trefoil, and other heavy Seeds	0	0	0½
	Ditto of Potatoes, Onions, &c.	0	0	0½
	Bushel of Apples, Pears, &c.	0	0	0½
	Bag of Hops	0	0	1
	Pocket of Ditto	0	0	0½
	Thousand of English Oil Cakes	0	0	6
	Ditto of Foreign ditto	0	0	6
	Pack of Wool, Cotton, &c. (containing Two hundred and forty Pounds)	0	0	1
Leather. Hides and Skins.	For every Hundred Weight of Tanned Hides and Calf Skins	0	0	0½
	Raw Hide	0	0	0½
	Hundred of Pelts	0	0	2
	Ton of Tan or Bark	0	0	4
Groceries.	For every Ton of Sugar, Fruits, Bacon, Cheese, Butter, Pork, Hams, Tongues, Salt, Salted Fish, Tallow, Soap, Candles, and all heavy Grocery Goods, not here specified	0	0	4
	For every Hundred Weight of Tea, Coffee, and Spices	0	0	0½
	Chest of Oranges, Lemons, &c.	0	0	1
	Puncheon of Molasses	0	0	3
Ale, Porter, Cyder, Perry, Vinegar and Oil.	For every Butt	0	0	3
	Puncheon	0	0	2
	Hogshead	0	0	1½
	Barrel	0	0	1
	Kilderkin or Runlet	0	0	0½
	Per Dozen in Hampers	0	0	0½
Madder.	At per Cask, per Cwt.	0	0	0½
	Pipe Clay, at per Ton	0	0	4

SCHEDULE E.—*continued.*

		For any Time not exceeding the first 24 Hours, and at per Week exceeding the first 24 Hours.		
		£	s.	d.
Spirits and Wines.	For every Pipe or Butt	0	0	6
	Hogshead	0	0	4
	Half Ditto	0	0	3
	Quarter Ditto	0	0	2
	Under 20 Gallons, at per Gallon	0	0	0½
	Per Dozen in Hampers	0	0	2
Hay and Straw.	For every Ton of Hay, Cinquefoil, Clover, or Straw	0	0	2
Timber and Deals.	For every Load of Oak, Elm, Pine, Beech and Fir Timber	0	0	2
	For every Load of Deals, Battens, and Lathwood	0	0	6
Mahogany.	For every Cubic Foot of Mahogany, Teak Wood, or other valuable Woods	0	0	2
	For every Ton of Hemp, Cordage, and Yarn	0	0	2
	Barrel of Pitch, Tar, Grease, Rosin, &c.	0	0	2
Stone, Slate, &c.	For every Ton of Stone, Slate, Plaister of Paris, Alum, unwrought Iron, Bar Iron, Lead, &c.	0	0	3
	For every Cubic Foot of Marble	0	0	0½
	1000 of Gutter, Pan, Mathematical, and Plain Tiles	0	0	3
	For every 1000 of Bricks and Paving Tiles	0	1	0
	Crate of Glass or Earthenware	0	0	3
	Carboy of Vitriol or Oil	0	0	1
	For every Corpse	0	5	0
	Organ	0	5	0
	Pianoforte, Harpsichord, or Harp	0	1	0
	For every Ton of Copper, Pewter, Brass, and other Metals, except Iron	0	0	6
	For Bale Goods, and all other Articles, Wares, or Merchandize, not specified in this Schedule, according to the Amount of Freight, at per Cwt.	0	1	6

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