

A12 Chelmsford to A120 Widening Scheme

TR010060

7.8 Borrow Pits Report

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7.8 Borrow Pits Report

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1 Executive summary

1.1.1 The design of the A12 Chelmsford to A120 widening scheme (the proposed scheme), with its cuttings and embankments and their associated side slopes, has an overall shortage of earthworks material necessary for construction. This deficit of overall earthworks material is in the order of 600,000m³ and is planned to be met by using borrow pits sited close to the relevant construction works.

1.1.2 Borrow pits are areas within the proposed Order Limits from where the necessary materials, of sufficient quantity and specification, can be excavated. Other earthworks material won from across the site that are surplus to requirements (such as excess topsoil or material that does not meet the specification for embankment construction) would be deposited within the borrow pits to reduce the overall net excavated volume at each borrow pit.

1.1.3 Therefore, the use of borrow pits local to the proposed scheme would provide the following:

- A source of suitable construction material close to the areas of deficit
- A local area for unsuitable (e.g. wet or silty) material to be deposited

This generally results in material haulage being more efficient, by reducing construction traffic on the public road network and similarly reducing greenhouse gas emissions associated with these activities.

1.1.4 While the borrow pits are anticipated to meet the earthworks general fill material deficit and granular material requirement, high quality aggregates that are not available within the borrow pit locations would still need to be imported.

1.1.5 Potential borrow pit locations have been established through a process of assessment, which reduced 18 possible locations down to four by applying a range of technical and environmental criteria.

1.1.6 The four borrow pits selected for the proposed scheme are as follows:

- Borrow Pit E (Work No. 17)
- Borrow Pit F (Work No. 26)
- Borrow Pit I (Work No. 48)
- Borrow Pit J (Work No. 59)

1.1.7 Given that the borrow pits are an integral part of the proposed scheme, their impacts have been assessed as part of the Environmental Statement [TR010060/APP/6.1]. In order to reduce duplication of information across multiple reports, the Environmental Statement does not disaggregate the environmental effects of the borrow pits separately. However, where it has been necessary to attribute potential significant effects and mitigation measures directly to borrow pit activities, the aspect assessments reported have referred to these relationships.

- 1.1.8 The current earthworks volume deficit does not support reinstating the borrow pits to their original ground levels or to their original land use. However, this report outlines restoration design principles for the borrow pits that aim to ensure their design mitigates potential impacts following their use during construction.
- 1.1.9 The potential presence of palaeolithic archaeology within the borrow pits has been assessed in the Environmental Statement. This has assumed, as a worst case, that deeper excavations which require groundwater management may need to be implemented within a smaller footprint in order to avoid impacts on palaeolithic archaeology. The depth and footprint of the borrow pits will be finalised as part of the detailed design, having regard to the need to minimise potential impacts of the borrow pits on palaeolithic archaeology.

2 Introduction

2.1 Purpose of the report

- 2.1.1 The purpose of this report is to explain why borrow pits are required for the proposed scheme. This report contains the following:
- An explanation of how the borrow pits will be used to provide material for the proposed scheme
 - Details of the optioneering process undertaken to identify, evaluate and select the four proposed borrow pit locations included in the proposed scheme
 - Details of the selected borrow pit locations and a summary of reasons for their selection
- 2.1.2 This report refers to other relevant documents within the Development Consent Order (DCO) application that describe the impact assessments and commitments made for the borrow pits required for the proposed scheme.

2.2 Proposed scheme description

- 2.2.1 The A12 Chelmsford to A120 widening scheme (the proposed scheme) comprises improvements to the A12 between junction 19 (Boreham interchange) and junction 25 (Marks Tey interchange), a distance of approximately 24km, or 15 miles. The proposed scheme involves widening the A12 to three lanes throughout (where it is not already three lanes) with a bypass between junctions 22 and 23 and a second bypass between junctions 24 and 25. It also includes safety improvements, including closing off existing private and local direct accesses onto the main carriageway, and providing alternative provision for walkers, cyclists and horse riders to existing routes along the A12, which would be removed. A detailed description of the proposed scheme can be found in Chapter 2: The proposed scheme, of the Environmental Statement [TR010060/APP/6.1].

2.3 Borrow pits overview

- 2.3.1 The planned approach to construction of the proposed scheme involves the extraction of construction materials from four individual borrow pits. The purpose of the borrow pits is to provide material for the proposed scheme to reduce the need to import material from external sources.
- 2.3.2 The proposed borrow pits would provide a source of suitable material close to those areas where additional fill and granular material will be required for construction of earthworks.
- 2.3.3 They also provide a suitable deposition location for excavated material that is considered unsuitable for engineering requirements, e.g. wet or silty material that does not meet the material design properties.
- 2.3.4 Instead of importing material from beyond the proposed scheme boundary, locally sourcing bulk earthworks materials and providing a deposition facility for

unsuitable material reduces heavy goods vehicle (HGV) movements and greenhouse gas emissions associated with the transport of materials.

2.3.5 The identified borrow pits comprise the following four locations (shown in Appendix B):

- Borrow Pit E – located on arable agricultural land to the north of the A12 between existing junctions 20b and 21.
- Borrow Pit F – located on arable agricultural land to the south of the A12 between existing junction 21, Latney's Boarding Kennels and Cattery, and Dengie Farm.
- Borrow Pit I – located on arable agricultural land to the north of the A12 between the existing Rivenhall End junction and junction 23 (Kelvedon South interchange). The area is bounded to the north-west by the Great Eastern Main Line (GEML).
- Borrow Pit J – located on arable agricultural land to the south-east of the A12 between the existing Highfields Lane and Inworth Road. It is approximately 1km south-east of Kelvedon.

2.3.6 The current earthworks volume deficit does not support reinstating the borrow pits to their original ground levels, or original land use, because the proposed scheme design requires a greater amount of fill material than is available from the local scheme cut areas.

2.4 Construction need for borrow pits

2.4.1 The preliminary scheme design aims to meet several constraints, including:

- highway geometry
- an even balance of material excavated versus material required to fill the new alignment
- being able to implement a gravity drainage system

2.4.2 The result in this case has led to an imbalance in material required to construct the proposed scheme, with a deficit of overall earthworks material. This deficit would be met by the proposed scheme borrow pits.

2.4.3 The immediate benefits of using local borrow pits are as follows:

- A source of suitable construction material close to the areas of deficit, making haul distance more efficient
- Reducing HGV movements associated with the import of acceptable fill material from areas remote from the proposed scheme to meet the shortfall
- Less construction haul traffic required on the public road network, reducing fuel use, associated vehicle emissions and potential road traffic incidents

- Providing a local area for material considered unsuitable for engineering purposes to be deposited, reducing the requirement for export out of the proposed scheme Order Limits
- 2.4.4 The incorporation of borrow pits would result in the proposed scheme being largely self-contained in terms of the sourcing of materials for earthworks.
- 2.4.5 Volume modelling of the preliminary design showed a shortfall of approximately 600,000m³ of general fill materials for use on the proposed scheme (granular and cohesive fill materials).
- 2.4.6 The key areas of deficit on the proposed scheme are as follows (shown in Appendix C):
 - New junction 21 (Witham South interchange) (approximately 200,000m³ deficit of general fill material)
 - New junction 22 (Colemans interchange) (approximately 400,000m³ deficit of general fill material)
- 2.4.7 The deficit material is primarily general earthworks embankment fill required for the construction of the grade separated junction design.

Table 2.1 Material quantities

Type of material	Source of material		Comments
	Engineering earthworks (m ³)	Borrow pits (m ³)	
Acceptable engineering fill required to construct the proposed scheme	1,900,000	N/A	Material to be generated from proposed scheme earthworks (cut areas).
Cut material generated from the proposed scheme acceptable for use as engineering fill	1,300,000	600,000	Site won material required to meet engineering fill requirements.
Cut material generated from the proposed scheme unsuitable for use as engineering fill	400,000	100,000	Cut material unsuitable for use as engineering fill to be used primarily for landscape works (e.g., ecological mitigation areas) and borrow pit restoration (where suitable) within the proposed scheme as close to its source of origin as reasonably practical.

- 2.4.8 In addition to the above, the Environmental Statement has assessed the works required to backfill voids in Colemans Farm Quarry, within the Order Limits, left unfilled after the extraction operations. This assessment has been undertaken as a worst case in the event that it becomes necessary for the Applicant to undertake any such works as part of the construction of the proposed scheme. Further detail is given in Chapter 2: The proposed scheme, of the Environmental Statement [TR010060/APP/6.1].
- 2.4.9 An additional 950,000m³ of fill material may therefore be required to backfill Colemans Farm Quarry in the event that the quarry operators cannot perform this task in advance of construction works in this area. In this event, the intention would be to import 650,000m³ of inert material from offsite and source 300,000m³ of non-granular fill material from Borrow Pit J.
- 2.4.10 It should be noted that this approach would not increase the Order Limits required for the borrow pit. The fill material supply would come from the borrow pit overburden material that would have been replaced in the borrow pit on completion. This would therefore have a bearing on the finished landscaping levels of the borrow pit. This has been assessed within the Environmental Statement [TR010060/APP/6.1].

Other potential sources of fill material

- 2.4.11 Other potential sources of earthworks fill material local to the proposed scheme have been investigated. This included importing material via the rail heads at either end of the proposed scheme in Chelmsford and Marks Tey, the supply of material from local quarries or using surplus materials from other construction projects ongoing at the time of construction of the proposed scheme. However, as the availability of sufficient quantities of economically viable materials of suitable specification cannot be guaranteed from alternative sources, these options are not considered feasible for the proposed scheme.

Import via railhead

- 2.4.12 The rail heads in Chelmsford and Marks Tey are operated by national aggregate suppliers providing material for their business purposes for East Anglia and East London. Generally, due to the nature of the businesses operating the rail heads, the materials imported would be primary aggregates, that are of higher cost and specification than are required for the construction of highway embankments. This type of material would not be economically or environmentally viable as general fill for construction of the earthworks for the proposed scheme because of the cost, traffic and carbon impact arising from their use.
- 2.4.13 In addition, the quantities and rate of import required by the proposed scheme would not justify additional train movements to import the lower specification materials required for highway embankment construction. This may only be viable in the event that there was a suitable supply close to a rail head from which to load the train. It may also result in additional vehicle movements at both ends of the journey, i.e. to the loading rail head and from the receiving rail head, and additional double handling and storage at each rail head.

Other local sources of material

- 2.4.14 Local sources of suitable materials may be available at the time of construction. However, at this stage, the quantities, quality and locations where material would be available during the construction of the proposed scheme are unknown. Potential sources would be subject to many factors affecting availability, including planning, the construction market at the time, the type of schemes that would be in construction and have surplus materials of appropriate specification, as well as their distance from the proposed scheme and the associated transport costs.
- 2.4.15 The rate of import required to suit the embankment fill operations would be unlikely to be available from local sources, resulting in sources being required from further afield with associated longer road hauls, many of which may need to be transported via local road networks as well as the strategic road network. Therefore, because of the cost, traffic and carbon impacts, and associated programme risks, this source of material is not considered to be economically or environmentally viable as general fill for the proposed scheme.
- 2.4.16 If, at the time of construction, local sites of suitable material are identified, these could be assessed to see whether the material meets the specification and is contamination free, is economically viable (including transport costs), and could be delivered without altering the conclusions of the Environmental Statement [TR010060/APP/6.1] for the proposed scheme. If such materials are available at a suitable rate of supply, their use could be considered and potentially reduce the overall need for material from borrow pits. However, transport costs would generally be higher than for material from borrow pits, and given the uncertainty of these sources and that they cannot be guaranteed, it is necessary to provide for borrow pits within the proposed scheme to ensure its deliverability.

2.5 Environmental assessment and management

- 2.5.1 An Environmental Impact Assessment has been undertaken for the proposed scheme and is reported in the Environmental Statement [TR010060/APP/6.1] in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017. The Environmental Statement contains the assessment of the potential impacts on the environment that may be caused during construction, operation and maintenance of the proposed scheme and describes proposed mitigation measures to avoid, prevent, reduce or, where practical and appropriate, offset the potential environmental impacts associated with the proposed scheme.
- 2.5.2 The cumulative environmental effects of the proposed scheme were also assessed to identify how the proposed scheme's individual effects may combine to result in different or greater effects, and how the proposed scheme may interact with other development plans and projects in the area.
- 2.5.3 The description of the proposed scheme and information relating to its construction is presented in Chapter 2: The proposed scheme, of the Environmental Statement [TR010060/APP/6.1], which has formed the basis upon which the Environmental Impact Assessment has been undertaken and includes details of the proposed borrow pits and restoration principles.

- 2.5.4 As the borrow pits are an integral component of the planned approach to the proposed scheme construction, the Environmental Statement does not disaggregate the environmental effects of the borrow pits.
- 2.5.5 Notwithstanding this, where it has been necessary to attribute potential significant effects and mitigation measures directly to borrow pit activities, the aspect assessments reported in the Environmental Statement [TR010060/APP/6.1] have referred to these relationships. The following Environmental Statement chapters are relevant to borrow pits:
- Chapter 6: Air quality
 - Chapter 7: Cultural heritage
 - Chapter 8: Landscape and visual
 - Chapter 9: Biodiversity
 - Chapter 10: Geology and soils
 - Chapter 11: Material assets and waste
 - Chapter 12: Noise and vibration
 - Chapter 13: Population and human health
 - Chapter 14: Road drainage and the water environment
- 2.5.6 Effects on palaeolithic archaeology and hydrology are particularly relevant to the borrow pits, and details on these matters are provided for each borrow pit in Section 6.1, Section 6.2, Section 6.3 and Section 6.4.
- 2.5.7 The Environmental Impact Assessment process identified a requirement for appropriate measures to be implemented prior to and during construction to protect the receiving environment; and to manage, control, reduce and monitor the proposed scheme's likely environmental effects. These measures comprise a range of standard, best practice and location-specific working methods, techniques and approaches that will be employed by the Principal Contractor, details of which are included within the Register of Environmental Actions and Commitments (REAC) presented within Appendix A of the first iteration Environmental Management Plan (EMP) [TR010060/APP/6.5], which forms part of the DCO application.
- 2.5.8 The first iteration EMP [TR010060/APP/6.5] is based on the preliminary design of the proposed scheme, the content of which is supported by a number of management plans for key environmental aspects which would, subject to the development consent being granted, be developed into final management plans before the start of construction.
- 2.5.9 The management plans included within the first iteration EMP [TR010060/APP/6.5] of specific relevance to the formation, operation and management of the borrow pits are as follows:
- Appendix B: Archaeological Management Plan

- Appendix D: Contaminated Land Management Plan
- Appendix E: Dust Management Plan
- Appendix I: Landscape and Ecology Management Plan
- Appendix J: Materials Management Plan
- Appendix K: Noise and Vibration Management Plan
- Appendix L: Site Waste Management Plan
- Appendix M: Soil Handling Management Plan
- Appendix N: Water Management Plan

2.6 Development Consent Order (DCO)

- 2.6.1 The draft DCO [TR010060/APP/3.1] sets out the provisions for the construction and operation of the proposed scheme. Schedule 2 of the draft DCO sets out the Requirements, which are the conditions that govern how the proposed scheme will be delivered.
- 2.6.2 The restoration of the borrow pits is secured through Requirements 6 and 12 of the draft DCO. Details of restoration will be shown in accordance with the detailed requirements set out in the Manual of Contract Documents for Highway Works, Volume 1, Series 3000 Landscape and Ecology (Highways Agency, 2001) and accompanying appendices, which will be produced at detailed design stage and will accord with the principles described in Section 4 of this report.
- 2.6.3 Where ongoing management and maintenance of restored borrow pit areas is required following construction, this is secured in the REAC, within the first iteration of the EMP [TR010060/APP/6.5]. The ongoing management and maintenance activities would be detailed in the third iteration EMP.
- 2.6.4 The Applicant would consult with the relevant local planning authorities on the restoration proposals of the borrow pits as part of the landscaping scheme in accordance with Requirement 5 of the draft DCO [TR010060/APP/3.1].

2.7 Transport Assessment

- 2.7.1 The Transport Assessment [TR010060/APP/7.2] sets out that, during the construction phase, construction traffic trips on the wider public road network would be reduced in part through obtaining material directly from borrow pits adjacent to the required areas and other measures, such as haul roads.
- 2.7.2 The Outline Construction Traffic Management Plan [TR010060/APP/7.7] sets out how material would be moved from the borrow pits during construction. Generally, the borrow pits would receive material that is considered unsuitable for engineering purposes from across the entire length of the proposed scheme. Where practical, this material would be moved via the haul roads, but the majority would have to be moved along the public road network.
- 2.7.3 By moving unsuitable material to borrow pits, export of the unsuitable material onto the wider public road network would be reduced.

- 2.7.4 The use of borrow pits in the proposed scheme therefore has transport benefits for both import and export of material, as it would lead to a reduction in construction traffic on the wider public highway network.

2.8 Planning policy assessment

- 2.8.1 Appendix F: Local Planning Policy Accordance Tables, of the Case for the Scheme [TR010060/APP/7.1] sets out a schedule of local policies contained in development plans which are considered to have the potential to be both important and relevant to the proposed scheme. Included within the policy assessment are the following local policies relating to borrow pits:

- Policies S4, S6, S8 of the Essex Minerals Local Plan (Essex County Council, 2014)

- 2.8.2 In relation to the policies highlighted above from the Essex Minerals Local Plan (Essex County Council, 2014), the Case for the Scheme [TR010060/APP/7.1] sets out that the four borrow pits proposed within Essex would meet the tests set out within the policy for the reasons below:

- The borrow pits are required to supply material for the proposed scheme, which is a specific major construction project. This is because the proposed scheme requires a greater level of fill material than the amount of suitable cut material that would be available from the proposed scheme footprint.
- The borrow pits are well related geographically to the proposed scheme, being within the Order Limits, and have been located to serve specific sections of the proposed scheme that would be in particular need for material.
- The borrow pits would serve the proposed scheme only and would not be used to supply minerals to the wider market. The borrow pits would not be worked after completion of construction.
- By helping to supply the balance of material needed for the construction of the proposed scheme, the borrow pits would minimise the need for material to be brought from offsite locations, thereby removing mineral traffic movements from the public highway and reducing traffic movements that would otherwise need to pass through local communities.
- Following extraction of the required material, the borrow pits would be landscaped through partial backfilling with material that is unsuitable for engineering purposes. The material used for restoring the borrow pits would be generated from the works across the proposed scheme. It is on this basis that the likely effects arising from the borrow pits have been assessed.

2.9 Acquisition of land

- 2.9.1 Given the limitations on restoring borrow pits to their previous condition, land that is required for the purposes of the borrow pits would be acquired permanently through the DCO, and not temporarily. However, the Applicant is willing to engage with affected landowners to understand their future aspirations for the

land, and to enter into voluntary negotiations to secure the use of the land for a borrow pit where agreement on terms acceptable for the proposed scheme can be reached. The Applicant remains committed to seeking to acquire all land and rights required by agreement where practicable.

3 Excavation methodology

3.1.1 Sourcing materials from the borrow pits for the proposed scheme would generally involve the following:

- General site clearance and vegetation removal would precede large-scale earthworks.
- Stripping off the topsoil with a bulldozer or bladed machine. Topsoil would be stockpiled in a temporary soil storage area and may be used as temporary local bunding to provide screening from local receptors.
- Removing the subsoil with a bulldozer or an excavator, which would also be stockpiled in a temporary soil storage area and may also be used as temporary local bunding to provide screening from local receptors.
- Excavation of target material from within the borrow pit by a combination of bulldozer and excavator which is loaded onto dumper trucks or road-going HGVs for transport to construction work areas.
- The excavation would be cut with temporary side slopes that suit the engineering qualities of the material, and cut-off ditches would be excavated to control groundwater flows in the area.
- Where required, mobile water pumps and pump lines would be located to lift water from the base of the excavation and any cut-off ditches to a treatment lagoon. The treated water will be discharged under environmental permitting requirements.
- If dewatering of a borrow pit is required, and excavation layout and ground conditions suit, a groundwater recharge arrangement will be implemented to manage groundwater levels. The suitability of this method will be investigated through the detailed design of the proposed scheme.

3.1.2 Backfilling with material considered unsuitable for engineering purposes would generally involve the following:

- Material would be delivered to the borrow pits by articulated dumper trucks or road-going HGVs.
- A bulldozer and roller would push out and progressively compact layers of material to build back up to the designed restoration proposal.

3.1.3 The current earthworks volume deficit does not support reinstating the borrow pits to their original ground levels or original land use. Borrow pit restoration is discussed in further detail in Section 4 of this report.

3.1.4 The indicative plant required for the various borrow pit activities is as follows (note that this list is not exhaustive):

- 40 tonne excavators
- 40 tonne articulated dumpers

- 25 tonne articulated dumper
- 20 tonne road-going rigid body dumper lorries
- D6 bulldozer
- Water pumps (varying diameters and output capacities)
- Tractor and bowser
- Rollers

3.1.5 A typical excavation team may comprise a bulldozer, excavator and several dumper trucks suitable for the haul length of the material. Several excavation teams could be active in any borrow pit at the same time depending on the material demand.

3.1.6 A tractor and bowser would generally be used in dry periods for dust suppression.

3.1.7 Where practicable, existing boundary features would be retained to minimise the potential environmental effects of the borrow pit activities, with the borrow pits being required for the duration of the construction phase for the proposed scheme.

3.1.8 Following extraction of the required materials, borrow pits would start to be restored, which would coincide with the construction phase as a staged process, i.e. part of the borrow pits would remain in use while other parts would be backfilled and restored.

Plate 3.1 Photograph of a working borrow pit (credit: Selwood; Michael Kheng, Kurnia Aerial Photography)



4 Restoration design principles

- 4.1.1 As previously stated, the current earthworks volume deficit does not support reinstating the borrow pits to their original ground levels or original land use.
- 4.1.2 The current indicative restoration proposals include a combination of wetlands, water bodies, woodland planting and landscaped areas. For Borrow Pit F, restoration proposals would include an area of woodland planting to the southern extent to offset nitrogen deposition effects on Perry's Wood, Inworth.
- 4.1.3 The following environmental design principles will apply:
- Borrow pits would be shaped to form natural gradients with rounded contours to integrate into the surrounding landscape.
 - Where water bodies remain after excavation, these would include scalloped edges and shallow slopes or berms to make them safe and improve access and egress for animals.
 - Planting within the restored borrow pits would include woodland planting where screening is required, along with intermittent tree and scrub planting and individual trees in species-rich grassland.
 - Boundaries with new or gapped up hedgerows with trees would tie into existing features to help restore the landscape pattern and maintain ecological connectivity.
 - Aquatic and wetland planting would be introduced at the margins of water bodies along with areas of wet woodland planting.
 - Borrow pits would be restored such that designed flood mitigation would function as described in Appendix 14.5: Flood Risk Assessment, of the Environmental Statement [TR010060/APP/6.3].

These principles are secured in the REAC, within the first iteration of the EMP [TR010060/APP/6.5], and are shown illustratively on Figure 2.1: Environmental Masterplan, of the Environmental Statement [TR010060/APP/6.2].

5 Optioneering

5.1 Outline selection and assessment

5.1.1 Potential borrow pit locations have been developed through continuous assessment. Initially, a desk-based study identified 18 potential locations (numbered 1 to 18). These were assessed using a Red/Amber/Green (RAG) rating based on various criteria, including the following:

- The availability and potential yield of acceptable engineering fill material
- Proximity to the proposed scheme
- The perceived ease of extraction
- Potential environmental impacts
- Planning and land use constraints.

5.1.2 It should be noted that, at the time, the early scheme design had an earthworks material deficit of approximately 2.7 million cubic metres that needed to be met using borrow pits on the proposed scheme. This large deficit was the driver for the large number of initial locations (18) needed to cater for the deficit. Given that the earthworks material deficit has substantially reduced (to 600,000m³), fewer borrow pits are required than was originally envisaged. For this reason, the assessment of potential borrow pit locations is considered robust.

5.1.3 There were seven borrow pit locations that were discounted from the 18 preliminary option locations referred to above. A summary of the reasons why these borrow pit locations were discounted is provided in Table 5.1.

Table 5.1 Summary reasons for borrow pits initially discounted

Borrow Pit	Summary reason for discounting
Borrow Pit 01	The distance of the potential borrow pit from the intended fill location combined with the potential haul road along narrow roads and through villages is unsuitable.
Borrow Pit 02	The assessment of available material concluded that the yield of suitable engineering fill is poor. The distance of the potential borrow pit from the intended fill location combined with the potential haul road along narrow roads and through villages is unsuitable.
Borrow Pit 03	The distance of the potential borrow pit from the intended fill location combined with the potential haul road along narrow roads and through villages is unsuitable.
Borrow Pit 09	The assessment of available material and haul road distance to the intended fill location are all favourable for this borrow pit. However, its use was

Borrow Pit	Summary reason for discounting
	precluded by a development allocation in the Braintree Local Plan – Options Assessment (Essex County Council, 2016).
Borrow Pit 13	<p>The location of the borrow pit is unfavourable due to being on the opposite side of a main watercourse from the intended fill area, as well as being in a flood zone.</p> <p>Groundwater levels are likely to be a significant issue based on the geotechnical assessment.</p> <p>The location is also unfavourable from a landscape and visual perspective, being within or adjacent to a former special landscape area, affecting the setting of, and views from, cultural heritage assets.</p>
Borrow Pit 14	<p>The location of the borrow pit is unfavourable due to being on the opposite side of a main watercourse from the intended fill area, as well as being in a flood zone.</p> <p>The location is also unfavourable from a landscape and visual perspective, being within or adjacent to a former special landscape area, affecting the setting of, and views from, cultural heritage assets.</p>
Borrow Pit 15	<p>The location of the borrow pit is unfavourable due to being on the opposite side of a main watercourse from the intended fill area, as well as being in a flood zone.</p> <p>Groundwater levels are likely to be an issue based on the geotechnical assessment.</p> <p>The location is also unfavourable from a landscape and visual perspective, being within or adjacent to a former special landscape area, affecting the setting of, and views from, cultural heritage assets.</p>

5.2 Preliminary borrow pit options

- 5.2.1 With these seven locations discounted, the desk-based study focused on the remaining 11 preliminary locations, plus one additional borrow pit (Borrow Pit L) which was included as an option following consultation with the landowner. The 12 options taken forward at this stage were renamed A to L as shown in Table 5.2. This provided the basis for environmental site surveys and ground investigation work.
- 5.2.2 The locations of the 12 preliminary borrow pits are shown in Appendix A.

Table 5.2 Locations of preliminary borrow pit options

Borrow pit (name)	Location	Initial indicative area (m²)
A – Mowden Hall Lane	West of Hatfield Peverel and to the east of Boreham. Approximately 300m south of the A12 on Mowden Hall Lane. Main Road (old A12) running parallel with the A12 separates the borrow pit from the strategic road network.	158,000m ²
B – Terling Road West	North of the village of Hatfield Peverel and separated by the GEML from the village.	142,000m ²
C – Terling Road East	North of the village of Hatfield Peverel and separated by the GEML from the village.	242,000m ²
D – The Vineyards	East of Hatfield Peverel between the A12 (to the south) and the GEML (to the north) adjacent to existing junction 20b.	142,000m ²
E – Hatfield Road	Between Hatfield Peverel and Witham on the north side of the A12 up to the boundary of the GEML, adjacent to existing junction 21.	294,000m ²
F – Dengie Farm	South-west of Witham to the east of existing junction 21 on the south side of the A12.	190,000m ²
G – Howbridge Hall Road	Directly south of Witham to the east of existing junction 21 on the south side of the A12.	350,000m ²
H – Blue Mills Hill	On the south-east corner of Witham, 300m north of Benton Hall golf club on the south side of the A12.	102,000m ²
I – Rivenhall End	Between the A12 and the GEML, directly to the east of Rivenhall and west of existing junction 23 (Kelvedon South interchange).	179,000m ²
J – Inworth Hall Farm	Along the southbound side of the A12 directly south of Kelvedon, with Inworth Road immediately to the east and Highfields Lane to the west.	811,000m ²
K – Prested Hall	East of the existing A12 between the east end of Feering and the Prested Hall Estate, approximately 700m south of existing junction 24	138,000m ²
L – Termitts Chase	North of the village of Hatfield Peverel and the GEML, south-west of Witham.	263,000m ²

5.2.3 Please note that the initial indicative areas referred to in Table 5.2 were included as an approximate land plot size available for preliminary borrow pit operations.

5.3 Preferred borrow pit options

- 5.3.1 Following the desk-based study, further work was undertaken to refine the highway alignment design to reduce the earthworks material deficit. The exercise was successful in reducing the deficit to approximately 2.2 million cubic metres.
- 5.3.2 This enabled the selection of five preferential proposed borrow pit locations from the 12 that were previously identified. The five preferred locations are listed in Table 5.3 and were selected predominantly for their location in relation to proposed material fill areas, and the volume and potential quality of material available within the proposed location.

Table 5.3 Preferred preliminary borrow pits

Borrow pit	Likely material deposition location
Borrow Pit E	North side of new junction 21 embankment.
Borrow Pit F	South side of new junction 21 embankment and mainline embankment widening between junctions 21 and 22.
Borrow Pit H	Part of new junction 22 embankments and mainline embankment widening between junctions 21 and 22.
Borrow Pit I	Part of new junction 22 embankments and mainline embankment widening between junctions 22 and 23.
Borrow Pit J	New junction 24 embankments and mainline embankments between junctions 23 and 25.

- 5.3.3 The remaining seven proposed borrow pit locations were not fully discounted at this stage because the ground investigation and environmental site survey work had not yet been completed to verify the desk-based study work.

5.4 Final borrow pit locations

- 5.4.1 On completion of the site survey work and subsequent reporting, the 12 locations were assessed again to verify the previous study and confirm the selection of the five preferred locations. For Borrow Pit K, where land access could not be secured in time to carry out ground investigation works, the previous desk-based study acted as the best information available to inform the further assessment.
- 5.4.2 Alongside this assessment, the preliminary design of the proposed scheme was developed to continue to reduce the deficit of fill materials. Over various iterations the alignment design was improved, and the overall deficit reduced to 0.6 million cubic metres of material which would be required from proposed scheme borrow pits. This enabled a reduction of the number of preferred locations required from five to four.
- 5.4.3 The assessment was undertaken as a RAG analysis and the criteria used are included in Table 5.4. The reasons why the eight borrow pit locations were discounted are summarised in Table 5.5. Table 5.4
- 5.4.4 The final borrow pit locations included for use in the proposed scheme are shown in Appendix B and listed below:

- Borrow Pit E (181,000m²)
- Borrow Pit F (221,000m²)
- Borrow Pit I (225,000m²)
- Borrow Pit J (338,000m²)

Table 5.4 Borrow pit appraisal criteria

Discipline	Criteria	Comments
Technical	Does the borrow pit provide suitable engineering/non-engineering fill for A12 construction?	Borrow pits with large portions and volumes of engineered fill material are favourable and beneficial to the proposed scheme as they can be used for high value granular product and embankment fill. Unacceptable fill material, which may comprise high quantities of organic matter (peat/marsh/bogs), perishable material, extremely sensitive clays and uncontrolled or hazardous waste should not be used in the permanent works and should be disposed offsite. Borrow pits with large portions and volumes of these types of material are unfavourable.
	Ease of extraction	The density and consistency of borrow pit materials are the key material properties assessed. Granular sands/gravels and cohesive soils shallower than 5m are expected to be easily extracted using conventional excavation methods such as dragline, excavators and bulldozers. Borrow pits which do not encounter groundwater are considered favourable due to less work required to manage inflows and increase stability of side slope of excavation.
	Likely quantity of usable material	An overall breakdown of various geological units likely to be encountered within the borrow pit with rough estimates of percentages based on geological maps and historical borehole information. Generally, locations that have larger quantities of acceptable engineered fill are favourable, whereas significant volumes of unacceptable material are considered to be unusable and unfavourable.
	Existing utilities – diversions/protection	Greenfield locations are likely to be simple and require no additional work to divert and protect existing overhead and underground utilities. Existing utilities that are present can sterilise areas of the borrow pit or create additional work to divert and protect existing overhead and underground assets.
	Contaminated land	Locations which are not near to commercial and industrial activities or are in relatively undisturbed ground are likely to require less effort in handling, treating and disposing contaminated waste. Locations which are heavily contaminated by commercial and industrial activities are likely to require significant effort in handling, treating and disposing the material and are therefore unfavourable.

Discipline	Criteria	Comments
Construction	Location relative to area of fill	Borrow pit to be located as close as practicable to where yielded materials would be required onsite to keep cost and haulage time to a minimum.
	Accessibility (haul road)	<p>A suitable and safe means of access for dump trucks to the borrow pits is essential. The preference is for off-road access between borrow pit and target fill area, i.e. it is preferable for borrow pit locations to be on the same side of the road as the construction working areas. Road-going dumper HGV is possible but is unfavourable because of the need to access the A12 via the local road network or temporary surfaced haul road.</p> <p>In each case, other constraints on potential haul roads such as rivers, railway crossings, topography, residential and commercial buildings, and utilities are also considered.</p>
	Borrow pit construction, dewatering/material drying/area for drying requirements, site setup	Proximity to watercourses and/or low-lying land could increase drainage and dewatering complexity during excavation. If material processing is required, space would need to be available within the plot for the setup, running and decommissioning for the sorting plant and any weighbridges that may be required.
Environment	Air quality	Generally, standard good construction practices are likely to reduce adverse air quality impacts to acceptable levels, making this a weak differentiator for different locations. However, air quality impacts on sensitive receptors within 100m of borrow pit boundaries have been assessed to strengthen the use of this criterion.
	Cultural heritage	<p>This criterion considered the proximity of the individual locations to designated heritage assets such as scheduled monuments, listed buildings, conservation areas and registered parks and gardens, and the likelihood of removing archaeological deposits due to the site preparation, operational works and restoration works.</p> <p>The proposed scheme lies within an area of high-risk potential for impacting palaeolithic archaeology. As such, palaeolithic archaeology is not considered to be a differentiator between identified locations because they all have the potential to impact palaeolithic archaeology.</p>

Discipline	Criteria	Comments
	Landscape and visual	This criterion considered the relationships of the identified locations to visual receptors, landscape designations and existing landscape character. The construction activities associated with borrow pit working, e.g. new visual effects of stockpiled materials, construction equipment and construction vehicles hauling the materials to and from the construction works, were also considered.
	Biodiversity	This criterion considered the impact on existing species (particularly those of protected status) from borrow pit activities. It was considered unfavourable if mitigation beyond standard good construction practice is likely to be required to reduce the impacts to acceptable levels.
	Noise and vibration	This criterion considered the relationships of the appraisal options to noise sensitive receptors, i.e. residential properties, community facilities and public rights of way (PRoWs).
	Population and health	This criterion considered the proximity of identified locations to PRoWs such as public footpaths, byways, bridleways and national cycle routes.
	Road drainage and the water environment	This criterion considered the proximity of the identified locations to surface water bodies and watercourses and potential flood risk. Impacts are likely to be associated with entrainment of sediments in controlling surface water runoff, local or far-reaching effects on the groundwater table and receptors that depend on it, and the potential for identified locations to become flooded depending on the relationship to identified zones of flooding.
Planning	Planning policy (including local plans, minerals plan and National Networks National Policy Statement (Department for Transport, 2014))	The preference is for materials to be taken from areas previously identified for extraction of minerals/engineering materials in the Essex Minerals Local Plan (Essex County Council, 2014). When reviewed, the potential borrow pit locations were found to be safeguarded for their mineral value. Mineral safeguarding means only mineral extraction or waste planning applications can be made in these areas.
	Planning applications and consented schemes	Following on from the above criterion, planning applications and consented schemes for minerals and waste were searched for on the Essex County Council's (2022) planning application search database. No

Discipline	Criteria	Comments
		planning applications or consented schemes were identified. Therefore, the proposed borrow pit locations are compliant with the Essex Minerals Local Plan
Existing land use	The land use	This criterion considered the extant use of the land, e.g. agricultural, and whether it is arable or pastoral, a potential or actual development location, or a public space. The key differential between locations is whether or not pasture or human uses increase the overall value of the land meaning an increased level of impact and requirement for detailed mitigation.
	Identify who owns the land (is it a public body or private landowner?)	The purpose of this criterion is to consider the extent to which land could be acquired.
	The percentage of the landholding affected (i.e. how much land is retained?)	This criterion indicates the level of impact to a particular landowner.

Table 5.5 Discounted preliminary borrow pits

Borrow pit	Summary reason for discounting
Borrow Pit A	<p>The distance of the borrow pit from the proposed scheme is unsuitable when compared to the preferred borrow pit locations. Ground investigations suggest that the yield of suitable material is not as high as the preferred borrow pits and that the indicated depth of groundwater may make extraction challenging.</p> <p>Material haulage lorries would be required to use the narrow Mowden Hall Lane to access the proposed scheme which goes against the preference for off-road haulage.</p> <p>Main Road separates the borrow pit from the A12, meaning construction traffic would need to travel via Hatfield Peverel or Boreham.</p>
Borrow Pit B	<p>The distance of the borrow pit from the proposed scheme is unsuitable when compared to the preferred borrow pit locations. The GEML separates this borrow pit from the A12, meaning construction traffic would need to travel on public highway via Hatfield Peverel, or a temporary bridge over the railway line. Both instances score unfavourably against accessibility of the borrow pit to the proposed scheme when compared to the preferred borrow pit locations.</p>
Borrow Pit C	<p>The distance of the borrow pit from the proposed scheme is unsuitable when compared to the preferred borrow pit locations. The GEML separates this borrow pit from the A12, meaning construction traffic would need to travel on public highway via Hatfield Peverel, or a temporary bridge over the railway line. Both instances score unfavourably against accessibility of the borrow pit to the proposed scheme when compared to the preferred borrow pit locations.</p>
Borrow Pit D	<p>Ground investigations have confirmed material suitability is better than originally expected for this borrow pit. However, this is very similar to the adjacent Borrow Pit E, which scored more favourably on location regarding the intended fill area.</p>
Borrow Pit G	<p>The distance of the borrow pit from the proposed scheme is unsuitable when compared to the preferred borrow pit locations. Ground investigations suggest that groundwater control during excavation is likely to be intensive and will result in drawdown impacts extending offsite which will need to be mitigated due to nearby area.</p>
Borrow Pit H	<p>The revised proposed scheme alignment design and earthworks material quantities render the location of the borrow pit unsuitable for the haulage distance to the general fill area it would serve.</p>

Borrow pit	Summary reason for discounting
	<p>Borrow Pit H and Borrow Pit I are located to serve the same area of fill. There is a shorter haulage distance to the required fill area from Borrow Pit I when compared to Borrow Pit H. In addition, Borrow Pit H would require multiple bridge structures to facilitate access, compared to a single bridge for access to Borrow Pit I. Therefore, Borrow Pit I is preferred over Borrow Pit H.</p>
Borrow Pit K	<p>The revised proposed scheme alignment design and earthworks material quantities render the location of the borrow pit unsuitable for the haulage distance to the general fill area it would serve.</p> <p>Additionally, the lack of access for carrying out site investigation works mean the previous assessments (for potential borrow pit locations) stand as the most relevant information. This suggests that groundwater will make extraction challenging and that borrow pit operations will have potential impacts on protected species.</p>
Borrow Pit L	<p>The distance of the borrow pit from the proposed scheme is unsuitable when compared to the preferred borrow pit location.</p> <p>The GEML separates this borrow pit from the A12, meaning construction traffic would need to travel on public highway via Hatfield Peverel, or a temporary bridge over the railway line. Both instances score unfavourably against the accessibility of the borrow pit to the proposed scheme.</p>

6 Final borrow pit locations

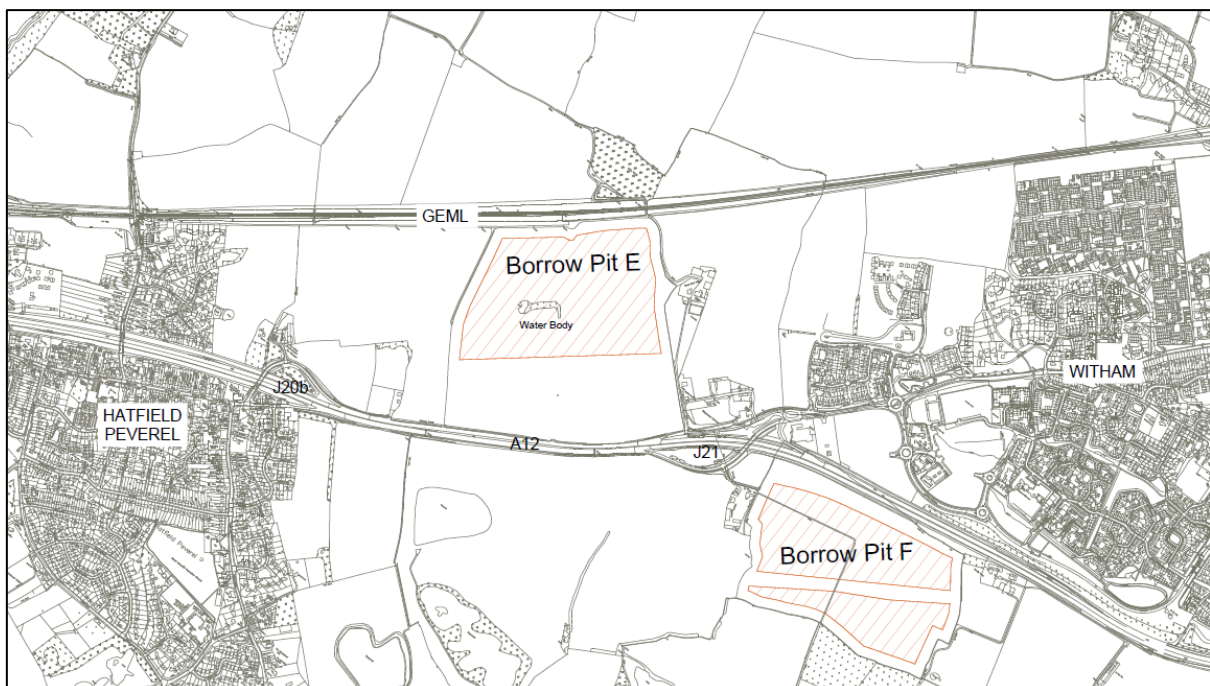
6.1 Borrow Pit – E

Summary of reasons for selection

- 6.1.1 The geology of this borrow pit meets the requirements of the fill material needed for the new junction 21 embankments, with an acceptable balance of suitable material versus unusable material.
- 6.1.2 It is anticipated that groundwater would be manageable and that pre-treatment of pumped groundwater prior to discharge is unlikely to be required.
- 6.1.3 This borrow pit is the closest option to the new junction 21 northside fill area, with a relatively short and simple off-road haul road for fill material, meaning it meets a primary requirement of the borrow pit.
- 6.1.4 Access to the strategic road network is easily achievable when compared to other borrow pits, which would also enable efficient return of unsuitable earthworks material to restore the borrow pit in line with the principles outlined in Section 4 of this report.
- 6.1.5 Environmental impacts to population and health are low and no water environment nor biodiversity impacts have been identified at this borrow pit location.
- 6.1.6 The borrow pit is also not located within 50m of any existing residential or commercial properties. Standard good construction practices would reduce adverse air quality and noise and vibration impacts to acceptable levels.

General description

Plate 6.1 Borrow Pit E location plan

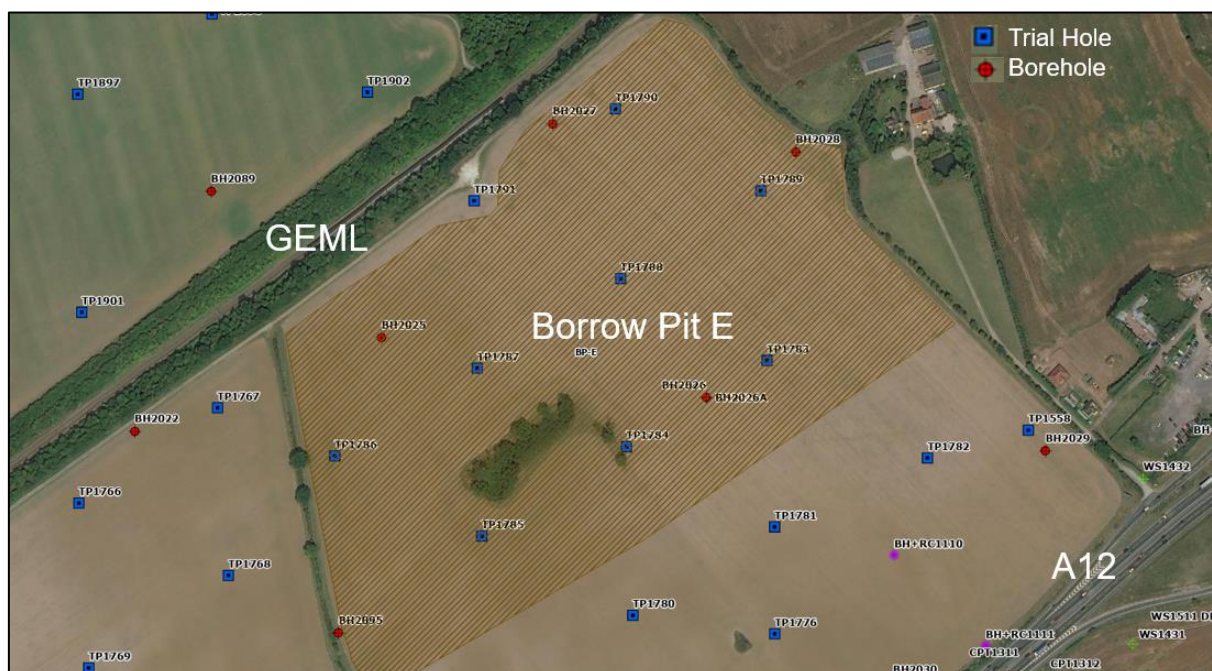


- Planning Inspectorate Proposed scheme Ref: TR010060
Application Document Ref: TR010060/APP/7.8

natural variations within the ground and potential presence of palaeolithic archaeology. Therefore, a worst case borrow pit depth of 4.5m has been assessed in the Environmental Statement [TR010060/APP/6.1].

- 6.1.13 The current Order Limits can accommodate mitigation for the effects of displacing groundwater if required. Mitigation would provide for water treatment methods, such as lagooning and settlement, in proximity to the excavated areas before groundwater could potentially be discharged to local watercourses. Other mitigation could include providing compensation flows to sensitive receptors such as veteran trees and existing water bodies via temporary ditch or pipe networks.
- 6.1.14 The first stage of ground investigation works included several trial holes and boreholes to determine the extents and suitability of the underlying strata. The results of the ground investigation are given in Appendix 10.1: Land Quality Risk Assessment, of the Environmental Statement [TR010060/APP/6.3] and summarised briefly below.

Plate 6.3 Borrow Pit E ground investigation layout plan



- 6.1.15 The geology of this location shows superficial Head Deposits and the Lowestoft Formation overlying Glaciofluvial Deposits. The underlying solid formation is London Clay material.
- 6.1.16 The intention is that the Lowestoft Formation and Head Deposits would be used as a Class 2 general cohesive fill for earthworks material and engineering fill.

Hydrology

Surface water features

- 6.1.17 Ground levels fall gently to the south-east. As previously mentioned, a water body sits near the centre of the proposed borrow pit. There is a separate

reservoir located approximately 180m south of the borrow pit location and a tertiary watercourse 120m to the south.

Surface water runoff

- 6.1.18 Surface water runoff towards the borrow pit is unlikely as the borrow pit is essentially positioned near the top of a slope. Surface water runoff from the borrow pit is likely to be to the east and south.

Flood risk

- 6.1.19 Environment Agency Long Term Flood Risk Information Mapping (Environment Agency, 2022) indicates the area is not liable to flooding from rivers.

Hydrogeology

- 6.1.20 From initial assessments of early ground investigation, groundwater was encountered in one borehole in Borrow Pit E (BH2025) at a level below the proposed excavation formation level. In BH2025, groundwater was encountered at 7.6m below ground level (bgl) and rose to 5.8mbgl. Subsequent groundwater level monitoring has confirmed these conditions, with a maximum recorded groundwater level of 6.8mbgl. Groundwater was not identified in any of the trial pits undertaken.
- 6.1.21 The nearest groundwater dependent terrestrial ecosystem (GWDTE) is over 1.6km away from the borrow pit location (Wet Woodland 1 and Marshy grassland 1).
- 6.1.22 Large-scale dewatering is not likely to be required at this location, unless deeper sections are required to be excavated due to palaeolithic archaeology. It is expected that the natural geology of this borrow pit may effectively collect small amounts of perched groundwater from silty/sandy seams within the excavated footprint, as well as rainwater at its base, due to its surface area in plan.
- 6.1.23 These are expected to be manageable volumes dealt with by a network of small grip drains or ditches excavated in the formation of the borrow pit to sumps at low points where the water would be pumped out with water pump sets, settled or screened if necessary, and routed to licensed discharge points via pipe work or ditch networks.
- 6.1.24 Volume for any storage requirements can be gained from the network of ditches in the base of the borrow pit or by means of artificial settlement lagoons at surface level.

Groundwater abstractions

- 6.1.25 The borrow pit is located less than 30m away from the nearest abstraction (PGA-2). There are also two identified abstraction points (LGA-3 and PGA-3) located approximately 190m south-east of the borrow pit and both have a Source Protection Zone (SPZ), implemented by the Environment Agency, to control activities within the area that may affect the abstraction point.
- 6.1.26 Nearby groundwater abstractions would need to be protected from potential groundwater contamination during borrow pit excavation. This would be

implemented post consent by gathering further information on the abstractions and updating the impact assessments to confirm whether additional measures were required. Such measures could include monitoring the groundwater abstractions prior to, during and post construction and provision of a temporary replacement water supply if required. If monitoring demonstrates a long-term impact, an alternative solution would be proposed such as permanent water supply connections or new abstraction points. These measures are secured in the REAC, within the first iteration of the EMP [TR010060/APP/6.5].

Palaeolithic archaeology

- 6.1.27 Initial investigation work has indicated the potential presence of palaeolithic archaeology in Borrow Pit E. Further investigation work to establish the extent of impacts would be undertaken in consultation with the cultural heritage stakeholders. If this highlights a significant impact to a cultural heritage asset, then mitigation measures would be implemented in accordance with Appendix 7.10: Archaeological Mitigation Strategy, of the Environmental Statement [TR010060/APP/6.3]. If the mitigation measure requires preservation of assets *in situ*, then the borrow pit may be modified to include a deepened section with a smaller footprint to avoid the area of palaeolithic interest.
- 6.1.28 Based on the initial investigation, the area of palaeolithic interest is in the eastern half of Borrow Pit E. If this area cannot be excavated due to the presence of palaeolithic archaeology, the western half of the borrow pit would be excavated at an increased depth, but not exceeding the 4.5m worst case depth previously assessed, to cater for the volume of material that would be lost from not excavating the area where palaeolithic archaeology is present.

Planning applications and consented schemes

- 6.1.29 There are no planning applications or consented schemes within the proposed borrow pit location.

Existing utilities

- 6.1.30 No buried or overhead utilities have been identified within the footprint of this proposed borrow pit based on a desk-based study of existing services from statutory undertakers. A buried medium-pressure gas main is located along the south-eastern edge of the land plot which is outside of the proposed borrow pit location.
- 6.1.31 Discussions with the landowner and farm management uncovered details of a live buried irrigation water main. The pipe runs directly east to west from the water body in the centre, off to the adjacent land plot.
- 6.1.32 This buried service will be maintained during borrow pit operation and, if necessary, will be diverted. This is shown on the Utility Diversions Works Plans [TR010060/APP/2.2.2] as Work No. U41A.
- 6.1.33 Further details are included in the Water Management Plan included in the first iteration EMP [TR010060/APP/6.5].

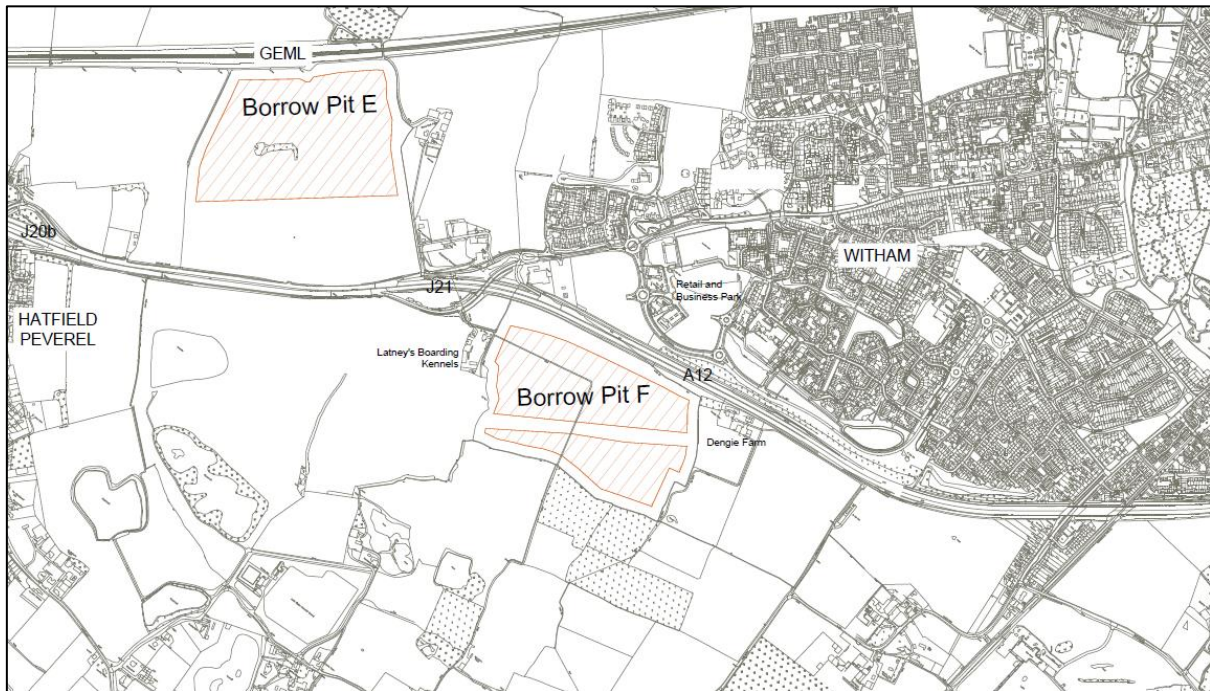
6.2 Borrow Pit – F

Summary of reasons for selection

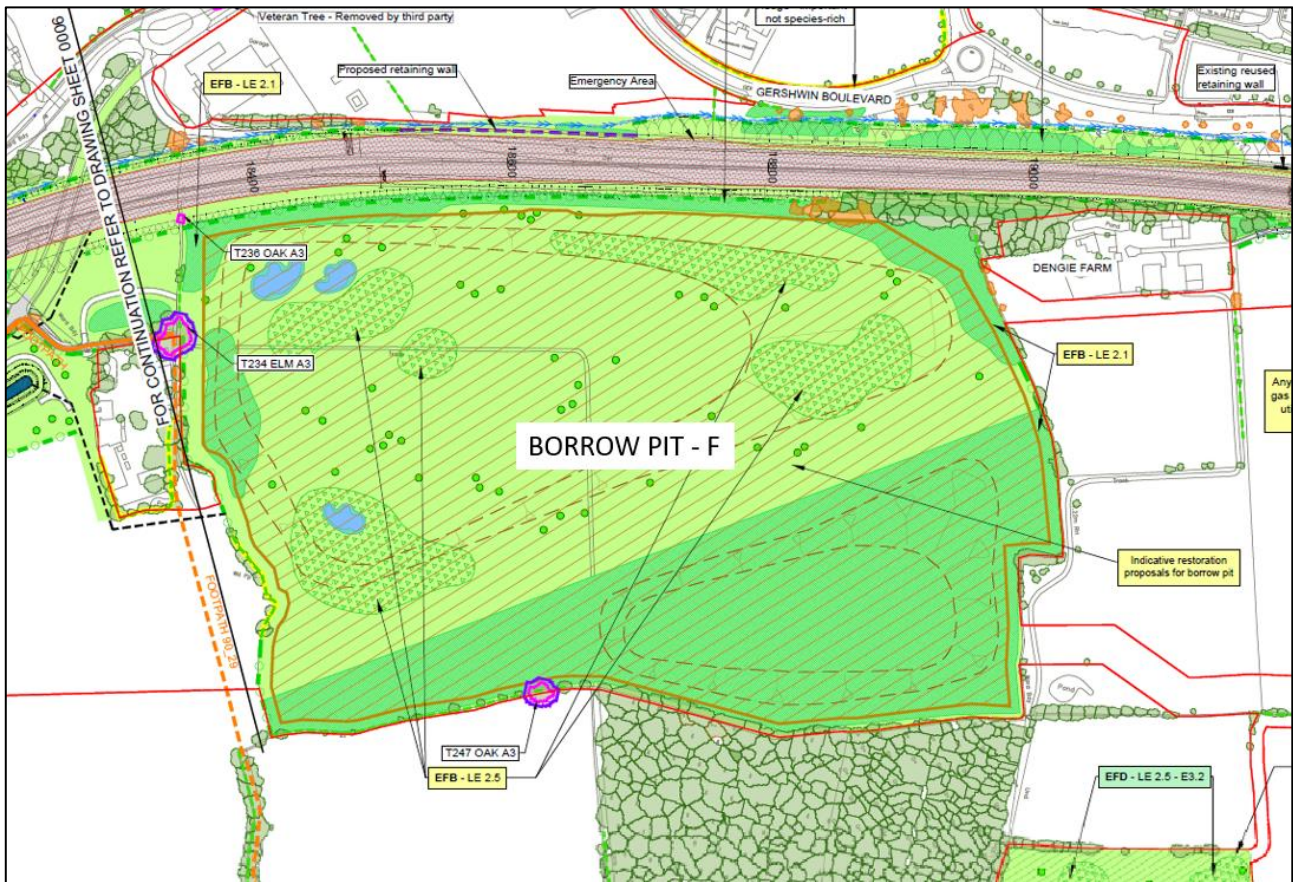
- 6.2.1 The geology of this borrow pit meets the requirements of the fill material needed for the new junction 21 embankments, with an acceptable balance of suitable material versus unusable material.
- 6.2.2 It is anticipated that groundwater would be manageable. Pre-treatment of pumped groundwater prior to discharge may be required, subject to discharge consent requirements. A Detailed Qualitative Risk Assessment may be required to assess the risk from potential contamination sources. This is secured in the REAC, within the first iteration of the EMP [TR010060/APP/6.5].
- 6.2.3 This borrow pit is the closest option to the new junction 21 southside fill area, with a suitable off-road haul road for fill material, meaning it meets a primary requirement of the borrow pit.
- 6.2.4 Access to the strategic road network is easily achievable when compared to other borrow pits, which would also enable efficient return of unsuitable earthworks material to restore the borrow pit in line with the principles outlined in Section 4 of this report.
- 6.2.5 The presence of two major buried utilities means that an area of the borrow pit is sterilised for extraction and will require protection measures during construction. This is considered to be manageable within the Order Limits proposed for the borrow pit.
- 6.2.6 Environmental impacts to population and health are low. However, in terms of biodiversity and noise and vibration impacts, an outlier badger sett is present in the borrow pit area and the borrow pit is located within 50m of an existing residential property. Additional mitigation measures beyond standard good construction practice may be needed to reduce impacts to acceptable levels.
- 6.2.7 There is potential for impacts to water quality from dewatering activities as mentioned above. However, these impacts are considered to be manageable and preferable to those that would have arisen from the borrow pits that have been discounted.
- 6.2.8 Mitigation for the above is secured in the REAC, within the first iteration of the EMP [TR010060/APP/6.5].

General description

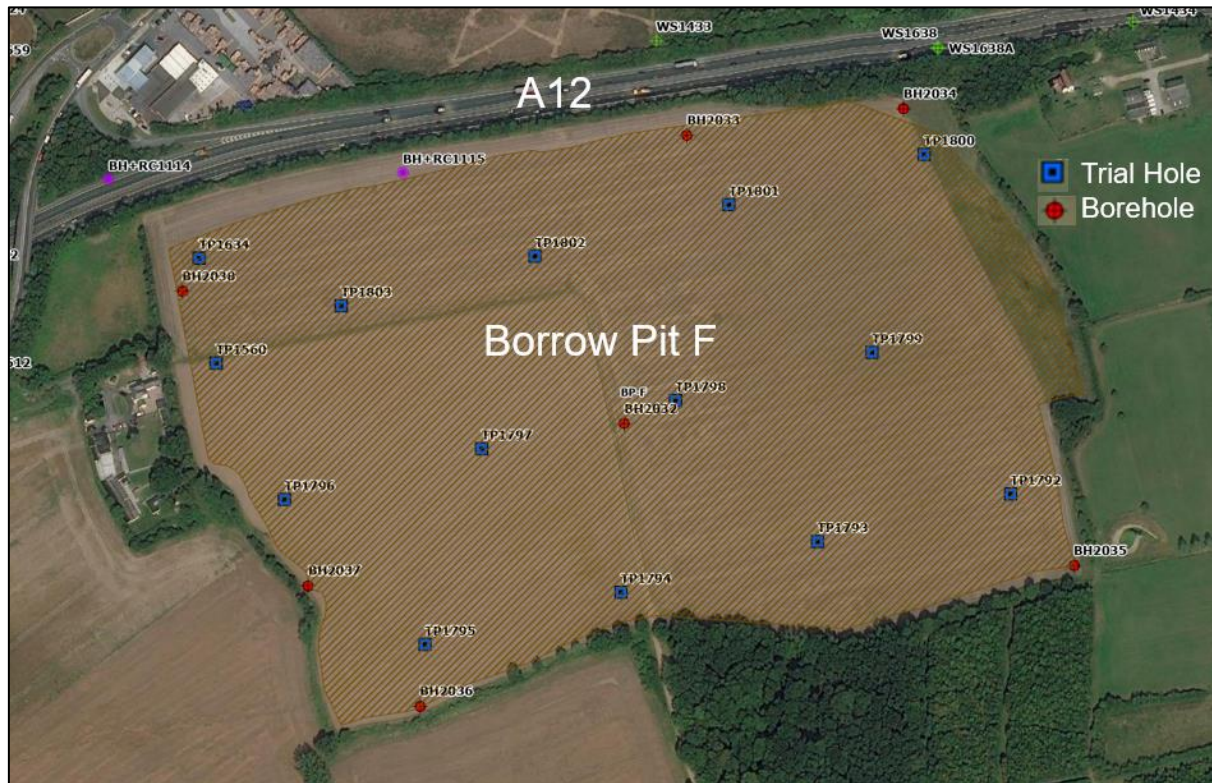
Plate 6.4 Borrow Pit F location plan



- 6.2.9 The borrow pit is located on arable agricultural land to the south of the A12 between the existing junction 21, Latney's Boarding Kennels and Cattery, and Dengie Farm. There is a densely vegetated woodland directly to the south-east of the land plot. The borrow pit is bounded on the western, southern and eastern sides by drainage ditches. Directly north of the A12 is a mixed-use development, predominantly a retail and business park.
- 6.2.10 The borrow pit is primarily intended for the south side of the new junction 21 fill embankment and to support fill requirements to the east along the mainline A12 embankment widening on the Witham bypass shown in Appendix C.
- 6.2.11 The anticipated volume of acceptable general fill material to be gained is 100,000m³. The current intention is to win earthworks material above the groundwater table in order to minimise impacts and avoid the need to mitigate against displacing groundwater. However, this may not be possible owing to natural variations of the target material within the ground and potential presence of palaeolithic archaeology. Therefore, a worst case borrow pit depth of 4m has been assessed in the Environmental Statement [TR010060/APP/6.1].
- 6.2.12 The current Order Limits can accommodate mitigation for the effects of displacing groundwater if required. Mitigation would provide for water treatment methods, such as lagooning and settlement, in proximity to the excavated areas before groundwater could potentially be discharged to local watercourses. Other mitigation could include providing compensation flows to sensitive receptors such as veteran trees and existing water bodies via temporary ditch or pipe networks.

Plate 6.5 Borrow Pit F illustrative restoration proposal

- 6.2.13 The first stage of ground investigation works included several trial holes and boreholes to determine the extents and suitability of the underlying strata. The results of the ground investigation are given in Appendix 10.1: Land Quality Risk Assessment, of the Environmental Statement [TR010060/APP/6.3] and summarised briefly below.
- 6.2.14 The geology of the borrow pit location shows superficial Head Deposits, Brickearth and the Lowestoft Formation overlying Glaciofluvial Deposits. The underlying solid formation is London Clay material.
- 6.2.15 The intention is that the Lowestoft Formation and Head Deposits would be used as a Class 2 general cohesive fill for earthworks material and engineering fill. If excavated, the Brickearth would potentially be used for Class 4 landscape fill.

Plate 6.6 Borrow Pit F ground investigation layout plan

Hydrology

Surface water features

- 6.2.16 Ground levels fall to the east towards the River Blackwater, which is situated approximately 1.1km from the borrow pit location.
- 6.2.17 There is a drainage ditch present around the boundary of the borrow pit location as previously mentioned.

Surface water runoff

- 6.2.18 Surface water runoff towards the borrow pit is likely to be from the west because of the borrow pit's location on a west to east running slope. Runoff from the borrow pit is likely to be in an easterly direction towards the River Blackwater. The existing surface water drains are likely to cut-off any overland flow into the borrow pit area. Mitigation is likely to be required to reinforce the capacity and water quality of drains on the eastern side for construction runoff. This could include existing drain clearance or additional temporary surface drains and attenuation ponds. Precise details would be determined following detailed design.

Flood risk

- 6.2.19 Environment Agency Long Term Flood Risk Information Mapping (Environment Agency, 2022) indicates the area is not liable to flooding from rivers.

Hydrogeology

- 6.2.20 From initial assessments of early ground investigation, groundwater was encountered in two boreholes, BH2035 and BH2038, both at levels below the proposed excavation formation level (>5m). However, groundwater level monitoring has recorded maximum groundwater levels of 0.78mbgl in BH2035 and 0.40mBGL in BH2032, which is located within the footprint of the proposed borrow pit.
- 6.2.21 Groundwater was also identified within 2.2mbgl in three of the 12 trial pits and less than 4mbgl in one trial pit, within the proposed borrow pit excavation depth. As such, there is expected to be a need to dewater the excavated area. This will be investigated in more detail through further ground investigation phases.
- 6.2.22 Dewatering is expected to be managed with a network of small grip drains or ditches excavated in the formation of the borrow pit to sumps at low points where the water would be pumped out with water pump sets, settled or screened if necessary, and routed to licensed discharge points via pipe work or ditch networks.
- 6.2.23 Volume for any storage requirements can be gained from the network of ditches in the base of the borrow pit or by means of artificial settlement lagoons at surface level.
- 6.2.24 The nearest GWDTE has been identified over 1.3km north-east (Riverview Meadows).

Groundwater abstractions

- 6.2.25 Groundwater abstractions LGA-3 and PGA-3 are located approximately 260m north-west of the borrow pit. Both have SPZs, implemented by the Environment Agency, to control activities within the area that may affect the abstraction point.
- 6.2.26 Nearby groundwater abstractions would need to be protected from potential groundwater contamination during borrow pit excavation. This would be implemented post consent by gathering further information on the abstractions and updating the impact assessments to confirm whether additional measures were required. Such measures could include monitoring the groundwater abstractions prior to, during and post construction and provision of a temporary replacement water supply if required. If monitoring demonstrates a long-term impact, an alternative solution would be proposed such as permanent water supply connections or new abstraction points. These measures are secured in the REAC, within the first iteration of the EMP [TR010060/APP/6.5].

Palaeolithic archaeology

- 6.2.27 Initial investigation work has indicated the potential presence of palaeolithic archaeology in Borrow Pit F. Further investigation work to establish the extent of impacts would be undertaken in consultation with the cultural heritage stakeholders. If this highlights a significant impact to a cultural heritage asset, then mitigation measures would be implemented in accordance with Appendix 7.10: Archaeological Mitigation Strategy, of the Environmental Statement [TR010060/APP/6.3]. If the mitigation measure requires preservation of assets

in situ, then the borrow pit may be modified to include a deepened section with a smaller footprint in order to avoid the area of palaeolithic interest.

- 6.2.28 Based on the initial investigation, the area of palaeolithic interest in Borrow Pit F is the oval shaped patch of Brickearth located centrally within the borrow pit area. If this area cannot be excavated due to the presence of palaeolithic archaeology, the annulus around the central section of the borrow pit would be excavated at an increased depth, but not exceeding the 4m worst case depth previously assessed, to cater for the volume of material that would be lost from not excavating the area where palaeolithic archaeology is present.

Planning applications and consented proposed schemes

- 6.2.29 There are no planning applications or consented schemes within the proposed borrow pit location.

Existing utilities

- 6.2.30 The key constraint identified from a desk-based study is a high-pressure gas main and pressurised foul water main that run south-west to north-east through the proposed borrow pit. There is also a buried 11kV electric cable that runs around the western and northern edges.
- 6.2.31 An exclusion zone would be applied to the gas and foul water mains. This would be secured through protective provisions for the benefit of the affected statutory undertakers. No excavation would be permitted within the exclusion zone. The exclusion zone would be demarked with fencing and would include designated engineered crossing points for mobile plant movements through the area. The crossing points would be designed in accordance with the requirements of the relevant protective provisions.

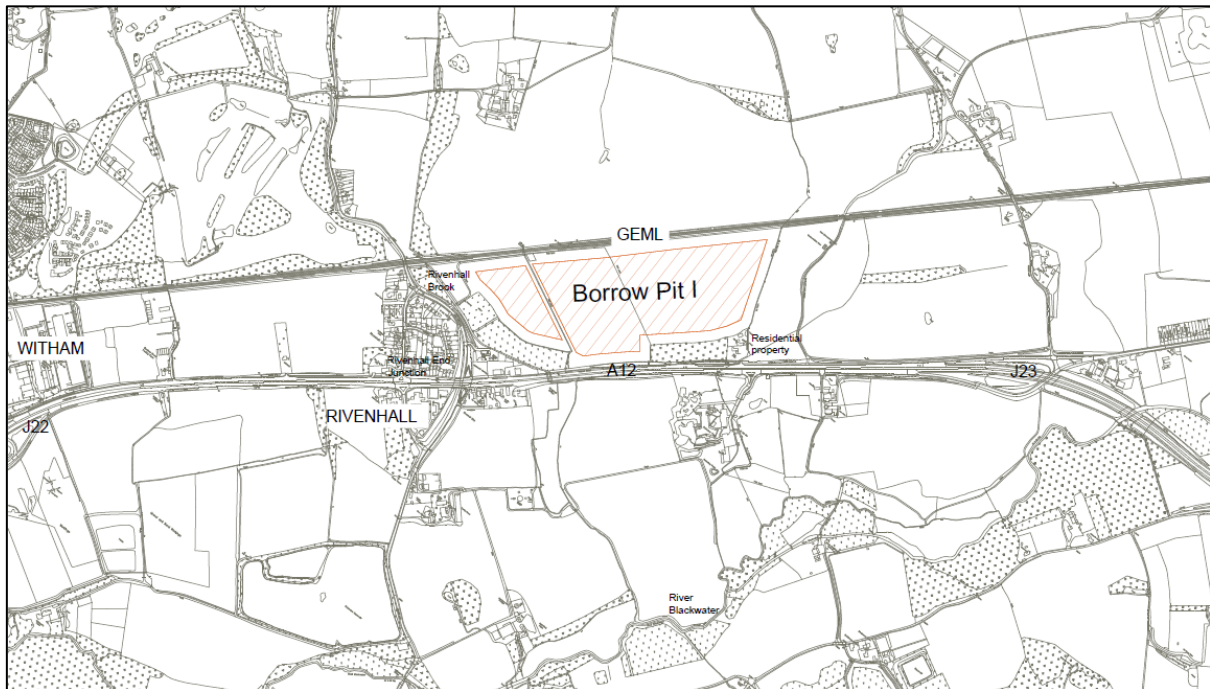
6.3 Borrow Pit – I

Summary of reasons for selection

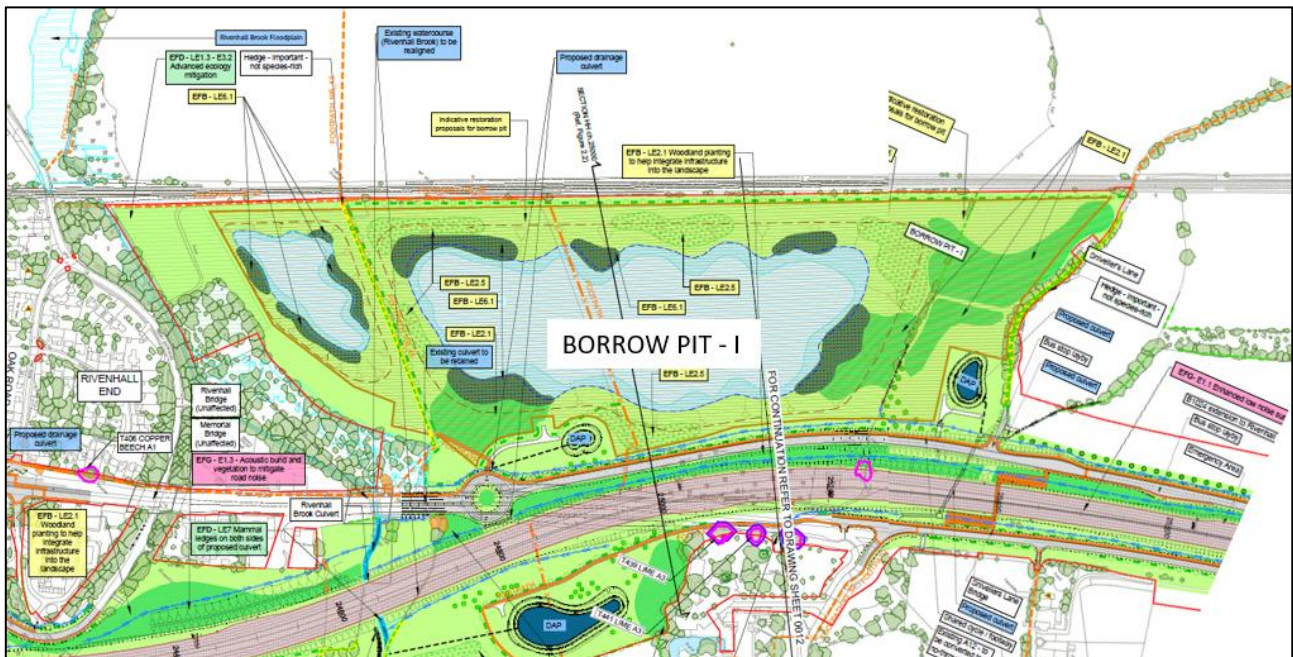
- 6.3.1 The geology of this borrow pit meets the requirements of the fill material needed for the new junction 22 embankments, with an acceptable balance of suitable material versus unusable material.
- 6.3.2 Due to the depth of excavation proposed, high groundwater levels and the presence of permeable materials at depth, a groundwater control system may be required, and drawdown impacts may extend offsite. Pre-treatment of pumped groundwater prior to discharge may be required, subject to discharge consent requirements. A Detailed Qualitative Risk Assessment may be required to assess the risk from potential contamination sources. Mitigation measures are secured in the REAC, within the first iteration of the EMP [TR010060/APP/6.5].
- 6.3.3 This borrow pit is the closest option to the new junction 22 fill area, with an off-road haul road for fill material that is preferred over the discounted options. Access to the strategic road network is easily achievable when compared to the other borrow pits, which would also enable efficient return of unsuitable earthworks material to restore the borrow pit in line with the principles outlined in Section 4 of this report.
- 6.3.4 There are overhead and buried utilities nearby that would have a relatively small effect on the operation of the borrow pit and will require protection measures during construction. This is considered to be manageable within the Order Limits proposed for the borrow pit.
- 6.3.5 The borrow pit operation will sever some existing PRoWs which would require diversion as described in the Outline Construction Traffic Management Plan [TR010060/APP/7.7]. Nearby residents are within 200m of the borrow pit, which may mean additional mitigation measures beyond standard good construction practice are required to reduce impacts to acceptable levels. In terms of biodiversity impacts, a main badger sett is present in the borrow pit area and would need to be closed under licence and relocated nearby. These impacts are considered to be manageable and the borrow pit preferable when compared to the borrow pits that have been discounted. The mitigation is secured in the REAC, within the first iteration of the EMP [TR010060/APP/6.5].

General description

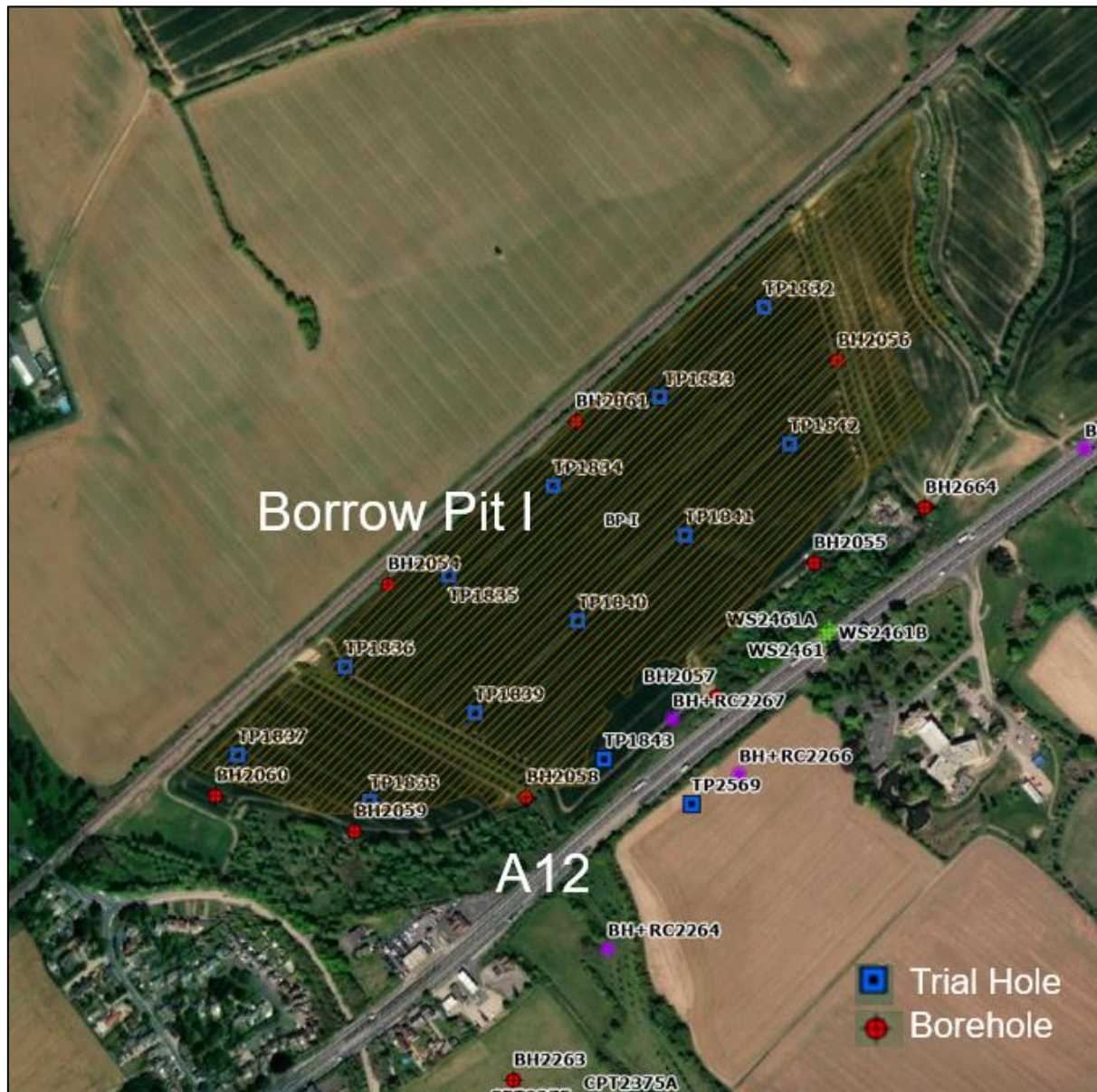
Plate 6.7 Borrow Pit I location plan



- 6.3.6 The borrow pit is located on arable agricultural land to the north of the A12 between the existing Rivenhall End junction and junction 23 (Kelvedon South interchange). The borrow pit is bounded to the north-west by the GEML, approximately 20m from the railway boundary fence.
- 6.3.7 The south-western edge adjoins a densely vegetated wet woodland, which separates the borrow pit from properties in part of Rivenhall End. Rivenhall Brook runs through the woodland approximately 80m from the borrow pit and under the existing A12 to the east. This meets with the River Blackwater approximately 600m from the borrow pit.
- 6.3.8 There are two PRoWs that run from the north-western edge of the borrow pit to the south-eastern edge at the existing A12. Footpath 105_45 will be temporarily diverted around the perimeter of the borrow pit and Footpath 105_46 will be permanently diverted. This is described in more detail in the Outline Construction Traffic Management Plan [TR010060/APP/7.7].
- 6.3.9 Two residential properties are located within 50m of the eastern edge of the borrow pit, under the alignment of the proposed B1024 connection road. These properties would be acquired and demolished as part of the proposed scheme (Work No.24(g)).
- 6.3.10 A telecommunications mast is located on the northern corner of the borrow pit. This would not be affected by the borrow pit works.



- Planning Inspectorate Proposed scheme Ref: TR010060
Application Document Ref: TR010060/APP/7.8

Plate 6.9 Borrow Pit I ground investigation layout plan

- 6.3.14 The geology of the borrow pit location shows superficial deposits in approximately the north-western half of the pit to consist of Lowestoft Formation and Glaciofluvial Deposits. In the approximate south-eastern half of the borrow pit the superficial geology is complex, consisting locally of material interpreted as Head Deposits, Interglacial Silt and Clay, Glaciolacustrine Deposits, Lowestoft Formation, Glaciofluvial Deposits and River Terrace Deposits. The underlying solid formation is London Clay material.
- 6.3.15 The intention is that the Lowestoft Formation and Head Deposits would be used as a Class 2 general cohesive fill for earthworks material and engineering fill. If encountered, Glaciofluvial and River Terrace Deposits would be used as a Class 1 general or Class 6 selected granular fill. At the above stated dig depth, it is likely that the London Clay would be recovered for use as a Class 2 general cohesive fill as well.

Hydrology

Surface water features

- 6.3.16 Ground levels fall gently to the south and south-east towards the Rivenhall Brook and River Blackwater. Rivenhall Brook and the River Blackwater are located as described above.

Surface water runoff

- 6.3.17 Surface water runoff towards the borrow pit is likely to be from the north-west because of its position towards the bottom of a north-west to south-east slope. The GEML is likely to prevent over land flows into the borrow pit area.
- 6.3.18 Runoff from the borrow pit is likely to be in a south and south-easterly direction towards the Rivenhall Brook, which would need to be managed during borrow pit operation. This could include existing drain clearance or additional temporary surface drains and attenuation ponds. Precise details would be determined following detailed design.

Flood risk

- 6.3.19 Hydraulic modelling undertaken for the proposed scheme shows Borrow Pit I is located partially within an area of fluvial floodplain associated with Rivenhall Brook. Activities within Borrow Pit I at risk of flooding would be managed and allowances would be made for floodplain control measures and contingency actions. This commitment is secured through the REAC included within the first iteration EMP [TR010060/APP/6.5]. For example, Borrow Pit I would have a plan to flood the borrow pit in response to flood warning/adverse weather conditions.

Hydrogeology

- 6.3.20 From initial assessments of early ground investigation, groundwater was encountered in five out of the eight boreholes undertaken within the borrow pit. At the shallowest point (BH2060), groundwater was encountered at 3.1mbgl rising to 0.62mbgl. At the deepest point (BH2054), groundwater was encountered at 10mbgl rising to 7mbgl. An initial layer of substrata is clay varying in depth from 1mbgl to 10mbgl. In addition, water seepage has been identified within five of the 12 trial pits.
- 6.3.21 Subsequent groundwater monitoring has confirmed high groundwater levels, with the maximum recorded groundwater level near the ground surface in BH2060 and 0.14mbgl in BH2058. Depth to groundwater appears to increase towards the north and north-east but is expected to be above the proposed dig depth across the whole footprint of the proposed borrow pit. As such, there is expected to be a need to dewater the excavated area. This will be investigated in more detail through further ground investigation phases.
- 6.3.22 Dewatering is expected to be managed with a network of small grip drains or ditches excavated in the formation of the borrow pit to sumps at low points where the water would be pumped out with water pump sets, settled or screened if necessary, and routed to licensed discharge points via pipe work or ditch networks.

- 6.3.23 Volume for any storage requirements can be gained from the network of ditches in the base of the borrow pit or by means of artificial settlement lagoons at surface level.
- 6.3.24 GWDTE Wet Woodland 7 is located 5m south-west of Borrow Pit I. No other GWDTEs are located near the borrow pit.
- 6.3.25 To mitigate any potential impact on Wet Woodland 7 (GWDTE), groundwater level and surface water flow monitoring would be undertaken around Borrow Pit I to support detailed assessments of Wet Woodland 7. Groundwater level monitoring using dataloggers would continue at existing boreholes beside Borrow Pit I and the A12. This would be complemented by a National Vegetation Classification survey to refine baseline habitat at the site. Additional ground investigation would include pumping tests at Borrow Pit I to support a more detailed dewatering impact assessment.
- 6.3.26 A Water Balance Compensation strategy would be put in place to compensate the loss of natural groundwater recharge to the site by diverting extracted groundwater from Borrow Pit I towards Wet Woodland 7. The volume of water to be diverted would be based on the detailed design and dewatering impact assessment and long-term groundwater monitoring around the site. The Water Balance Compensation strategy would determine whether monitoring of existing boreholes should continue during construction of Borrow Pit I and until groundwater has rebounded.
- 6.3.27 A post-construction National Vegetation Classification survey would be undertaken to verify that no significant change in vegetation has taken place during construction at Wet Woodland 7.
- 6.3.28 These commitments are secured within the REAC, within the first iteration of the EMP [TR010060/APP/6.5].

Groundwater abstractions

- 6.3.29 One groundwater abstraction (PGA-6) is located approximately 550m north-west of the borrow pit.
- 6.3.30 Nearby groundwater abstractions would need to be protected from potential groundwater contamination during borrow pit excavation. This would be implemented post consent by gathering further information on the abstractions and updating the impact assessments to confirm whether additional measures were required. Such measures could include monitoring the groundwater abstractions prior to, during and post construction and provision of a temporary replacement water supply if required. If monitoring demonstrates a long-term impact, an alternative solution would be proposed such as permanent water supply connections or new abstraction points. These measures are secured in the REAC, within the first iteration of the EMP [TR010060/APP/6.5].

Palaeolithic archaeology

- 6.3.31 Initial investigation work has indicated the potential presence of palaeolithic archaeology in Borrow Pit I. Further investigation work to establish the extent of impacts would be undertaken in consultation with the cultural heritage stakeholders. If this highlights a significant impact to a cultural heritage asset,

then mitigation measures would be implemented in accordance with Appendix 7.10: Archaeological Mitigation Strategy, of the Environmental Statement [TR010060/APP/6.3]. If the mitigation measure requires preservation of assets *in situ*, then the borrow pit may be modified to include a deepened section with a smaller footprint in order to avoid the area of palaeolithic interest.

- 6.3.32 Based on the initial investigation, the area of palaeolithic interest in Borrow Pit I covers most of the south-eastern half of the borrow pit area. If this area cannot be excavated due to the presence of palaeolithic archaeology, the north-western half of the borrow pit would be excavated at an increased depth, but not exceeding the 17m worst case depth previously assessed, to cater for the volume of material that would be lost from not excavating the area where palaeolithic archaeology is present.

Planning applications and consented proposed schemes

- 6.3.33 There are no planning applications or consented schemes within the proposed borrow pit location.

Existing utilities

- 6.3.34 The key constraint identified from a desk-based study of existing services from statutory undertakers within this borrow pit area is the existing 11kV overhead electric cables that run north-west to south-east in two locations near the borrow pit edges.
- 6.3.35 An exclusion zone would be set around the cables. This would be secured through protective provisions for the benefit of the affected statutory undertakers. No excavation would be permitted within the exclusion zone. The exclusion zone would be demarked with fencing and would include designated engineered crossing points for mobile plant movements through the area. The crossing points would be designed in accordance with the requirements of the relevant protective provisions.

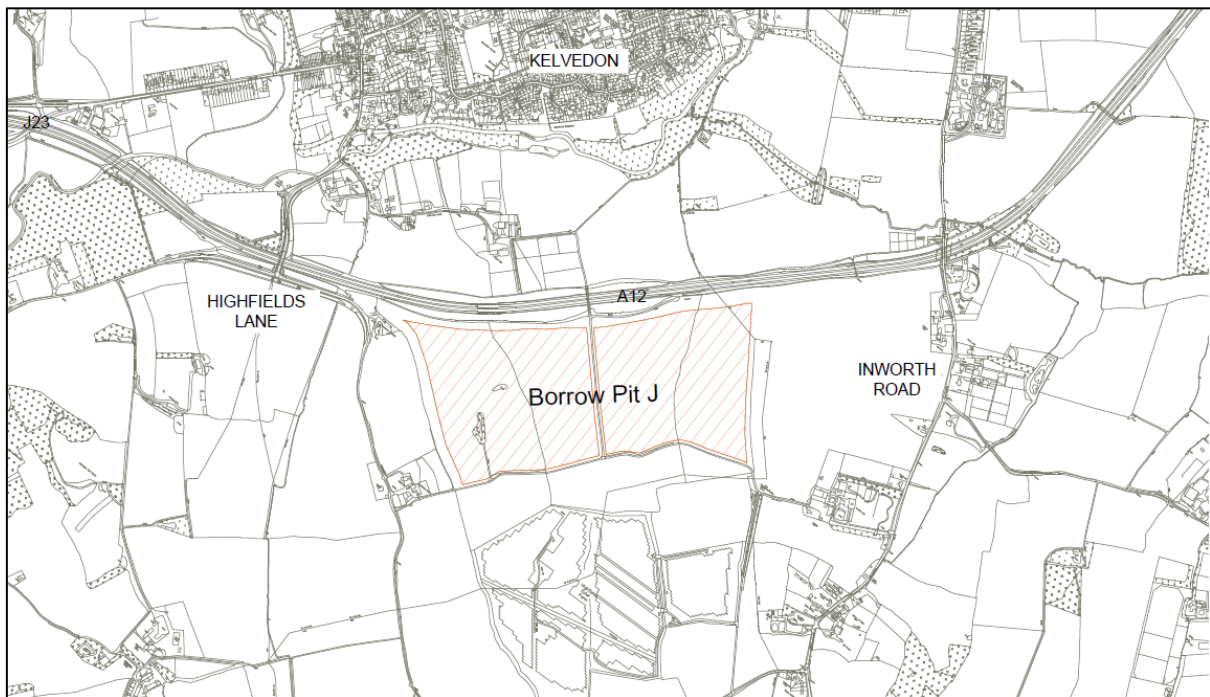
6.4 Borrow Pit – J

Summary of reasons for selection

- 6.4.1 The geology of this borrow pit meets the requirements of the granular earthworks material needed for the proposed scheme, with an acceptable balance of suitable material versus unusable material.
- 6.4.2 Due to the depth of excavation proposed, high groundwater levels and the presence of permeable materials at depth, it is likely that a groundwater control system would be required, and drawdown impacts may extend offsite. This is expected with the type of material that is targeted in this borrow pit.
- 6.4.3 Suspected asbestos containing materials have been encountered within the borrow pit area, but these materials would not be disturbed because an exclusion zone would be implemented around this area. As such, pre-treatment of pumped groundwater prior to discharge is unlikely to be required. Relevant mitigation measures are secured in the REAC, within the first iteration of the EMP [TR010060/APP/6.5].
- 6.4.4 Although the borrow pit is not located centrally within the proposed scheme, it is relatively close and has reasonable off-road links to some proposed scheme areas with good links to the strategic road network, which will be used for distributing the granular material.
- 6.4.5 There are overhead and buried utilities nearby that would have a relatively small effect on the operation of the borrow pit and may require protection measures during construction. This is considered to be manageable within the Order Limits proposed for the borrow pit.
- 6.4.6 The borrow pit operation will sever some existing PRoWs which would require diversion as described in the Outline Construction Traffic Management Plan [TR010060/APP/7.7]. Nearby residents are within 100m of the borrow pit, which may mean additional mitigation measures beyond standard good construction practice may be needed to reduce impacts to acceptable levels. In terms of biodiversity impacts, an outlier badger sett is present in the borrow pit area which will be impacted, and several mature trees have been identified which will be avoided. The density of archaeology that requires mitigation at this borrow pit location is potentially quite high, but this is deemed to be preferable to importing the required material from outside of the Order Limits. Impacts on archaeology are considered to be manageable by the use of exclusion zones if required.
- 6.4.7 Mitigation measures for the above are secured in the REAC, within the first iteration of the EMP [TR010060/APP/6.5].

General description

Plate 6.10 Borrow Pit J location plan

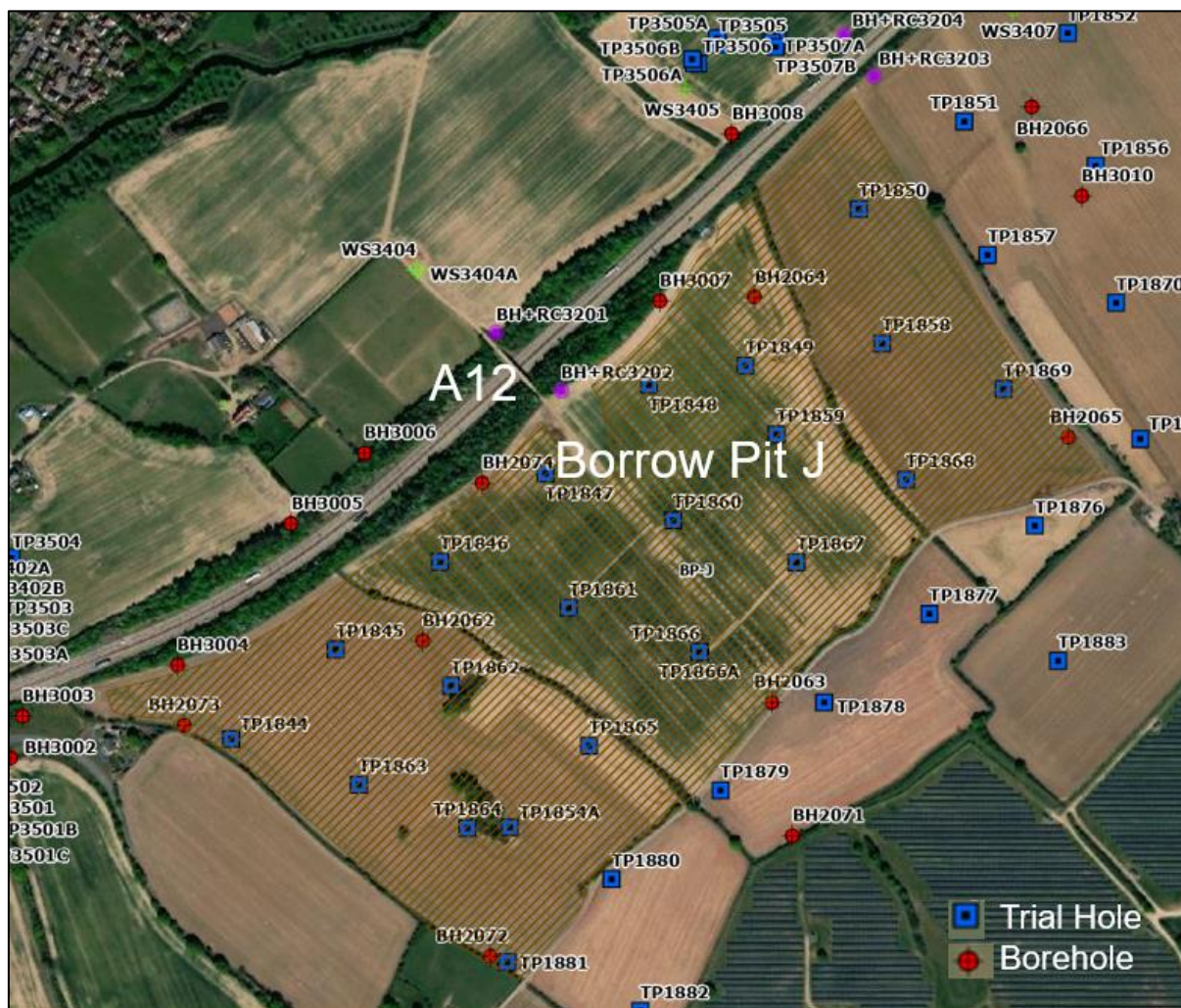


- 6.4.8 The borrow pit is located on arable agricultural land to the south-east of the A12 between the existing Highfields Lane and Inworth Road. It is approximately 1km south-east of Kelvedon.
- 6.4.9 The borrow pit is bounded by a mix of hedgerows and woodland and is bisected by a PRoW that runs north-west to south-east across the centre of the borrow pit. The borrow pit is also split in the same direction by two ordinary watercourses that meet the A12 embankment and cross under the carriageway heading to the River Blackwater approximately 500m to the north-east.
- 6.4.10 A number of buildings are located around the borrow pit, within 300m of the edge of the excavation zone. This is considered in further detail in the hydrogeology section for this borrow pit below.
- 6.4.11 A telecommunications mast is located on the north-eastern corner of the borrow pit approximately 70m from the working area. This will not be affected by the borrow pit works.
- 6.4.12 A solar panel farm is located approximately 120m to the south-east of the borrow pit which extends along the entire length of the proposed location. Although the panels are located generally upwind of the borrow pit, standard good construction practice of slowing down the speed of vehicles and damping down the ground surface will help to control dust levels. This will be secured through the first iteration EMP [TR010060/APP/6.5].

Plate 6.11 Borrow Pit J illustrative restoration proposal

- 6.4.13 The borrow pit is primarily intended for the extraction of granular material for use across the proposed scheme as selected fill material and other construction aggregates as shown in Appendix C. The borrow pit may also need to be used for the extraction of Class 2 fill, to backfill Colemans Quarry.
- 6.4.14 The anticipated volume of granular material to be gained is 300,000m³ at a dig depth of 7m. The anticipated volume of Class 2 fill required for the backfill of Colemans Quarry would also be 300,000m³, bringing the total anticipated volume required from Borrow Pit J up to 600,000m³.
- 6.4.15 The first stage of ground investigation works included several trial holes and boreholes to determine the extents and suitability of the underlying strata. The results of the ground investigation are given in Appendix 10.1: Land Quality Risk Assessment, of the Environmental Statement [TR010060/APP/6.3] and summarised briefly below.

Plate 6.12 Borrow Pit J ground investigation layout plan



- 6.4.16 The geology of the borrow pit location shows superficial deposits in the north-east of the pit consist predominately of Lowestoft Formation and Glaciofluvial Deposits with some localised River Terrace and Head Deposits. In the south-west of the borrow pit, the superficial geology is complex, consisting locally of material interpreted as Head Deposits, Interglacial Silt and Clay, Lowestoft Formation, Glaciofluvial Deposits and River Terrace Deposits. The underlying solid formation is London Clay material.
- 6.4.17 The intention is that the River Terrace and Glaciofluvial Deposits would be used as a Class 1 general granular fill for earthworks material, engineering fill or preferably Class 6 granular fill.
- 6.4.18 Depending on the quality of the granular material excavated, processing and treatment may be used to gain concrete and drainage aggregates for use on the proposed scheme. This would be undertaken within the footprint of the borrow pit area and has been assessed within the Environmental Statement [TR010060/APP/6.1].

Hydrology

Surface water features

- 6.4.19 Ground levels fall to the north-west towards the Domsey Brook and River Blackwater. The Domsey Brook is approximately 150m to the north of the borrow pit location and the River Blackwater 400m to the north-west. A spring is mapped approximately 350m to the north-west.

Surface water runoff

- 6.4.20 Surface water runoff towards the borrow pit is likely to be from the south-east due to its location approximately mid-way down a north-westerly slope towards the River Blackwater. The runoff will most likely be concentrated in the shallow valley features that form the land drains for the area.
- 6.4.21 Runoff from the borrow pit is likely to be in a north-westerly direction towards the existing A12 highway.

Flood risk

- 6.4.22 The proposed scheme's hydraulic modelling shows that Borrow Pit J encroaches within the flood extents of Watercourse 21 and 21a. Activities within Borrow Pit J at risk of flooding would be managed and allowances would be made for floodplain control measures and contingency actions. This commitment is secured through the REAC included within the first iteration EMP [TR010060/APP/6.5]. For example, this would include a plan to flood the borrow pit in response to flood warning/adverse weather conditions.

Hydrogeology

- 6.4.23 From initial assessments of early ground investigation, groundwater was encountered in three out of the 14 boreholes undertaken – all three locations are in the southern section of Borrow Pit J. At the shallowest point (BH2072), groundwater was encountered at 0.4mbgl; the groundwater remained at this level. At the deepest point (BH2062), groundwater was encountered at 5.2mbgl rising to 4mbgl. In addition, water seepage has been identified within four trial pits excavated.
- 6.4.24 Subsequent groundwater level monitoring has confirmed shallow groundwater within the footprint of the proposed borrow pit, with groundwater levels of 0.54mbgl recorded in BH2072 and 1.35mbgl in BH2064. As such, there is expected to be a need to dewater the excavated area. This will be investigated in more detail through further ground investigation phases.
- 6.4.25 Dewatering is expected to be managed with a network of small grip drains or ditches excavated in the formation of the borrow pit to sumps at low points where the water would be pumped out with water pump sets, settled or screened if necessary, and routed to licensed discharge points via pipe work or ditch networks.
- 6.4.26 Volume for any storage requirements can be gained from the network of ditches in the base of the borrow pit or by means of artificial settlement lagoons at surface level.

- 6.4.27 There are two GWDTEs located near the proposed borrow pit location. Brockwell Meadows is located 475m north of the borrow pit location and Wet Woodland 8 is located 442m north-east of the borrow pit location. These have been assessed as having a moderate groundwater dependency.

Groundwater abstractions

- 6.4.28 A public water supply borehole has been identified 20m from Inworth Road (LGA-29). However, this location is not included in the Environment Agency GIS dataset, and it is likely the abstraction licence has lapsed or been surrendered. In any case, this abstraction draws water from the Chalk at depth with a thick layer of London Clay overlaying it providing protection; hence, no risks to this abstraction are likely. The eastern half of the borrow pit location is situated in a groundwater Source Protection Zone 3 (total catchment) associated with abstractions to the north and north-east. The nearest of these is 12km north-east, and no risks to these abstractions are likely from the localised effect of the proposed borrow pit.
- 6.4.29 Based on current information regarding groundwater, any dewatering in the borrow pit excavation area would be undertaken and groundwater treated prior to discharge to surface water bodies or back to groundwater through groundwater recharge arrangement. Environmental permits would be sought from the Environment Agency, separate to and outside of the DCO application, before this work commences.
- 6.4.30 Buildings could be at risk of potential differential settlement effects associated with a reduction in groundwater levels. This could include the buildings located within 300m of the borrow pit. For these receptors, a detailed settlement risk assessment based on the detailed design and supplementary ground investigation would be undertaken. Should buildings be confirmed to be at risk of differential settlement, additional mitigation measures would be required such as condition surveys and asset protection measures. This is secured in the REAC, within the first iteration of the EMP [TR010060/APP/6.5].

Palaeolithic archaeology

- 6.4.31 Initial investigation work has indicated the potential presence of palaeolithic archaeology in Borrow Pit J. Further investigation work to establish the extent of impacts would be undertaken in consultation with the cultural heritage stakeholders. If this highlights a significant impact to a cultural heritage asset, then mitigation measures would be implemented in accordance with Appendix 7.10: Archaeological Mitigation Strategy, of the Environmental Statement [TR010060/APP/6.3]. If the mitigation measure requires preservation of assets *in situ*, then the borrow pit may be modified to include a deepened section with a smaller footprint in order to avoid the area of palaeolithic interest. This would not exceed the assessed worst-case depth of 7m.

Planning applications and consented proposed schemes

- 6.4.32 There are no planning applications or consented schemes within the proposed borrow pit location.

Existing utilities

- 6.4.33 No buried or overhead utilities have been identified within the footprint of this proposed borrow pit location based on a desk-based study of existing services from statutory undertakers.
- 6.4.34 There is a set of 11kV overhead cables that run along the south-western edge of the borrow pit, approximately 10m from the working area, as well as two buried water mains that run along the north-eastern edge at distances of 10m and 120m from the borrow pit location. These are not shown to cross the working area of the borrow pit. An exclusion zone would be applied to the cables and water mains. This would be secured through protective provisions for the benefit of the affected statutory undertakers. No excavation would be permitted within the exclusion zone.

7 Conclusion

- 7.1.1 A combination of design constraints has resulted in a deficit of general earthworks fill for the proposed scheme.
- 7.1.2 Potential borrow pit locations have been established through a process of assessment, which reduced 18 possible locations down to four. This was achieved with a combination of desk-based, high-level assessment, further informed by preliminary ground investigations and scheme design development.
- 7.1.3 The four proposed scheme borrow pits are targeted at providing a combination of:
- earthworks material and engineering fill close to the main earthworks deficit areas
 - other granular construction materials for the proposed scheme's needs
 - reception areas for material deemed unsuitable for engineering purposes
 - a reduction in HGV traffic associated with earthworks material supply on public roads (import from external sources)
- 7.1.4 The following four borrow pits have been identified for the proposed scheme:
- Borrow Pit E (located near new junction 21)
 - Borrow Pit F (located near new junction 21)
 - Borrow Pit I (located between new junction 22 and existing junction 23)
 - Borrow Pit J (located near new junction 24)
- 7.1.5 These were chosen primarily because they contain material suitable to the requirements of the proposed scheme and their location in relation to the required earthworks fill areas.
- 7.1.6 The environmental impacts of the borrow pits are similar across all of the proposed options and are not considered to be a determining factor in identifying the preferred borrow pit locations.
- 7.1.7 Potential impacts and mitigation for the borrow pits are discussed further in the Environmental Statement [TR010060/APP/6.1].
- 7.1.8 The potential presence of palaeolithic archaeology within the borrow pits has been assessed in the Environmental Statement [TR010060/APP/6.1]. This has assumed, as a worst case, that deeper excavations which require groundwater management may need to be implemented within a smaller footprint in order to avoid impacts on palaeolithic archaeology. The depth and footprint of the borrow pits will be established as part of the detailed design, having regard to the need to minimise potential impacts of the borrow pits on palaeolithic archaeology.

Acronyms

Abbreviation	Term
bgl	Below ground level
BP	Borrow pit
DCO	Development Consent Order
EMP	Environmental Management Plan
GEML	Great Eastern Main Line
GWDTE	Groundwater dependent terrestrial ecosystem
HGV	Heavy goods vehicles
LGA	Licensed Groundwater Abstraction
PGA	Private Groundwater Abstraction
PRoW	Public right of way
REAC	Register of Environmental Actions and Commitments
SPZ	Source Protection Zone

Glossary

Term	Definition
Aggregate	An umbrella term for bulk raw particulate materials used in infrastructure construction
Alignment	The horizontal (lateral) or vertical (height) position of a road. It can be defined by a series of horizontal tangents and curves or vertical crest and sag curves, and the gradients connecting them.
Baseline	In EIA, 'baseline conditions' are the environmental conditions in existence before the occurrence of an impact from a development, i.e. they are the existing conditions that would be affected.
Below ground level (bgl)	A term typically accompanied by a depth in metres to denote a point that occurs beneath the surface of the ground.
Borehole	A hole bored into the ground, usually as part of investigations, typically to test the depth and quality of soil, rock and groundwater. A borehole can also be used to dewater the ground.
Borrow pit	A temporary mineral working to supply material for a specific construction project
Bridleway	A route along which the general public has rights to travel on foot or horseback. Cyclists may use a bridleway but are obliged to give way to other users on foot or horseback.
Bund	An embankment which acts as a visual or noise screen or acts as a barrier to control the spillage of fluids.
Class 1 material	General granular fill material defined and tested in accordance with BS 1377: Part 2
Class 2 material	General cohesive fill material defined and tested in accordance with BS 1377: Part 2
Class 4 material	Landscape fill material defined and tested in accordance with BS 1377: Part 2
Class 5 material	Topsoil defined and tested in accordance with BS 1377: Part 2
Class 6 material	Selected granular fill material defined and tested in accordance with BS 1377: Part 2
Cohesive fill materials	Fine grained and often with high water content such as clays and silts.
Compulsory acquisition	The compulsory acquisition of land or buildings for public interest purposes.
Construction	Activity on and/or offsite required to implement the proposed scheme. The construction phase is considered to commence with the first activity on site (e.g., creation of site access), and ends with demobilisation.

Term	Definition
Construction compound	A compound used during construction for the storage of material, assembly of components or for other construction related activities.
Construction Traffic Management Plan	A plan setting out the strategy and measures to be adopted with respect to highway and transportation issues for the proposed scheme. The Construction Traffic Management Plan supports the DCO application and would be embedded within the eventual construction contractor documentation and will form an overarching and comprehensive management procedure for the contractor to adhere to.
Development	Any proposal that results in a change to the land use, landscape and/or visual environment.
Development Consent Order (DCO)	Introduced by the Planning Act in 2008, a DCO is the means of obtaining permission for developments categorised as Nationally Significant Infrastructure Projects (NSIPs).
Environment Agency	Established under the Environment Act 1995, it is a non-departmental public body of Defra. The Environment Agency is the leading public body for protecting and improving the environment in England and Wales. It is responsible for wide-ranging matters, including the management of all forms of flood risk, water resources, water quality, waste regulation, pollution control, inland fisheries, recreation, conservation and navigation of inland waterways.
Environmental Impact Assessment (EIA)	A process by which information about environmental effects of a proposed development is collected, assessed and used to inform decision making. For certain projects, EIA is a statutory requirement.
Environmental Statement	A document produced in accordance with the EIA Directive, as transposed into UK law by the EIA Regulations, to report the results of an EIA.
Grade separation	Grade separation is a method of aligning a junction of two or more surface transport axes at different heights (i.e., grades) so that they will not disrupt the traffic flow on other transit routes when they cross each other.
Granular fill materials	Clean mixture of crushed stone or crushed or uncrushed gravel.
Ground investigation	Ground investigations are a means of determining the condition of the ground, ideally before beginning construction works.
Groundwater	Water below ground level.
Groundwater dependent terrestrial ecosystem (GWDTE)	Groundwater dependent terrestrial ecosystems are wetlands which critically depend on groundwater flows and chemistries.
Haul road	Temporary routes which will be used by construction vehicles.
Heavy goods vehicle (HGV)	A commercial carrier vehicle with a gross vehicle weight of more than 3.5 tonnes.

Term	Definition
Land-take	The temporary acquisition or permanent loss of land as a result of the construction and/or operation of the proposed scheme.
Mineral safeguarding area (MSA)	An area designated by a mineral planning authority which covers known deposits of minerals which are desired to be kept safeguarded from unnecessary sterilisation by non-mineral development.
National Cycle Network	A series of traffic-free paths and quiet, on-road cycling and walking routes that connect to every major town and city. These routes are promoted for both recreational and active travel purposes.
National Highways	National Highways is the public body that operates, maintains and improves England's motorways and major A-roads.
Operation	Describes the operational phase of a completed development and is considered to commence at the end of the construction phase, after demobilisation.
Order Limits	The Order Limits are the spatial boundaries of the proposed scheme indicated on the Plans by a red line. This is the Limit of Land to be Acquired or Used by the proposed scheme. This is the area in which the DCO would apply.
Planning Act 2008	The primary legislation that establishes the legal framework for applying for, examining and determining Development Consent Order applications for Nationally Significant Infrastructure Projects.
Plant	The machinery or infrastructure used to construct or support the operation of a given development or facility.
Principal Contractor	Contractor appointed to coordinate the construction phase of a project where it involves more than one contractor.
Public right of way (PRoW)	A right to cross land owned by another person is known as a 'right of way'. If this is a right exercisable by the public at large, it is a 'public right of way'.
Screening	Creating a barrier to reduce visual impacts
Source Protection Zone (SPZ)	Zones around groundwater sources used for potable supply or food processing, including wells, boreholes and springs, which show the level of risk to the source from contamination.
Trial hole	A trial hole or pit (or test pit) is an open cut excavation of ground in order to study or sample the composition and structure of the subsurface, usually dug during a site investigation, a soil survey or a geological survey. It is also used to identify and locate existing underground services.

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Appendix A Initial borrow pit sites for assessment

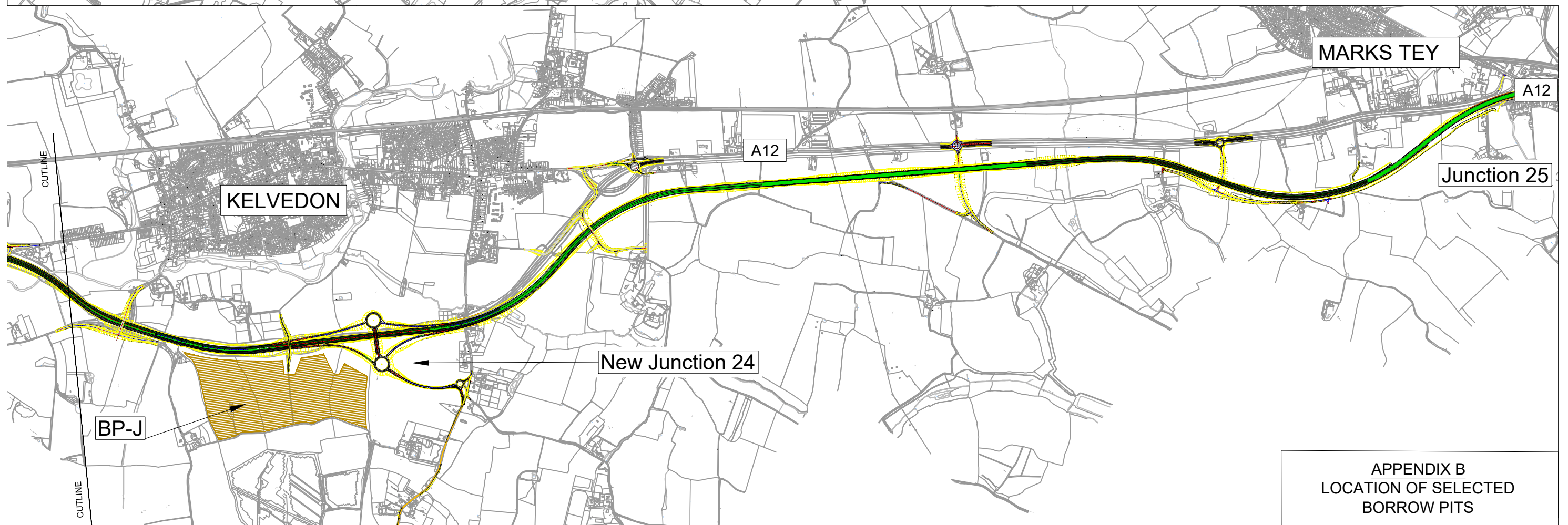
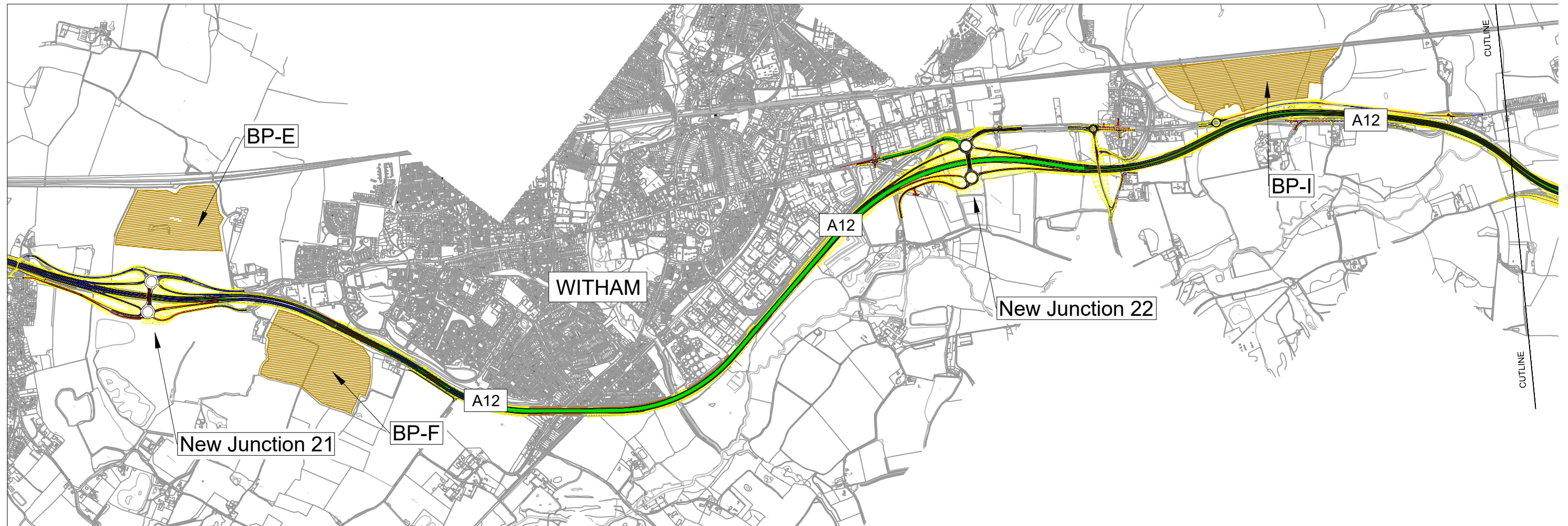


APPENDIX A
Borrow Pit Sites Considered for Assessment

KEY:

- POTENTIAL AND PRELIMINARY BORROW PITS
- SELECTED FINAL BORROW PITS

Appendix B Location of selected borrow pits



APPENDIX B
LOCATION OF SELECTED
BORROW PITS

Appendix C **Proposed scheme fill deficit areas**

