A12 Chelmsford to A120 widening scheme
TR010060

6.3 ENVIRONMENTAL STATEMENT

APPENDIX 11.1 MINERAL RESOURCE ASSESSMENT

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ENVIRONMENTAL STATEMENT APPENDIX 11.1 MINERAL RESOURCE ASSESSMENT

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ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING AND MINERAL PROCESSING
MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

JACOBS UK LIMITED

A12 CHELMSFORD TO A120 WIDENING SCHEME

MINERAL RESOURCE ASSESSMENT

MAY 2022

wardell armstrong

Wardell Armstrong
Tudor House, 16 Cathedral Road, Cardiff, CF11 9LJ, United Kingdom
Telephone: +44 (0)29 2072 9191 www.wardell-armstrong.com

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JACOBS UK LIMITED

A12 CHELMSFORD TO A120 WIDENING SCHEME

MINERAL RESOURCE ASSESSMENT

MAY 2022

PREPARED AND APPROVED BY:

NEIL HUGHES Technical Director,

Chartered Mineral Surveyor
and Registered Valuer

[redacted]

Wardell Armstrong is the trading name of Wardell Armstrong LLP, Registered in England No. OC307138.

Registered office: Sir Henry Doulton House, Forge Lane, Etruria, Stoke-on-Trent, ST1 5BD, United Kingdom

UK Offices: Stoke-on-Trent, Birmingham, Bolton, Bristol, Bury St Edmunds, Cardiff, Carlisle, Edinburgh, Glasgow, Leeds, London, Newcastle upon Tyne and Truro. International Offices: Almaty and Moscow

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EXECUTIVE SUMMARY

The proposed scheme between junctions 19 (Boreham interchange) and 25 (Marks Tey interchange) is proposed to improve safety, solve strategic traffic problems arising from inadequate and varying route standards, and reduce congestion and delay, which will collectively increase resilience along this key part of the strategic road network (SRN).

The Applicant is seeking powers to widen the existing A12 to three lanes (where it is not already three lanes) between junction 19 and junction 25. The proposed works extend for a total of 15 miles (24km).

The proposed scheme also includes safety-related improvements, including closing off existing private and local direct accesses onto the main carriageway, and alterations and improvements to existing non-vehicular routes along the A12 for walkers, cyclists and horse riders (WCH).

Major connecting roads include the A130, which joins the A12 at junction 19, and the A120, which joins the A12 at junction 25. The B1137 links Boreham to junction 19 and Hatfield Peverel, and the B1018 and the B1019 link Maldon to Witham and Hatfield Peverel respectively. The B1023 (Inworth Road) links Kelvedon to Tiptree, and Braxted Park Road connects Tiptree to Rivenhall End. These are the main local roads that connect directly to the A12 and therefore will be subject to some associated development to integrate the proposed scheme with the local traffic network.

The proposed scheme will also require the diversion and alteration of utilities, including apparatus for electricity, communications, water and gas. One of the high-pressure gas main diversions has the potential to be a Nationally Strategic Infrastructure Project (NSIP) in its own right under section 20 of the Planning Act 2008.

A significant proportion of the Order Limits for the proposed scheme is located within land which is designated as a Mineral Safeguarded Area for sand and gravel and to a lesser extent the safeguarded area for brick clay. Therefore, the proposed scheme is subject to Policy S8 of the Minerals Local Plan (MLP) and a Mineral Resource Assessment (MRA) is required as part of the Development Consent Order (DCO) application to establish the viability of the prior extraction of mineral such that the resource is not sterilised where this can be avoided.

Underlying geology

Published geological plans for the area within the Order Limits show that the site is underlain by safeguarded sand and gravel and brick clay resources.

The ground investigations (GI) have confirmed the lateral extent and variability in the thickness of the overburden and safeguarded mineral resources. Furthermore, the GI has also identified zones within the safeguarded areas where mineral resources are absent. The variation of the mineral and overburden thicknesses impacts upon the working ratio which, in certain places could make mineral extraction potentially uneconomically workable.

Mineral safeguarding planning policy

The National Planning Policy Framework (NPPF) facilitates the sustainable use of minerals, by safeguarding mineral resources by defining mineral safeguarding areas (MSAs); and adopting appropriate policies so that known locations of specific minerals resources of local and national importance are not sterilised by non-mineral development where this should be avoided. However, this policy does not create a presumption that the resources defined would be worked.

The National Networks National Policy Statement (NNNPS) sets out the Government's policies to deliver the development of Nationally Significant Infrastructure Projects (NSIP) on the national road and rail networks in England. The Secretary of State uses the NNNPS as the primary basis for making decisions on DCO applications. The relevant policies from the NNNPS are Paragraphs 5.169 (which requires applicants should safeguard any mineral resources on the proposed site as far as possible) and Paragraph 5.182 where a proposed development has an impact on a MSA, the applicant will need to put forward appropriate mitigation measures to safeguard mineral resources.

Policy S8 (Safeguarding mineral resources and mineral reserves) of the adopted Essex Minerals Local Plan (MLP) 2014 outlines that, by applying MSAs and/or Minerals Consultation Areas (MCA), the Mineral Planning Authority will safeguard mineral resources of national and local importance from surface development that would sterilise a significant economic resource or prejudice the effective working of a permitted mineral reserve, preferred or reserved site allocation within the MLP. There are three permitted mineral operations within close proximity to the proposed scheme, namely Bulls Lodge Quarry, Colemans Farm Quarry and Marks Tey brick clay quarry.

If, in the opinion of the Local Planning Authority, surface development should be permitted, consideration shall be given to the prior extraction of existing minerals. MSAs are designated for mineral deposits of sand and gravel, as defined on the Policies Map.

Paragraph 210(d) of the NPPF applies two tests as to whether prior extraction is appropriate; whether it is 'practical' and 'environmentally feasible' to extract the mineral. The practicality

of prior extraction should be considered in the context of the primary development (i.e. the proposed scheme), rather than as a standalone commercially-led extraction activity. The principle of prior extraction has been considered as part of this MRA.

Mineral resource assessment

The MRA has assessed the safeguarded sand and gravel and brick clay resources immediately underlying the permanent land take of the proposed scheme. Nonetheless, it is important to acknowledge that the existing A12 already extends over a significant MSA for sand and gravel and brick clay.

Sand and gravel:

The total safeguarded area for sand and gravel is 130,387ha. The area of safeguarded sand and gravel within the permanent land take of the proposed scheme (excluding the National Highways owned land) is 413ha or 0.32% of the total safeguarded area.

The MRA acknowledges that the proposed scheme potentially sterilises 265,000 tonnes proven sand and gravel reserves to the west of the consented extraction area at Colemans Farm Quarry within Design Section 2. It is further acknowledged that a planning application is currently being determined to permit the extraction of these reserves (within Phases 5-7) prior to the commencement of construction of the proposed scheme. For the purpose of this MRA, these proven reserves are included in the calculation of net sterilisation of sand and gravel and represent a 'worst case scenario'.

The gross tonnage of safeguarded sand and gravel resources situated beneath the permanent land take is approximately 16.805 million tonnes (Mt). However, 6.684Mt lie beneath the existing alignment of the A12. Hence, the net quantity of sand and gravel sterilised by the proposed scheme amounts to 10.121Mt.

Greater Essex Local Aggregate Assessment 2021 (reflecting the position at the end of 2020) reported permitted sand and gravel reserves to be 33.59 Mt, which based on the 10 year sales gives a landbank of 10.3 years and exceeds the seven year landbank requirement required by the NPPF (paragraph 213, f). As at 31st December 2021, there were four pending planning permissions across Greater Essex which if approved would add a further 9.5Mt of sand and gravel further increasing the landbank.
It is not considered that the proposed scheme would significantly affect mineral/aggregate reserves, due to the sufficient supply.

Brick clay:

The gross tonnage of brick clay resources beneath the permanent land take is 0.822Mt. The existing A12 already sterilises 1.027Mt. The proposed scheme effectively sterilises 0.401Mt.

The total safeguarded area for brick clay is area amounts to 197ha. The area of safeguarded brick clay which intersects the permanent land take of the proposed scheme (excluding the National Highways owned land) is 1.97ha or 1% of the total safeguarded area.

Practicality of prior extraction

The practicality of prior extraction should be assessed as a conservation measure required due to the proposed implementation of non-mineral development (the proposed scheme) that would sterilise a finite resource.

In addition to the removal of the mineral resource, prior extraction would also require:

- The infilling of the mineral excavation void with material having the necessary engineering properties, either general fill, inert waste or processed aggregate.
- Compaction of infill material.

The MRA contains a financial appraisal which confirms significant additional project costs of £75.76M (including the inert waste required to infill Colemans Farm Quarry, phases 5-7) and delay to the delivery of the proposed scheme well beyond 2027, when factoring in the excavation and handling of the minerals. Whilst profitability is not an explicit test set by the NPPF (although this may impact on practicality) the above monetary figure highlights that it would not be economically viable for the prior extraction of these mineral resources.

The proposed scheme, once operational, would open up economic growth and enable housing development. Given the context of the proposed scheme, the benefits it would provide outweigh the impact it would have on mineral sterilisation.

Borrow pits to provide material for the proposed scheme

There is a shortfall of c. 0.6M cubic metres of general fill materials for use on the proposed scheme (granular and cohesive fill materials). This deficit would be met by the four proposed scheme borrow pits.

Environmental feasibility

If prior extraction were to be carried out, it would be necessary to employ a large compliment of plant and equipment to excavate the mineral resource, which would result in adverse environmental impacts in terms of increased noise, dust emissions, visual impact and potential impact to groundwater.

Prior extraction of these minerals would also require significant heavy goods vehicle (HGV) movements to transport resource off-site, and to import a large volume of inert waste to infill the voids arising from extraction.

Whilst it is acknowledged that the proposed scheme would sterilise minerals of local and economic importance, prior extraction has been considered, as required by Policy S8 of the adopted Essex MLP. For the reasons set out above, due to the proposed scheme's role in enabling future housing development and alleviating congestion, it has not been found for prior extraction to be practical or environmentally feasible. As such, the need for this infrastructure project outweighs the safeguarding of the identified sands and gravels and brick clay.

Conclusion

Whilst the safeguarded sand and gravel and brick clay resources are of national and local importance, the conclusion of the MRA is that the principle of prior extraction is neither practical nor environmentally feasible. As such, the need for this infrastructure project outweighs the safeguarding of the sand and gravels and brick clay.

Given the context of the proposed scheme in delivering the necessary infrastructure to enable future housing development, relieve traffic congestion on the existing A12 corridor and providing a strategic link for Essex and across the wider east and southeast of England, the benefits it would provide outweigh the impact it would have on mineral sterilisation.

1 INTRODUCTION

1.1.1 Wardell Armstrong LLP has been instructed by Jacobs UK Limited to produce a Mineral Resource Assessment (MRA) Report as part of the Development Consent Order (DCO) application for the proposed A12 Chelmsford to A120 widening scheme road development (the proposed scheme).

2 THE PROPOSED SCHEME

2.1 Proposed scheme overview

2.1.1 The proposed scheme between junctions 19 (Boreham interchange) and 25 (Marks Tey interchange) is proposed to improve safety, solve strategic traffic problems arising from inadequate and varying route standards, and reduce congestion and delay, which will collectively increase resilience along this key part of the SRN.

2.1.2 The Applicant is seeking powers to widen the existing A12 to three lanes (where it is not already three lanes) between junction 19 and junction 25. The proposed works extend for a total of 15 miles (24km).

2.1.3 The proposed scheme also includes safety-related improvements, including closing off existing private and local direct accesses onto the main carriageway, and alterations and improvements to existing non-vehicular routes along the A12 for WCH.

2.1.4 Major connecting roads include the A130, which joins the A12 at junction 19, and the A120, which joins the A12 at junction 25. The B1137 links Boreham to junction 19 and Hatfield Peverel, and the B1018 and the B1019 link Maldon to Witham and Hatfield Peverel respectively. The B1023 (Inworth Road) links Kelvedon to Tiptree, and Braxted Park Road connects Tiptree to Rivenhall End. These are the main local roads that connect directly to the A12 and therefore will be subject to some associated development to integrate the proposed scheme with the local traffic network.

2.1.5 The proposed scheme will also require the diversion and alteration of utilities, including apparatus for electricity, communications, water and gas. One of the high-pressure gas main diversions has the potential to be a NSIP in its own right under section 20 of the Planning Act 2008.

2.1.6 A detailed description of the proposed scheme can be found in Chapter 2: The proposed scheme, of the ES [TR010060/APP/6.1], and the location and extents of the proposed scheme are illustrated on Figure 1.1 of the Environmental Statement [TR010060/APP/6.2].

2.2 Application area in relation to safeguarded sites(s)

2.2.1 The geographic extent of the proposed scheme which is defined by the Order Limits is approximately 863ha, with permanent acquisition of land estimated at approximately 657ha.

2.2.2 These figures are consistent with the Order Limits issued for the proposed scheme on 9 January 2022. Both the Order Limits and permanent acquisition areas include land that is already within the existing National Highways ownership boundary. The calculations and assessments provided in this MRA reflect the 9 January Order Limits and as there has subsequently been a net reduction in the Order Limits, therefore this MRA should be considered worst case.

2.2.3 The total Mineral Safeguarding Area (MSA) for sand and gravel within Greater Essex is 130,387ha and 197ha for brick clay. The Order Limits of the proposed scheme extends over an area of 863ha, of which approximately 703.2ha (0.5%) lies within the safeguarded sand and gravel MSA and 6.74ha (3.4%) within the brick clay MSA respectively.

2.3 Construction programme and phasing

2.3.1 Construction is currently scheduled to start on site in Q1 2024. The proposed scheme would take approximately four years to construct, with the proposed scheme open to traffic in Q4 2027. Further details on construction programme and phasing are provided in Chapter 2: The proposed scheme, of the Environmental Statement [TR010060/APP/6.1].

2.4 Material extraction

2.4.1 The preliminary design for the proposed scheme aims to address several constraints including: highway geometry; an even balance of material excavated versus material required to fill the new alignment; and 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 alignment with a deficit of overall earthworks material. This deficit would be met by the proposed scheme borrow pits. The incorporation of borrow pits would result in the proposed scheme being largely self-contained in terms of the sourcing of materials for earthworks. The immediate benefits of using local borrow pits are:

- A source of suitable construction material close to the areas of deficit, making haul distance more efficient.
- Reducing heavy goods vehicles (HGV) movements associated with the import of acceptable fill material from areas remote from the proposed scheme to meet the shortfall.
- Construction haul traffic would be reduced on the public road network bringing reductions in fuel use and associated vehicle emissions.
- Providing a local area for material considered unsuitable for engineering purposes to be deposited, reducing the requirement for export out of the scheme boundary.

2.4.3 Volume modelling of the preliminary design showed a shortfall of approximately 600,000m^3 of general fill materials for use on the proposed scheme (granular and cohesive fill materials), i.e. after the consideration of the earthworks balance information provided in **Table 1**.

2.4.4 The key areas of deficit on the proposed scheme are at the new junction 21 (Witham South Interchange) (approximately 200,000m^3 deficit of general fill material) and new junction 22 (Colemans Interchange) (approximately 400,000m^3 deficit of general fill material). The deficit material is primarily general earthworks embankment fill required for the construction of the grade separated junction design.

TABLE 1:
EARTHWORKS MODELLING

Excavated material	Source		Description
	Engineering earthworks (m^3)	Borrow pits (m^3)	
Acceptable engineering fill required to construct the proposed scheme.	1,900,000	N/A	Acceptable fill required to be generated from the proposed scheme earthworks (cut areas) and borrow pits.
Cut material generated from proposed scheme acceptable for use as engineering fill.	1,300,000	600,000	Site won material required to meet engineering fill requirements.

TABLE 1: EARTHWORKS MODELLING			
Excavated material	**Source**		**Description**
	Engineering earthworks (m^3)	**Borrow pits (m^3)**	
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.
An additional 950,000m^3 of fill material may be required to backfill Colemans Farm Quarry in the event that quarry operators cannot perform this task in advance of construction works in this area. In this event the intention would be to import 650,000 m^3 of inert material from off-site and source 300,000m^3 of non-granular fill material from borrow pit J (as discussed below). It should be noted that this approach would not increase the area required for the borrow pit, because the supply would come from the overburden material that would have been replaced in the borrow pit on completion. This would therefore have a bearing on the finished landscaping of the borrow pit. This has been assessed with the Environmental Statement [TR010060/APP/6.1]			

2.4.5 Options have been assessed for import of bulk material or the use of on-site borrow pits to source the required material. The preferred option is to use four on-site borrow pits which would reduce potential impacts associated with transport of imported fill. If required, it is envisaged that aggregate processing plant would form part of the allocated borrow pit areas.

2.4.6 The locations of the four borrow pits, which have been included within the Order Limits, are shown on Figure 2.3 [TR010060/APP/6.2] and described in Chapter 2: The proposed scheme, of the Environmental Statement [TR010060/APP/6.1] and The Borrow Pit Report [TR010060/APP/7.8]. These borrow pits are as follows:

- **Borrow Pit E**: located between the existing junction 20b and junction 21. Extracting c. 0.100M cu.m of material from the Lowestoft Formation and Head Deposits to provide Class 2 general cohesive fill for earthwork's material and engineering fill. The borrow pit is primarily intended for the northside of the new Junction 21 fill embankment and to support any minor fill requirements to the west through Hatfield Peverel and the Junction 19 improvements.

- **Borrow Pit F**: situated to the east of junction 21 on the south side of the A12 south of Witham. Extracting c. 0.100M cu.m of material from the Lowestoft Formation and Head Deposits for Class 2 general cohesive fill for earthwork's materials and engineering fill. If excavated, the Brickearth would potentially be used for Class 4 landscape fill. 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.
- **Borrow Pit I**: to the east of Rivenhall End and west of junction 23 (Kelvedon). Extracting c. 0.400M cu.m of general fill materials. The intention is that the Lowestoft Formation and Head Deposits would be used as a Class 2 general cohesive fill for earthwork's material and engineering fill. If encountered, Glaciofluvial and River Terrace Deposits would be used as a Class 1 or 6 general or selected granular fill. It is also likely that the London clay would be recovered for use as a Class 2 general cohesive fill. The borrow pit is primarily intended for the new Junction 22 fill embankments and mainline embankment stretching from that Junction to Crane's bridge (existing Junction 23).
- **Borrow Pit J**: on the southbound side of the A12 with Inworth Road located immediately to the east. Extracting c. 0.3M cu.m of granular material for use across the proposed scheme as selected fill material and other construction aggregates. The intention is that the River Terrace and Glaciofluvial Deposits would be used as a Class 1 general granular fill for earthwork's material, engineering fill or preferably Class 6 granular fill. Depending on the quality of the granular material and effort to excavate it, processing and treatment may be used to gain concrete and drainage aggregates for use on the proposed scheme. The borrow pit may also need to be used for the extraction of Class 2 fill, to backfill Colemans Quarry. The anticipated volume of Class 2 fill required for the backfill of Colemans Quarry, would be 0.3M cu.m, bringing the total anticipated volume required from borrow Pit J up to 0.6M cu.m.

2.4.7 The largest quantity of materials to be used in construction of the proposed scheme would likely be earthworks materials, aggregates for road foundation materials, asphalt aggregates and drainage/duct aggregates. It is assumed at this stage that all these materials, except for the site won material from earthworks/borrow pits, would be imported to site as they are unlikely to be available in the borrow pits.

2.4.8 Other sources of earthworks fill material investigated local to the proposed scheme include rail heads at either end of the proposed scheme in Chelmsford and Marks Tey. These rail heads are operated by national aggregate suppliers providing material for their business purposes for East Anglia and East London. These Suppliers have been contacted for the potential provision of material for the proposed scheme.

2.4.9 Any material imported via railheads would generally be primary aggregates owing to the nature of the businesses operating the railheads. It is unlikely that this type of material would be economically or environmentally viable as general fill for the proposed scheme because of the cost, traffic and carbon impact of doing so.

2.4.10 Whilst local sources of suitable materials may be available at the time of construction, the quantities, quality and locations are currently unknown, and any potential sources would be subject to many factors affecting availability. The high rate of import would also be difficult for local sources to achieve resulting in longer road hauls many of which may need to be on local road networks.

2.4.11 It is unlikely that this source of material would be economically or environmentally viable as general fill for the proposed scheme because of the cost, traffic and carbon impact of doing so couple with the programme risk.

3 MINERAL PLANNING POLICY

3.1 Planning policy context

3.1.1 The proposed scheme falls within the administrative boundaries of Braintree District Council, Chelmsford City Council, Colchester Borough Council and Maldon District Council (as the Local Planning Authorities) and Essex County Council (ECC) (as the Minerals and Waste Planning Authority).

3.2 National planning policy

3.2.1 The National Networks National Policy Statement (NNNPS) sets out the Government's policies to deliver the development of Nationally Significant Infrastructure Projects (NSIP) on the national road and rail networks in England. The Secretary of State uses the NNNPS as the primary basis for making decisions on DCO applications.

3.2.2 Key policy from the NNNPS relevant to this scope of work are set out below:

- Paragraph 5.169 of the NNNPS states that applicants should safeguard any mineral resources on the proposed site as far as possible.
- Paragraph 5.182 of the NNNPS states that where a proposed development has an impact on a MSA, the Secretary of State should ensure that the applicant has put forward appropriate mitigation measures to safeguard mineral resources.

Local planning policy – Essex Minerals Local Plan (MLP) 2014

3.2.3 The Essex MLP, adopted in 2014 aims to safeguard mineral resources of national and local importance from surface development that would otherwise sterilise a significant economic resource or prejudice the effective working of a permitted mineral reserve, Preferred or Reserve Site allocation within the MLP.

3.2.4 The MLP proposals map illustrates MSAs for deposits of sand and gravel, silica sand, chalk, brickearth and brick clay. Mineral Consultation Areas (MCAs) are drawn up to an area of 250 metres from each safeguarded permitted minerals development and Preferred and Reserve Site allocation as shown on the Policies Map.

3.2.5 Policy S8 (Safeguarding mineral resources and mineral reserves) requires that '*…a non-mineral proposal located within a MSA which exceeds defined thresholds must be supported by a Minerals Resource Assessment to establish the existence, or otherwise, of a mineral resource capable of having economic importance*'.

3.2.6 This will ascertain whether there is an opportunity for the prior extraction of that mineral to avoid the sterilisation of the resource, as required by the National Planning Policy Framework (NPPF) (Para 204). Policy S8 also states that *'…Proposals which would unnecessarily sterilise mineral resources or conflict with the effective workings of permitted minerals development or Preferred Mineral site allocation shall be opposed*.'

3.2.7 Policy S8 also requires that any proposed non-mineral development located within an MCA must be supported by a Minerals Infrastructure Assessment (MIA) to ensure that existing and allocated mineral sites and infrastructure are protected from inappropriate neighbouring developments that may prejudice their continuing efficient operation. Policy S8 of the MLP defines MCAs as extending up to 250m from the boundary of a minerals infrastructure site or allocation for the same.

3.2.8 The Order Limits area passes through a number of MCA. A MIA has been prepared as part of the DCO application to assess and reduce any adverse impact of the safeguarded mineral infrastructure / allocations pertaining to the MCA.

3.2.9 The adopted Mineral Local Plan is currently under review in accordance with Regulation 18 of the Town and Country Planning (Local Planning) (England) Regulations 2012 (as amended). Policy S6 – Provision for sand and gravel extraction forms part the review and the mineral planning authority is also engaging in a call for sites exercise for sand and gravel extraction to maintain a sufficient supply.

3.3 Safeguarded mineral resources

3.3.1 The safeguarded mineral resources within the MLP are based upon the 'Mineral Resource Information for Development Plans: Essex (comprising Essex, Southend-on-Sea, Thurrock and the London Boroughs of Barking and Dagenham, Havering, Redbridge and Waltham Forest)', a British Geological Survey (BGS) commissioned report (Ref. CR/02/127N) and accompanying map published in 2002.

3.3.2 The report is one of a series prepared by the BGS for various administrative areas in England for the Office of the Deputy Prime Minister's research project Mineral Resource Information in Support of National, Regional and Local Planning. The objective of the report being to protect mineral resources from sterilisation. The mineral resources covered by the Essex Report include sand and gravel, clay, hydrocarbons, silica sand, building stone and chalk.

3.3.3 The extent of safeguarded mineral resources illustrated on the map are defined by the overburden to mineral ratio which delineate areas within which potentially workable mineral may occur, but their economic potential can only be determined by detailed evaluation programme.

Sand and gravel resources

3.3.4 Within Essex, the safeguarded sand and gravel resources comprise:

- Head gravels
- Glaciofluvial sand and gravel
- Glacial sand and gravel
- River Terrace Deposits

Brick clay resources

3.3.5 The material is used in the manufacture of bricks and to lesser extent roof tiles and clay pipes. It can also be used as a construction fill and for lining and sealing landfill sites.

3.3.6 Brick clay is extracted at two sites in the County, namely Bulmer Brickfield and Marks Tey. It is important that an adequate and steady supply of brick making clay remains available to support development in the County and preserve its heritage assets. The NPPF requires the maintenance of a landbank of at least 25 years at both sites. There are sufficient reserves at Marks Tey to meet this requirement.

3.3.7 The brick manufacturing site at Mark's Tey uses Quaternary age interglacial clay blended with clays imported from outside the county to produce facing bricks.

3.4 Potentially affected mineral resources

3.4.1 The Order Limits are located within land which is designated as a MSA and therefore the proposed scheme is subject to Policy S8 of the MLP.

3.4.2 A significant proportion of the study area lies within a MSA for sand and gravel, with the total site area exceeding the 5ha threshold for this mineral. Part of the study area also falls within a MSA for brick clay and exceeds the threshold of one dwelling for this mineral. These thresholds are defined in Policy S8 of the MLP.

3.4.3 A MRA has been prepared as part of the DCO application to establish the viability of the prior extraction of mineral such that the resource is not sterilised where this can be avoided.

3.4.4 A list of relevant mineral designations and specific facilities which would potentially be affected by the proposed scheme are listed in **Table 2** and also illustrated on Figure 11.1 of the Environmental Statement [TR010060/APP/6.2].

TABLE 2: POTENTIALLY AFFECTED MINERALS INFRASTRUCTURE AND DESIGNATIONS	
Site type	Site name
MSAs	Sand and gravel
	Brick clay
MLP Safeguarded Sites	Bulls Lodge Quarry
	Land at Colemans Farm Quarry
	Bulls Lodge Quarry Coated Stone Plant
	Marks Tey Rail Siding

3.5 Mineral resource assessment

3.5.1 This MRA has been produced having regard to Minerals Safeguarding Practice Guidance V1.4 (April 2019) issued by the Mineral Products Association and the Planning Officers Society.

3.5.2 This MRA not only provides practical guidance to Local Planning Authorities and 'non-mineral' developers affected by Mineral Safeguarding, it also includes guidance on the scope and format of MRAs.

3.6 Mineral infrastructure assessment

3.6.1 A separate MIA has been prepared as part of this DCO application. This is provided in Appendix 11.2 of the Environmental Statement [TR010060/APP/6.3].

4 NATURE OF THE EXISTING MINERAL RESOURCE

4.1 Geological appraisal of the locality

4.1.1 The geology of the study area is shown on the Geological Survey of Great Britain (England and Wales), Sheets:

- Sheet 241, Chelmsford, Solid and Drift Edition, 1: 50,000 series, 1975 map
- Sheet 223, Braintree, Solid and Drift Edition, 1: 50,000 series, 1982 map

4.1.2 The 1975 and 1982 geological maps present superseded drift and solid geology stratigraphic terminology. The changes in geology stratigraphic terminology are summarised in **Table 3** below. The geological memoirs are Chelmsford (1985) and Braintree (1986).

4.1.3 The general stratigraphy consists of a combination of Quaternary superficial deposits comprising all of which overlying bedrock geology of the Eocene Thames Group (London Clay Formation). The geological maps also indicate several buried (drift-filled) channels within the study area.

4.1.4 The following generic assessment of the geology of the area has been inferred from available information together with historical ground investigation (GI) factual/interpretative/design reports. This is summarised in **Table 3**.

TABLE 3:
GEOLOGICAL STRATIGRAPHY

	Sheet 241 (1975) Geological Map	**Sheet 223 (1982) Geological Map**	**BGS Geology of Britain viewer & Lexicon of Named Rock Units (Current)**	
Drift	Alluvium		Superficial	Alluvium
	River Terrace Deposits			**River Terrace Deposits (S)**
	Head			**Head Deposits (S)**
	Brickearth	N/A		**Brickearth (S)**
	Lacustrine Deposits			Interglacial Lacustrine Deposits
	Lake Deposits	N/A		Glaciolacustrine Deposits
	Boulder Clay			Lowestoft Formation
	Glacial Sand and Gravel			**Glaciofluvial Deposits (S)**
	N/A	Kesgrave Sands & Gravel		**Kesgrave Catchment Subgroup (S)**

TABLE 3: GEOLOGICAL STRATIGRAPHY				
Solid	London Clay		Bedrock	London Clay Formation
	Woolwich & Reading Beds	Lower London Tertiaries		Lambeth Group
	Thanet Beds			Thanet Formation
	Upper Chalk			Chalk
(S) Safeguarded mineral resources				

4.2 Descriptions of superficial deposits

4.2.1 The following descriptions are derived from the GI carried out to inform the ground conditions beneath the proposed scheme. The abbreviations (OB), (SMR) and (BR) indicate whether the deposit is classed as Overburden, Safeguarded Mineral Resource or Bedrock for the purpose of this MRA.

Alluvium and peat (OB)

4.2.2 Alluvial deposits typically comprising soft to firm normally consolidated, compressible silty clay, with localised depositions of silt, sand, peat, organic matter and basal gravel. The BGS Memoir describes Alluvium as soft, pale brown silty clay with traces of organic matter. Alluvium is the unconsolidated detrital material deposited by a river, stream or other body of running water as a sorted or semi-sorted sediment in the bed of the stream or on its floodplain or delta, or as a cone or fan at the base of a mountain slope.

River terrace deposits (SMR – sand and gravel)

4.2.3 The River Terrace Deposits typically comprise sand and gravel, with local lenses of silt, clay or peat. Historical exploratory holes have described this material as brown sand and gravel containing silt.

Head deposits (SMR – sand and gravel)

4.2.4 Head deposits typically comprise varying composition of gravel, sand and clay, depending on upslope source and distance from source. Head deposits may comprise of poorly sorted and poorly stratified depositions generally by solifluction, hillwash and/or soil creep and may comprise local lenses of silt, clay, peat and organic material. The BGS Memoir describes Head as being derived from different parent materials and is therefore comprised of silty sands, silty clays and chalk free orange-brown stony clay.

Brick clay (SMR)

4.2.5 Brickearth typically comprises varying compositions of silt to clay. Historical exploratory holes have described this material as soft brown silty to very silty sandy clay or firm brown clayey silt. The BGS Memoir describes Brickearth as light sandy loam.

Interglacial lacustrine deposits (OB)

4.2.6 Interglacial Lacustrine Deposits typically comprise organic-rich interbedded sand, silt, clay of glaciolacustrine origin.

Glaciolacustrine deposits (OB)

4.2.7 The Glaciolacustrine Deposits are typically described as silt and clay, laminated, commonly rich in organic matter, with locally interbedded peat, of glaciolacustrine origin. Historical exploratory holes in the area have described this material as a brown silty clay.

Lowestoft formation (OB)

4.2.8 Lowestoft Formation typically comprises chalky till, interbedded with outwash sands, gravels, silts and clays. The thickness of this material is highly variable and may be as deep as 60m within locally buried channels. Historical exploratory holes describe this unit as firm to stiff mottled pale orange to brown silty clay with chalk inclusions and occasional angular flint gravels and rounded pebbles. The BGS Memoir describes the Boulder Clay, now known as Lowestoft Formation, as grey clay with chalk inclusions.

Glaciofluvial deposits (SMR – sand and gravel)

4.2.9 Glaciofluvial Deposits are typically described as sand and gravel with local lenses of silt, clay and organic material of glaciofluvial origin. Historical exploratory holes describe this unit as orange/brown fine to coarse sand and sandy gravel.

Kesgrave catchment subgroup (SMR – sand and gravel)

4.2.10 The Kesgrave Catchment Subgroup comprises fluvial, lacustrine and organic deposits of the pre-diversionary River Thames and associated pre-glacial deposits. The Kesgrave Catchment Subgroup typically comprise fluvial gravels, with sedimentary structures such as bedding (Lacustrine silts, clays and organic peats are uncommon). The BGS Memoir has noted high proportions of flint, quartz and quartzite pebbles.

London clay formation (BR)

4.2.11 The London Clay Formation typically comprises bioturbated or poorly laminated, blue-grey or grey-brown slightly calcareous, silty clay to clayey silt, with localised silt and sandy clay. Historical exploratory holes have described London Clay Formation as firm to stiff orangish brown with some grey mottling silty clay (weathered) and stiff grey silty clay (unweathered).

5 A12 – A120 WIDENING GROUND INVESTIGATIONS

5.1 Summary

5.1.1 Geotechnical Engineering Ltd were commissioned by Costain, on behalf of the Client, National Highways, to undertake a GI to determine the ground conditions for the proposed scheme.

5.1.2 The purpose of the GI was to obtain data regarding the ground and groundwater conditions at the site, so that suitable methods of design and construction may be adopted for the proposed works.

5.1.3 Given the extent of the proposed scheme, the GI for each design section were subdivided into separate reports as summarised in **Table 4** below.

TABLE 4:
GROUND INVESTIGATIONS

DESIGN SECTION	GROUND INVESTIGATION FACTUAL REPORT
Design Section 1: (11km length) Junction 19 Boreham Interchange to Junction 21 Lynfield Motors Interchange.	EASTBOUND CARRIAGEWAY
	EASTBOUND OFFLINE
	WESTBOUND CARRIAGEWAY
	WESTBOUND OFFLINE
Design Section 2: (5.8km length) Junction 21 Lynfield Motors Interchange to Junction 23 Kelvedon South.	EASTBOUND CARRIAGEWAY
	WESTBOUND CARRIAGEWAY
	OFFLINE
Design Section 3: (10.9km length) Junction 23 Kelvedon South to Junction 25 Marks Tey.	WESTBOUND CARRIAGEWAY
	EASTBOUND CARRIAGEWAY
	OFFLINE

5.1.4 The locations of the exploratory holes used as part of this MRA is illustrated on the plans contained in **Annex A** of this MRA.

5.2 Ground investigations summary – Design Section 1

5.2.1 A summary of the borehole and window sample logs for Design Sections 1 to 3 are contained in **Annex B** of this MRA.

Eastbound carriageway

5.2.2 The fieldwork was carried out during the period 2 December 2019 to 2 July 2020.

5.2.3 Site work and in situ testing comprised 47 boreholes, 27 window samples, and 67 no. samples for Particle Size Distribution (PSD) analysis.

Eastbound offline

5.2.4 The fieldwork was carried out during the period 30 March to 11 May 2020.

5.2.5 Site work and in situ testing comprised five boreholes and 21 no. samples for PSD analysis.

Westbound carriageway

5.2.6 The fieldwork was carried out during the period 27 January to 15 July 2020.

5.2.7 Site work and in situ testing comprised 44 boreholes, three machine excavated trial pits and 54 no. samples for PSD analysis.

Westbound offline

5.2.8 The fieldwork was carried out during the period 18 March to 17 June 2020.

5.2.9 Site work and in situ testing comprised 17 dynamic sampled boreholes, one cable percussive borehole, 26 machine excavated trial pits and 73 no. samples for PSD analysis.

Ground investigations summary Design Section 1: summary of findings

Soil/made ground

5.2.10 The thickness of the soils and made ground varied from 0.05m to 3.0m (encountered in borehole BH2015). Average thickness of the soil/made ground was 0.37m.

Overburden

5.2.11 Across the Section, the GI confirmed the overburden to comprise Alluvium, Peat, Glaciolacustrine deposits and Lowestoft Formation.

5.2.12 The combined thickness of the overburden encountered during the GI varied considerably between 0m up to 16.8m (BH2025). Average thickness of overburden was 1.63m.

Mineral resources

5.2.13 Head, Glaciofluvial and River Terrace Deposits made up the safeguarded sand and gravel mineral resources. The combined thickness of these resources varied between 0m to 11.5m (BH+RC1109). Average thickness was 2.01mH.

Mineral quality

5.2.14 Bulk samples were obtained from Head, Glaciofluvial, and River Terrace Deposits and subject to laboratory testing to determine their PSD in order to confirm whether or not the mineral is of appropriate quality for use as aggregate.

5.2.15 The results of the PSD tests confirm the percentage of cobbles, gravel, sand and fines (comprising silt and clay passing through a sieve size of 63 microns). Those deposits that contain fines >15% would require processing to conform with the British Standard for use as aggregate within concrete or as engineered fill.

5.2.16 A total of 38 PSD tests were carried out on the bulk samples obtained from safeguarded sand and gravel mineral resources.

Head deposits

5.2.17 The PSD results of those sampled revealed the proportions of gravel, sand and fines were 13 – 62% gravel, 25 – 43% sand and 13 – 44% fines.

Glaciofluvial deposits

5.2.18 These proportions ranged between 1 – 100% gravel, 0 – 85% sand and 0 – 20% fines.

River terrace deposits

5.2.19 Proportions range between 46 – 85% gravel, 14 – 46% sand and 1 – 11% fines.

5.2.20 The PSD results are contained in **Annex C** of this MRA and the averages summarised in **Table 5** below.

TABLE 5:
SUMMARY OF PSD RESULTS ON SECTION 1 MINERAL RESOURCES

Resource	No. of Samples	Cobbles (%)	Gravel (%)	Sand (%)	Fines (%)
Head	2	0	38	34	28
Glaciofluvial	29	0	62	32	6
River Terrace	7	0	67	28	4

5.2.21 From the table above, it can be seen that the Head deposits would require processing to remove the fines content. However, the Glaciofluvial and River Terrace Deposits reveal an average fine content well below 15% which in theory would not require washing. These resources could produce aggregate for concrete or as engineered fill.

Overburden to mineral ratio

5.2.22 There were 205 GI points used in the assessment. Safeguarded sand and gravel mineral resources were absent in 60 of the GI locations. In those where mineral resources were present, the overburden to mineral ratio varied between 0.03 to 68:1.

Ground investigations summary – Design Section 2

Eastbound carriageway

5.2.23 The fieldwork was carried out during the period 18 May to 30 July 2020.

5.2.24 Site work and in situ testing comprised 13 boreholes, nine window samples, one machine excavated trial pit and 64 no. samples for PSD analysis.

Westbound carriageway

5.2.25 The fieldwork was carried out during the period 8 June to 3 September 2020.

5.2.26 Site work and in situ testing comprised 12 boreholes, three window samples and 36 no. samples for PSD analysis.

Offline

5.2.27 The fieldwork was carried out during the period 1 July to 14 October 2020.

5.2.28 Site work and in situ testing comprised 27 boreholes, three machine excavated trial pits and 142 no. samples for PSD analysis.

Ground investigations summary Design Section 2: summary of findings

Soil/made Ground

5.2.29 The thickness of the soils and made ground varied from 0.04m to 4.0m (encountered in borehole BH+RC2620). Average thickness of the soil/made ground was 0.39m.

Overburden

5.2.30 Across the Section, the GI confirmed the overburden to comprise Alluvium, Peat, Glaciolacustrine deposits, Interglacial lacustrine deposits and Lowestoft Formation.

5.2.31 The combined thickness of the overburden encountered during the GI varied considerably between 0m up to 7.4m (BH+RC2269). Average thickness of overburden was 1.28m.

Mineral resources

5.2.32 Head, Glaciofluvial and River Terrace Deposits made up the safeguarded sand and gravel mineral resources. The combined thickness of these resources varied between 0m to 9.90 m (BH2240). Average thickness was 4.55m.

Mineral quality

5.2.33 A total of 75 PSD tests were carried out on bulk samples obtained from safeguarded sand and gravel mineral resources.

Head deposits

5.2.34 Of those sampled, the proportions were 3 – 74% gravel, 17 – 36% sand and 1 – 80% fines.

Glaciofluvial deposits

5.2.35 These proportions ranged between 0 – 77% gravel, 3 – 78% sand and 6 – 97% fines.

River terrace deposits

5.2.36 Proportions range between 0 – 99% gravel, 1 – 95% sand and 0 – 85% fines.

5.2.37 The PSD results are contained in **Annex C** of this MRA and the averages summarised in **Table 6** below.

TABLE 6:
SUMMARY OF PSD RESULTS ON SECTION 2 MINERAL RESOURCES

Resource	No. of Samples	Cobbles (%)	Gravel (%)	Sand (%)	Fines (%)
Head	6	0	37	26	37
Glaciofluvial	5	0	35	34	31
River Terrace	64	0	40	46	14

5.2.38 From the table above, due to the variability in the composition of the head and glaciofluvial resources, these would require washing. Once the fines are removed the resources would be considered suitable for use as aggregate within concrete or as engineered fill.

Overburden to mineral ratio

5.2.39 There were 64 borehole and window sampling points used in the MRA for Section 2. Safeguarded sand and gravel mineral resources were absent in 14 of the GI locations. In those where mineral resources were present, the overburden to mineral ratio varied between 0.01 to 6.2:1.

5.3 Ground investigations summary – Design Section 3

Westbound carriageway

5.3.1 The fieldwork was carried out during the period 7 December 2020 to 15 February 2021.

5.3.2 Site work and in situ testing comprised six boreholes, two window samples, three machine excavated trial pit and 18 no. samples for PSD analysis.

Eastbound carriageway

5.3.3 The fieldwork was carried out during the period 4 to 15 January 2021.

5.3.4 Site work and in situ testing comprised seven boreholes, one window sample and nine no. samples for PSD analysis.

Offline

5.3.5 The fieldwork was carried out during the period 23 November 2020 to 19 March 2021.

5.3.6 Site work and in situ testing comprised 62 boreholes, 43 window sample boreholes, 85 excavated trial pits and 22 no. samples for PSD analysis.

Ground investigations summary Design Section 3: summary of findings

Soil/made ground

5.3.7 The thickness of the soils and made ground varied from 0.10m to 1.80m (encountered in borehole BH2015). Average thickness of the soil/made ground was 0.40m.

Overburden

5.3.8 Across the Section, the GI confirmed the overburden to comprise Alluvium, Peat, Glaciolacustrine deposits and Lowestoft Formation.

5.3.9 The combined thickness of the overburden encountered during the GI varied considerably between 0.20m up to 19.0m (BH+RC3206). Average thickness of overburden was 4.93m.

Mineral resources

5.3.10 Head, Glaciofluvial, River Terrace Deposits and Kesgrave Catchment Group made up the safeguarded sand and gravel mineral resources. The combined thickness of these resources varied between 0m to 12.0m (BH+RC3202). Average thickness was 4.52m.

Mineral quality

5.3.11 Bulk samples were obtained from Glaciofluvial, River Terrace Deposits and Kesgrave Catchment Subgroup which make up the safeguarded sand and gravel mineral resources with Section 3. A total of 60 PSD tests carried out on the bulk samples.

Glaciofluvial deposits

5.3.12 Of those sampled, the proportions were 0 – 96% gravel, 1 – 94% sand and 0 – 99% fines.

River terrace deposits

5.3.13 These proportions ranged between 2 – 29% gravel, 23 – 83% sand and 0 – 75% fines.

Kesgrave Catchment Subgroup

5.3.14 Proportions range between 0 – 85% gravel, 14 – 84% sand and 0 – 30% fines.

5.3.15 The PSD results are contained in **Annex C** of this MRA and the averages summarised in **Table 7** below.

TABLE 7:
SUMMARY OF PSD RESULTS ON SECTION 3 MINERAL RESOURCES

Resource	No. of Samples	Cobbles (%)	Gravel (%)	Sand (%)	Fines (%)
Glaciofluvial	43	0	15	60	25
River Terrace	4	0	42	47	11
Kesgrave	13	0	43	51	6

5.3.16 From the table above, due to the variability in the composition of the various resources, all would require washing to a certain degree. Once the fines are removed the resources would be considered suitable for use as aggregate within concrete or as engineered fill.

Overburden to mineral ratio

5.3.17 There were 101 borehole and window sampling points used in the MRA for Section 3. Safeguarded sand and gravel mineral resources were absent in 30 of the GI locations. In those where mineral resources were present, the overburden to mineral ratio varied between 0.04 to 13.80:1.

5.4 Conclusions

5.4.1 The results of the GI indicate that the underlying superficial geology is variable across the length of the proposed scheme.

5.4.2 The level of extensive GI is considered appropriate to inform the MRA.

6 ASSESSMENT OF MINERAL STERILISATION

6.1 3D modelling

6.1.1 To determine the quantity of mineral existing beneath the footprint of each section of the proposed scheme, 3D models were created for the following profiles:

- Topographical survey (existing ground profile)
- Base of the overburden (e.g. soils, made ground/engineered fill, alluvium, peat and Lowestoft Formation)
- Base of safeguarded sand and gravel mineral resource
- Base of brickearth mineral resource

6.1.2 All models were created in LSS, a Windows-based Digital Terrain 3D modelling software created by McCarthy Taylor Systems Ltd.

6.2 3D model construction methodology

Existing ground:

6.2.1 *A* 3D model was created by uploading the topographical survey data provided by the client.

Geological models:

6.2.2 3D models representing the base of overburden and safeguarded mineral resources were created adopting the same methodology.

6.2.3 Firstly, the coordinates of each borehole and window sample GI point were uploaded into LSS and assigned the datum levels determined from the borehole logs for the overburden and mineral resource.

6.2.4 Next, a 50m radius circle was created around each GI location, and the respective datum level assigned to the perimeter of the circle.

6.3 Mineral resource assessment methodology

Gross mineral sterilisation

6.3.1 For each Design Section of the proposed scheme, a 3D model representing the outline of the permanent land take was created in LSS and assigned levels from the topographical survey. Similarly, a 3D model of the outline of the existing A12 road was also created.

6.3.2 At various points along the route of the proposed scheme, there are areas where no mineral resources are present. Consequently, to avoid these 'barren' areas, the sections of permanent land take were subdivided into mineral resource blocks which are illustrated in **Drawings CA12026-001** to **CA12602-008** of this MRA.

6.3.3 To determine the quantity of overburden and mineral resources situated beneath each mineral resource block, the 3D surface model was compared to the 3D model of the base of overburden and the base of the mineral resource. This represents the gross volume of sterilised mineral resource.

Existing mineral sterilisation

6.3.4 There are already safeguarded mineral resources present beneath the existing A12. The 3D model of the outline of the existing A12 road was used to calculate this quantity.

6.4 Net safeguarded sand and gravel sterilisation

6.4.1 The estimated net quantity of sand and gravel sterilised within the permanent land take has been determined by deducting the A12 mineral sterilisation volume from the gross volume. These quantities are summarised in **Tables 8** to **10** below:

Design Section 1

TABLE 8:
DESIGN SECTION 1 SAND AND GRAVEL STERILISED MINERAL RESOURCES

Net Soils & Overburden volume	Gross Mineral	A12 Mineral	Net Mineral	Net Mineral	Average Overburden to Mineral Ratio
(m^3)	(m^3)	(m^3)	(m^3)	Tonnes	
450,000	907,700	493,300	414,400	**663,000**	0.68:1

Notes:

1. Soils and overburden volume includes both the soil and the Lowestoft Formation glacial till.
2. Gross mineral volume is that which lies beneath the permanent land take area
3. A12 mineral is the mineral resource already sterilised
4. Net mineral volume is the gross mineral less A12 mineral
5. Net mineral tonnage is the net mineral volume multiplied by a conversion factor of 1.60 tonnes per cubic metre
6. The average overburden to mineral ratio is calculated by dividing the volume of soils and overburden by the saleable mineral tonnage.

Design Section 2

6.4.2 The safeguarded sand and gravel operation at Colemans Farm Quarry lies within Design Section 2. The proposed scheme has the potential to sterilise some of the consented mineral resources in the northern part of the quarry extraction area. Furthermore, the operator, Brice Aggregates, has proven 265,000 tonnes of economically extractible sand and gravel resources exist beneath the proposed scheme to the west of the consented extraction area. These would need to be removed in advance of the proposed scheme to avoid them becoming sterilised. Subsequently, Brice Aggregates have submitted a planning application (PA Ref. ESS/36/21/BTE) to the mineral planning authority for a western extension to the quarry (Phases 5-7) which, if approved, will permit the extraction of the sand and gravel resources and infilling of the extracted areas with c. 425,000 tonnes of inert material to achieve the restoration landform prior to commencement of the proposed scheme. A copy of the revised working plan for the proposed extension illustrating Phases 5-7 is provided in **Annex D**.

6.4.3 Whilst this MRA acknowledges the submission of the planning application (currently under determination at the time of writing), the proven sand and gravel reserves have been incorporated into the calculation of the sterilised reserves within Design Section 2 for the purpose of the MRA as illustrated in **Drg. CA12096-004A** and shown in **Table 9** below.

TABLE 9:
DESIGN SECTION 2 SAND AND GRAVEL STERILISED MINERAL RESOURCES

Net Soils & Overburden volume	Gross Mineral	A12 Mineral	Net Mineral	Net Mineral	Average Overburden to Mineral Ratio
(m^3)	(m^3)	(m^3)	(m^3)	Tonnes	
1,828,000	3,789,000	859,400	2,929,600	**4,952,360**	0.40:1

6.4.4 Should planning permission be granted to allow the extraction of these proven resources prior to construction of the proposed scheme then the net tonnage of sterilised mineral in Table 9 reduces to 4.952Mt. **Drg. CA12096-004B** reflects the exclusion of these minerals from the MRA assessment of sterilised sand and gravel resources in Design Section 2.

Design Section 3

TABLE 10: DESIGN SECTION 3 SAND AND GRAVEL STERILISED MINERAL RESOURCES					
Net Soils & Overburden volume	**Gross Mineral**	**A12 Mineral**	**Net Mineral**	**Net Mineral**	**Average Overburden to Mineral Ratio**
(m^3)	**(m^3)**	**(m^3)**	**(m^3)**	**Tonnes**	
5,970,000	5,641,000	2,825,000	2,816,000	**4,506,000**	1.33:1

Combined Net Tonnage of Sand and Gravel Resources (Design Stages 1 – 3)

6.4.5 The estimated total net quantity of sand and gravel sterilised within the permanent land take in Design Stages 1 -3 is **c. 10.121Mt** (including the proven resources within Colemans Farm Quarry Phases 5 – 7). In the event of planning permission being granted for their extraction, the net tonnage reduces to **9.856Mt**.

6.5 Net safeguarded brick clay sterilisation

6.5.1 The proposed scheme extends across safeguarded brick clay mineral resources within Section 3 only at Marks Tey.

6.5.2 The estimated net quantity of brick clay sterilised within the permanent land take is summarised in **Table 11** below:

TABLE 11: SECTION 3 BRICK CLAY STERILISED MINERAL RESOURCES					
Net Soils & Overburden volume	**Gross Mineral**	**A12 Mineral**	**Net Mineral**	**Net Mineral**	**Average Overburden to Mineral Ratio**
(m3)	**(m3)**	**(m3)**	**(m3)**	**Tonnes**	
60,000	462,0000	328,000	134,200	239,000	0.25:1
Notes: 1. Net mineral tonnage is the net mineral volume multiplied by a conversion factor of 1.78 tonnes per cubic metre					

6.5.3 The estimated total net quantity of brick clay sterilised within the permanent land take is **c.0.239Mt**.

7 CONSTRAINTS IMPACTING UPON THE PRACTICALITY OF MINERAL EXTRACTION

7.1 Summary of constraints

7.1.1 There are a number of constraints present within the proposed scheme Order Limits that would impact upon the practicality of mineral extraction. These constraints are considered to be coincident with those that apply to the proposed scheme.

7.1.2 The existing and future baseline conditions within the proposed scheme Order Limits and surrounding area, applicable to each of the aspect chapters, is reported in the following chapters of the Environmental Statement [TR010060/APP/6.1]:

- Chapter 2: The proposed scheme
- Chapter 6: Air quality
- Chapter 7: Cultural heritage
- Chapter 8: Landscape and visual
- Chapter 9: Biodiversity
- Chapter 10: Geology and soils
- Chapter 12: Noise and vibration
- Chapter 13: Population and human health
- Chapter 14: Road drainage and the water environment

7.1.3 Key highway and utility constraints are shown on the plans produced to support Volume 2 of the DCO application, and environmental constraints on figures produced to support the Environmental Statement in Volume 6 of the DCO application. Those of relevance to this assessment include:

Volume 2:

- Highway infrastructure and utilities - General Arrangement Plans [TR010060/APP/2.10] and Highways Engineering Section Drawings [TR010060/APP/2.12].

Volume 6 [TR010060/APP/6.2]:

- Air quality - construction dust assessment - sensitive receptors [Figure 6.4 of the Environmental Statement]

- Cultural heritage – archaeological remains and cultural heritage built heritage and historic landscape [Figures 7.1 and 7.2 of the Environmental Statement]
- Landscape and visual – key landscape constraints [Figure 8.1 of the Environmental Statement]
- Biodiversity – biodiversity designated sites, biodiversity important habitats and protected species [Figures 9.1 to 9.3 of the Environmental Statement]
- Geology and soils – land contamination areas and agricultural land classifications [Figures 10.1 and 10.2 of the Environmental Statement]
- Population and human health – population and health context (residential dwellings, community assets and public rights of way etc) [Figure 13.1 of the Environmental Statement]
- Road drainage and the water environment – water environment features [Figures 14.1 to 14.7 of the Environmental Statement]

7.2 Key constraints impacting on the practicality of mineral extraction

7.2.1 The adopted Essex MLP acknowledges that mineral extraction can have a considerable impact on its surroundings which requires careful consideration and Chapter 5 of the MLP contains development management policies aimed at minimising such impacts to acceptable levels:

- Paragraph 5.17 identifies impacts arising from noise, dust, fumes vibration, illumination and debris on the highway
- Paragraph 5.19 lists the factors to be taken into account such as proximity of the proposed development to homes, schools and other sensitive land use
- Paragraph 5.20 advises that a minimum buffer zone of 100 metres be defined between a residential property and the excavation in order to minimise the impact of working on the local amenity

7.2.2 Of the above constraints listed in Section 7.1 of this MRA, those of most concern in proximity to the proposed scheme include:

- Private property and housing
- Community land and assets
- Development land and businesses

- Agricultural land holdings
- Designated environmental sites and features
- Highway infrastructure
- Utilities corridors

7.2.3 These constraints are detailed in Chapter 2: The proposed scheme and the following chapters of the Environmental Statement in Volume 6 of the DCO application [TR010060/APP/6.1], and are likely to impact the practicality of mineral extraction through either direct or indirect sterilisation of the mineral resource:

- Chapter 6: Air quality
- Chapter 7: Cultural heritage
- Chapter 8: Landscape and visual
- Chapter 9: Biodiversity
- Chapter 10: Geology and soils
- Chapter 12: Noise and vibration
- Chapter 13: Population and human health
- Chapter 14: Road drainage and the water environment

8 FINANCIAL APPRAISAL

8.1 Introduction

8.1.1 A financial appraisal has been prepared as part of MRA based on a hypothetical scenario whereby all minerals existing immediately beneath the permanent land take of the proposed scheme road corridor could be removed by prior extraction.

8.2 Hypothetical scenario

8.2.1 The objective of this scenario is to address the requirements of Policy S8 of the Essex MLP by considering the possibility of prior extraction.

8.2.2 In this scenario, the key assumptions are:

a) That all minerals sterilised by the proposed road corridor development are capable of being extracted by the Principal Contractor for the proposed scheme and removed off site (as dug without prior processing) to the nearest quarry operation(s).

b) That those mineral operations are able to accommodate the mineral resources from the proposed scheme whilst still complying with the conditions of their respective planning permissions in terms of importation, transportation, etc.

c) The minerals from the proposed scheme would be processed by the receiving mineral operations to remove the fines content and the aggregate screened and graded into their respective sizes for sale into the market.

8.2.3 The rate at which the mineral would be removed would be dictated by how many existing mineral operators would be interested in taking the mineral for processing. This would be influenced by several factors, for example:

- compatibility of the minerals to be extracted compared to those at the receptor quarry for blending to suit existing customers/market
- ability of receptor quarry to accommodate the additional minerals (i.e. sufficient availability of land for stockpiling)
- ability of receptor quarry to import minerals (potential planning restrictions)
- availability of plant and equipment and haulage vehicles
- distance between proposed scheme and quarry operation

- traffic impact arising from hauling mineral – increase in the rate of extraction would proportionately increase lorry movements

8.2.4 During the extraction of the mineral resources, the resultant mineral excavations would need to be infilled with suitable inert material to return the site to pre-road construction levels. It would be necessary for the rate of importation to correlate with the rate of mineral extraction, there is a logistical requirement to ensure sufficient quantity of material is available.

8.2.5 Furthermore, the inert material would need to be suitably compacted to achieve the required engineering specifications to create a stable foundation for the construction of the proposed scheme. The existence of groundwater would adversely impact on the programme to complete ground compaction and result in additional construction costs.

8.3 Financial appraisal assumptions

General assumptions:

Design Sections of proposed scheme

8.3.1 The sand and gravel mineral resources have been independently assessed for each of the three Design Sections of the proposed scheme rather than as one single entity.

Proximity of existing mineral operations

8.3.2 There are three mineral operations situated either within or in close proximity of each design section of the proposed scheme:

- Design Section 1: Bulls Lodge Quarry – Hanson Quarry Products Europe
- Design Section 2: Colemans Farm Quarry – Brice Aggregates Ltd
- Design Section 3: Colchester Quarry – Tarmac Ltd.

8.3.3 The assumption is that the prior extraction of sand and gravel resources would be taken to the quarry operation located within each design stage.

Bulls lodge quarry

8.3.4 Bulls Lodge Quarry is already affected by the proposed Chelmsford North East Bypass (CNEB) scheme which will traverse south to north through the quarry. The route links with junction 19 (Boreham interchange) via a radial distributor road (part of the Beaulieu Park development.

8.3.5 To deliver the Northeast Chelmsford expansion plans associated with the Chelmsford Garden Village, in accordance with Chelmsford City Councils' proposed timescales and to avoid sterilisation of the consented mineral reserves, it is necessary for the already approved phased extraction of the sand and gravel to be modified so that extraction is carried out much sooner than previously intended and contrary to timescales stipulated in the existing planning permissions. Therefore, the mineral operator will be entirely focussed in achieving the revised programme of mineral extraction so as to avoid any delay to the CNEB scheme and the Chelmsford Garden Village proposals.

8.3.6 Consequently, there would appear to be no scope for the quarry to accommodate a proportion of as-dug sand and gravel resources from the proposed scheme.

Colemans farm quarry

8.3.7 The quarry has submitted three planning applications, namely ESS/36/21/BTE, ESS/51/21/BTE and ESS/98/21/BTE, to amend the working and restoration schemes to enable extraction of all accessible mineral reserves from within the corridor affected by the A12 improvements. The operator, Brice Aggregates Limited, will facilitate a restoration back to original surface level of this area by importing inert materials prior to the commencement of A12 construction works.

8.3.8 The grant of planning permission for these three applications will ensure mineral reserves are not needlessly sterilised by the construction of the A12 (consistent with national and local policy guidance) and will support the timely delivery of the proposed scheme by providing a suitable surface at pre-quarrying ground levels on which the road can be built.

8.3.9 Similarly to Bulls Lodge Quarry, the operator will be entirely focussed upon extracting all mineral reserves and infilling the excavations in order to facilitate the construction programme for the proposed scheme.

8.3.10 Therefore, it would appear that there is also no scope for the quarry to accommodate the proportion of as-dug mineral resources from the proposed scheme.

Colchester quarry, Colchester

8.3.11 The original planning permission for the extraction of sand and gravel at Colchester Quarry was granted in December 1969. Subsequent planning permissions have been granted for extensions to the original quarry, and for the restoration of the quarry via landfill.

8.3.12 Tarmac Limited is the operator of the quarry which extends to the use of the on-site asphalt and concrete batching plants. Cory Environmental is the operator of the landfill and is responsible for the restoration of the site.

8.3.13 Planning permission stipulates a completion date for the extraction of minerals and restoration of the quarry. Even if the site were able to accommodate its proportion of as-dug material this would require the submission of planning application(s) to allow the importation of as-dug minerals. The preparation, consultation and determination of the application would all take time, which if approved, would inevitably impact on the construction programme for the proposed scheme.

8.3.14 Again, similarly to the quarries at Bulls Lodge and Colemans Farm, there would appear to be no scope for the quarry to accommodate the as-dug minerals from the proposed scheme.

Additional sand and gravel operations within Greater Essex

8.3.15 The Greater Essex Local Aggregate Assessment 2021 states that there are 37 sand and gravel operations in Greater Essex, of which 24 were active. These are listed in **Table 12** below.

Table 12:
Sand and Gravel operations within Greater Essex

No.	QUARRY	OPERATOR	CESSATION DATE	DISTANCE TO ORDER LIMITS (KM)
1	BIRCH QUARRY	HANSON	2018	3.2
2	COBBS FARM	SRC LTD	2021	7.5
3	ELMSTEAD HALL	R W MITCHELL & SONS	2021	11.9
4	BRADWELL QUARRY	BLACKWATER AGGREGATES	2022	4.9
5	LUFKINS FARM	BRETT AGGREGATES	2022	15.9
6	CURRY FARM	DEWICKS	2023	15.7
7	MARTELLS QUARRY	SRC LTD (silica sand)	2026	11.5
8	BRIGHTLINGSEA QUARRY	BRETT AGGREGATES	2026	14.4
9	HIGHWOOD QUARRY	SRC LTD	2026	19.0
10	SHEEPCOTES FARM	SRC LTD	2027	4.4
11	CROWN QUARRY	SRC LTD	2028	74.1
12	ST CLERES PIT	DANBURY AGGREGATES	2029	2.9

Table 12:
Sand and Gravel operations within Greater Essex

No.	QUARRY	OPERATOR	CESSATION DATE	DISTANCE TO ORDER LIMITS (KM)
13	ROYAL OAK	DANBURY AGGREGATES	2029	6.5
14	ASHELDHAM QUARRY	G&B FINCH LTD	2029	18.2
15	ELSENHAM QUARRY	BRETT AGGREGATES	2029	25.8
16	CRUMPS FARM	EDVIRON LTD	2031	19.2
17	BULLS LODGE	HANSON	2034	0.5
18	RAYNE QUARRY	TARMAC	2035	13.3
19	COLEMANS FARM QUARRY	BRICE AGGREGATES	2036	0.0
20	WIVENHOE QUARRY	TARMAC	2039	12.0
21	COLCHESTER QUARRY	TARMAC	2042	2.6
22	ALRESFORD CREEK	BRETT AGGREGATES	2042	13.3
23	FINGRINGHOE QUARRY	JJ PRIOR LTD	2042	70.5
24	BLACKLEY QUARRY	FRANK LYONS PLANT SERVICES	2045	9.0

8.3.16 It can be seen from the table that at the commencement of construction of the proposed scheme (Q1 2024), quarry nos. 1-6 will have ceased mineral production and will either be under restoration or completely restored. By the time the proposed scheme is completed (Q4 2027), a further four sites will have ceased production.

8.3.17 Of the remaining 18 sites still operating at the commencement of construction of the proposed scheme, Crown Quarry (no. 11) and Fingringhoe Quarry (no. 23) can be discounted owing to their distance from the proposed scheme. The remaining 16 sites lie between 0km to 25.8km from the Order Limits with the average distance being 10.75km.

8.3.18 Equal apportionment of the total mineral resources from the proposed scheme amongst these 16 operations would be 0.616Mt. As has been mentioned previously, even if these operations had capacity to accommodate these resources, all would require a variation to their planning permissions which would take time to complete without any guarantee of approval. This would inevitably lead to delays in the construction programme and delivery of the proposed scheme.

Income assumptions:

Mineral selling price

8.3.19 An average selling price of £16.50 per tonne for mineral is considered to be representative of the typical market range at current levels. However, as the mineral would be simply excavated in its natural state 'as dug' by the Principal Contractor for the proposed scheme and then sold onto a third party (i.e. the mineral operators in closest proximity to the proposed development) it would command a lower value compared to processed sand and gravel material.

8.3.20 The lower value would reflect that the mineral operator would still need to process the material at its quarry prior to sale. It would be reasonable to set the selling price at 50% of the market value for processed sand and gravel. The rate of £8.25 per tonne has been applied in the calculation.

Inert waste gate price

8.3.21 A gate price of £4.80 per tonne for the importation of inert waste has been used which is considered to be representative of the typical market range.

Haulage

8.3.22 The cost of hauling the 'as dug' mineral from the proposed scheme site to the accommodating mineral operation has been set at a rate of £3.00 per tonne.

Expenditure assumptions:

Switch from red diesel

8.3.23 In line with changes announced by the UK Government, from 1 April 2022, construction and mineral operators will lose the rebate on the use of red diesel. Consequently, heavy plant and equipment (excavators, dumpers, shovels) will have to switch to white diesel. The loss of the rebate will significantly increase fuel costs for operators.

Earthworks

8.3.24 The task of excavating the soils and overburden has been allocated a cost of £2.35 per cubic metre.

Aggregate production costs

8.3.25 Site operations would include extraction of the mineral, loading direct into HGV lorries and haulage to the nearest quarry. There would be no requirement for on-site processing and washing of the mineral to extract the fines prior to the sale as these aspects would be done at the selected quarry. To reflect the simplified extraction operation, a rate of £5.00 per tonne has been used.

Ground engineering and compaction of inert fill

8.3.26 The inert fill would require a degree of compaction in order to create a stable foundation upon which to construct the road development. This could impact upon the design (slope stability and settlement of earthworks) as compacted cohesive fill may be poorer foundation than existing sands and gravels.

8.3.27 To assess the availability of inert material in the County, the Minerals and Waste Monitoring Report (period 1 April 2017 – 31 March 2018) reported that in 2017, a total of 3.55Mt of construction, demolition and excavation waste was generated within the plan area of which 0.685Mt was sent to non-inert landfill.

8.3.28 Allowing for compaction of the inert material, it is possible that approximately 10.63Mt of inert material would be required. Based on the availability of inert material, hypothetically, if the proposed scheme were able to source all available inert material, the infilling and compaction programme could take at least c. 3 - 4 years.

8.3.29 This would inevitably lead to significant time delays in the delivery, not to mention the added costs of the proposed scheme. The better option would be to leave the mineral resources in situ. Nevertheless, to reflect the compaction operation and in-situ testing to measure compaction levels a rate of £6.15 per tonne has been used.

Aggregate levy

8.3.30 Included at the current rate of £2.00 per tonne. Payable when the mineral leaves the site of the proposed scheme.

Mineral royalty

8.3.31 A typical royalty for sand and gravel to average £2.00 per tonne has been assumed. However, to reflect the value of the 'as dug' mineral a 50% discount to the royalty rate has been applied. A royalty would only be payable to the mineral owners(s) in the event that the mineral rights have not been acquired by National Highways.

Inert waste royalty

8.3.32 A waste royalty at £1.68 per tonne has been assumed based upon 30% of the gate price of £4.80 per tonne – this would be payable to the landowners.

Exclusions

8.3.33 The appraisal does not include any provision for depreciation of plant and equipment, any potential finance costs, applicant profit or inflation. Also excluded are the mineral and waste royalties. It is assumed that the applicant has already acquired the freehold title to the surface and the underlying minerals.

8.4 Financial appraisal review

8.4.1 Wardell Armstrong's financial assessment is provided in **Annex E** of this MRA and summarised in **Table 13** below.

TABLE 13:

Design Section	Sterilised Mineral Tonnage	Inert Waste Infill Tonnage	Total Income	Total Costs	Profit/Loss
1	663,000	696,150	£8,811,270	-£13,080,827	-£4,269,557
2	*4,952,000	5,199,600	£65,812,080	-£85,248,963	-£19,436,883
3	4,506,000	4,731,300	£59,884,740	-£111,937,484	-£52,052,744
TOTALS	**10,121,000**	**10,627,050**	**£134,508,090**	**-£210,267,274**	**-£75,759,184**

* Includes the 265,000 tonnes of proven sand and gravel resources within Colemans Farm

8.4.2 Whilst profitability is not an explicit test set by the NPPF (although this may impact on practicality), the financial appraisal contained in this MRA has concluded that prior extraction of the mineral resources as part of the proposed scheme could result in additional costs of £75.76M (£75.31M excluding Colemans Farm Quarry extension reserves) and is therefore not economically viable in the context of constructing the proposed scheme.

9 VIABILITY OF PRIOR EXTRACTION

9.1 Ability of site to incorporate temporary mineral processing plant

9.1.1 Prior extraction is not considered to be a practical option, as demonstrated by the financial appraisals, so there is no requirement for temporary mineral processing plant for this purpose.

9.2 Proximity to existing mineral sites or processing plant

9.2.1 The nearest existing mineral operations located within close proximity to the proposed scheme are:

- Bulls Lodge Quarry, operated by Hanson Quarry Products Europe situated adjacent to Design Section 1.
- Colemans Farm Quarry, operated by Brice Aggregates Limited situated within Design Section 2 where the proposed alignment of the A12 traverses through the mineral extraction area.
- Colchester Quarry, operated by Tarmac Limited and situated to the southeast of Design Section 3.

9.2.2 As mentioned in 8.3 of this MRA (proximity of existing mineral operations), when construction works commence for the proposed scheme, 16 quarries lie between 0km – 25.8km from the Order Limits. Even if these operations had capacity to accommodate these resources, all would require a variation to their planning permissions which would take time to complete without any guarantee of approval. This would inevitably lead to delays in the construction programme and delivery of the proposed scheme.

9.3 Context of site and mineral within the wider mineral resource area

9.3.1 The total MSA for sand and gravel within Greater Essex is 130,387ha and 197ha for brick clay.

9.3.2 The Order Limits of the proposed scheme extends over an area of 862.7ha, of which 703.2ha (0.5%) lies within the safeguarded sand and gravel MSA and 6.74ha (3.4%) within safeguarded Brick Clay.

9.3.3 The area of ‘permanent land take’ (with National Highways owned land removed) within the sand and gravel and brick clay MSAs is 413.2ha (0.3%) and 1.97ha (1.0%) respectively.

9.3.4 The consented reserves at Bulls Lodge Quarry are approximately 10.0Mt which will be extracted over a period between 2021 – 2039.

9.3.5 Colemans Farm Quarry has approximately 2.2Mt of sand and gravel reserves remaining, to be extracted up to 2034, provided planning permission [Ref. ESS/36/21/BTE] is granted for an extension to the mineral workings.

9.3.6 In 2014, sand and gravel reserves at Colchester Quarry were estimated to be 2.5Mt. Operations at the quarry are scheduled to continue until 2042.

9.4 Proximity to viable transport links for mineral haulage

9.4.1 This is not applicable as prior extraction is not considered to be economically viable as demonstrated by the financial appraisals.

9.5 Potential for indigenous material to be used in the construction of the proposed development, reducing the need for import

9.5.1 Overall, the design engineers have confirmed that there is a shortfall of c. 0.6M cu.m of general fill materials for use on the proposed scheme (granular and cohesive fill). This deficit would be met by the four proposed scheme borrow pits. The incorporation of borrow pits would result in the proposed scheme being largely self-contained in terms of the sourcing of materials for earthworks (as illustrated in **Table 1**).

9.5.2 The largest quantity of materials to be used in construction of the proposed scheme would likely be earthworks materials, aggregates for road foundation materials, asphalt aggregates and drainage/duct aggregates. It is assumed at this stage that all these materials, except for the site won material from earthworks/borrow pits, would be imported to site as they are unlikely to be available in the borrow pits.

9.5.3 Depending on the quality of the granular material and effort to excavate it, processing and treatment may be used to gain concrete and drainage aggregates for use on the proposed scheme from Borrow Pit J.

9.6 Potential benefits through mineral restoration, e.g. land reclamation, landscape enhancement

9.6.1 The mineral deposits existing beneath the proposed scheme are not intended to be removed by prior extraction nor by conventional quarrying methods. Therefore, there would not be any potential benefits via mineral restoration.

9.6.2 An Environmental Masterplan has been produced which shows the proposed scheme design and areas within the Order Limits reserved for environmental mitigation. This is included in Figure 2.1 of the Environmental Statement [TR010060/APP/6.2]. This is also supported by illustrative cross sections shown on Figure 2.2 of the Environmental Statement [TR010060/APP/6.2].

9.6.3 The Environmental Masterplan, Figure 2.1 of the Environmental Statement [TR010060/APP/6.2], shows the indicative borrow pit restoration proposals, in line with the general principles described in Chapter 2: The proposed scheme, of the Environmental Statement [TR010060/APP/6.1]. A Borrow Pit Report has been included within Volume 7 of the DCO application [TR010060/APP/7.8].

9.6.4 An Outline Landscape and Ecology Management Plan (LEMP), part of the first iteration Environmental Management Plan (EMP), has also been included with the DCO application [TR010060/APP/6.5]. This presents how the landscape and ecological mitigation would be reinstated, monitored, and maintained. A detailed landscape specification and maintenance schedule will be produced at the detailed design stage.

9.7 Opportunities for incidental extraction as part of the development of the site such as foundations, footings, landscaping, sustainable drainage systems

9.7.1 The combined thickness of the soil and overburden varies considerably, between 1.67 – 5.33m (average thicknesses). It is considered unlikely for any opportunity to exist for the incidental extraction of mineral resources through the construction of various structures associated with the proposed scheme such as abutment/retaining walls. Therefore, the quantity of mineral capable of being extracted is expected to be minimal.

9.8 Evidence of interested operators/local market demand

9.8.1 The latest Greater Essex Local Aggregate Assessment 2021 states that there are 37 sand and gravel operations in Greater Essex, of which 24 are currently active. Of the 13 inactive sites, nine are permitted but were not actively extracting mineral at 31 December 2020. The combined production capacity of these sites is c. 3.60Mtpa.

9.8.2 Sand and gravel sales in 2020 were 2.96Mt, although this figure may be reduced due to the impact COVID-19 had on sales during 2020. The three year average of sales (2018 – 2020) was 3.23Mt. The apportionment of sand and gravel supply for Greater Essex in the adopted Local Development Plan is 4.45Mtpa.

9.8.3 The permitted reserves of sand and gravel stood at 33.59Mt as stated by the Greater Essex Local Aggregate Assessment 2021. The ten year average sales (2011 to 2020) were 3.26Mt meaning that the landbank of sand and gravel reserves stands at 10.30 years and so is above the seven year requirement as required by the NPPF (paragraph 213,f). At 31 December 2021, there were four planning permissions for sand and gravel extraction awaiting determination, which if granted, would increase the landbank by a further 9.5Mt.

9.8.4 Total tonnage of sand and gravel situated beneath the permanent land take of the proposed scheme (and subject to prior extraction) is 10.121Mt (including Colemans Farm Quarry Phases 5-7) which is the equivalent of just over 3 years total mineral supply for Essex.

9.8.5 To put matters into context, there would be 16 quarries operating during the construction of the proposed scheme and if the mineral from the proposed scheme were apportioned equally, then each operation would need to accommodate c. 0.632Mt. In all likelihood, none of the sites have the capacity to take such a volume of material and to do so would require variation to existing planning permissions for matters such as traffic movements, timescale of mineral operations, etc.

9.8.6 Given the remaining reserves at Bulls Lodge Quarry, Colemans Quarry and Colchester Quarry, none of the operators are likely to be interested in taking any mineral resources from the proposed scheme.

9.8.7 It is considered that there is sufficient supply of sand and gravel into the local market from the existing mineral operations.

10 CONCLUSIONS

10.1 Whether prior extraction is environmentally feasible

10.1.1 Due to time implications for delivery of the proposed Scheme by 2027, there is little scope for delay in the programme.

10.1.2 To extract all 10.121Mt of sand and gravel in approximately 4 years would be a substantial undertaking, requiring an enormous fleet of plant and machinery which would greatly exceed the operation of a normal quarry which inevitably could result in adverse environmental impacts etc.

10.2 Prior extraction of minerals

Sand and gravel:

10.2.1 The latest Greater Essex Local Aggregate Assessment 2021 states that sand and gravel sales in 2020 were 2.96Mt although this figure may reflect the impact of COVID-19 had on sales during 2020. The three year average of sales (2018 – 2020) was 3.23Mt.

10.2.2 Total tonnage of sand and gravel subject to prior extraction is 10.121Mt (including Colemans Farm Quarry Phases 5-7) which is the equivalent of just over 3 years total mineral supply for Essex. The introduction of this quantity of mineral into the mineral supply market is totally impractical.

10.2.3 To put matters into context, there would be 16 active sand and gravel sites in Greater Essex at the time of construction and if the mineral from the proposed scheme were apportioned equally then each operation would need to accommodate c. 0.632Mt.

10.2.4 In all probability, none of the sites have the capacity to take such a volume of material and to do so would require variation to existing planning permissions for matters such as traffic movements, timescale of mineral operations, etc.

Brick clay:

10.2.5 The MLP requires the maintenance of at least a 25 year landbank at both the Bulmer Brickfield and Marks Tey sites. When the MLP was adopted in July 2014, there were sufficient permitted reserves at both operations to achieve the 25 year landbank. Therefore, prior extraction of brick clay is not necessary.

10.3 Whether the site has the potential to be worked for mineral in the future

10.3.1 The proposed scheme would be a permanent usage of the land as the road would have a design life of 60 years. Therefore, the possibility of the sterilised sand and gravel and brick clay minerals left in situ beneath the proposed scheme being worked at any point in the future is considered unlikely.

10.4 Whether prior extraction is practical at the site in the context of the non-mineral development, taking into account the estimated value of the mineral, restoration and the overall viability of the development

10.4.1 Prior extraction is not considered to be a practical option owing to the inevitable delays that would occur, jeopardising the delivery of the proposed scheme by 2027. Furthermore, the financial appraisal for the extraction of sand and gravel illustrates that the cost of prior extraction is not economically viable, adding c. £75.76M to the cost of the proposed scheme.

10.4.2 The critical factor affecting the economic viability of prior extraction of sand and gravel and/or brick clay is that the cumulative costs of extraction, infilling and compaction of the void to provide a stable foundation for construction exceeds the proceeds of sale of the minerals to an existing operator. As the mineral would need to be taken away and processed at another facility, this significantly reduces their value and consequently the level of income.

10.4.3 Furthermore, the requirement to compact the infill would not only result in additional delays in the construction of the proposed scheme but the work involved to achieve compaction may require review of the design and subsequent increase in costs.

How the MRA has informed the proposed non-mineral development

10.4.4 Chapter 3: Assessment of alternatives, of the Environmental Statement [TR010060/APP/6.1] details the proposed scheme history and the design alternatives that have been considered, including the environmental factors which have influenced the decision making (e.g. consideration of the sterilisation of minerals). It is important to acknowledge that the design of the proposed scheme is influenced by the existing A12 which already extends over a substantial MSA for sand and gravel and brick clay.

10.4.5 The financial appraisal demonstrates that prior extraction of the sand and gravel is not commercially viable. However, if the extraction was undertaken as a stand-alone quarry operation, as the full proceeds of the sale of aggregate would be realised, this aspect alone makes their extraction potentially economically viable.

10.4.6 Extraction in this context would create even further delay in the delivery of the proposed scheme because extraction would take several years, as it would be impractical to dispose of 10.121Mt of aggregate into the market from a single source given the average annual production for Greater Essex is 3.26Mt. Furthermore, the site would significantly increase the sand and gravel landbank. Consequently, this could significantly impact upon existing sand and gravel sites by impeding plans for quarry extensions not to mention reduction in market supply.

10.4.7 As a consequence, the mineral resources existing beneath the proposed scheme do not warrant safeguarding or prior extraction. Furthermore, the proposed scheme would not be compatible with the criteria set out in the mineral safeguarding policy for non-mineral development, i.e. minerals are not of economic importance nor is prior extraction practicable.

10.5 If prior extraction is not practical, the justification for sterilising the mineral

10.5.1 The proposed scheme is listed in the Greater Essex Local Aggregate Assessment 2021 (paragraphs 1.3.6 and 1.3.7) as one of the major construction projects that are either planned, programmed or underway and indicates 2027/28 as the potential delivery date for the project.

10.5.2 The availability of inert material is another limitation to prior extraction. The Minerals and Waste Monitoring Report (period 1st April 2017 – 31st March 2018) reported that in 2017, a total of 3.55Mt of construction, demolition and excavation waste was generated within the plan area of which 0.685Mt was sent to non-inert landfill leaving a net tonnage of 2.865Mt of inert material potentially available.

10.5.3 Theoretically, on the assumption that all inert waste generated within the County of Essex could be made available for infilling the excavations of the proposed scheme (and that it was suitable to be compacted), then given the quantity of material required, this would take a minimum of 3.6 years. Clearly, this timescale is impractical as there are existing permitted developments which already utilise this material. Furthermore, the number of lorry movements required to deliver this material would be in excess of 1.1 million.

10.5.4 Prior extraction of minerals, infilling and ground compaction would result in considerable delays which would make it impossible to achieve the completion of the proposed scheme by 2027.

10.6 If prior extraction is practical, how this will be phased as part of, or preceding, the non-mineral development

10.6.1 Prior extraction is not considered a practical option for the reasons set out in this assessment. Furthermore, phasing of the prior extraction would only exacerbate any potential delays to the delivery of the proposed scheme.

ANNEXES

ANNEX A:

EXPLORATORY HOLE LOCATION PLANS AND GEOLOGICAL LONG SECTION

CAD FRAME ITEMS

N

NORTH ARROW

0 — 200

SCALE 1:2500 — METRES

SCALE BAR

SCALE BAR

FOR CONTINUATION REFER TO PAGE XX (Cutline)

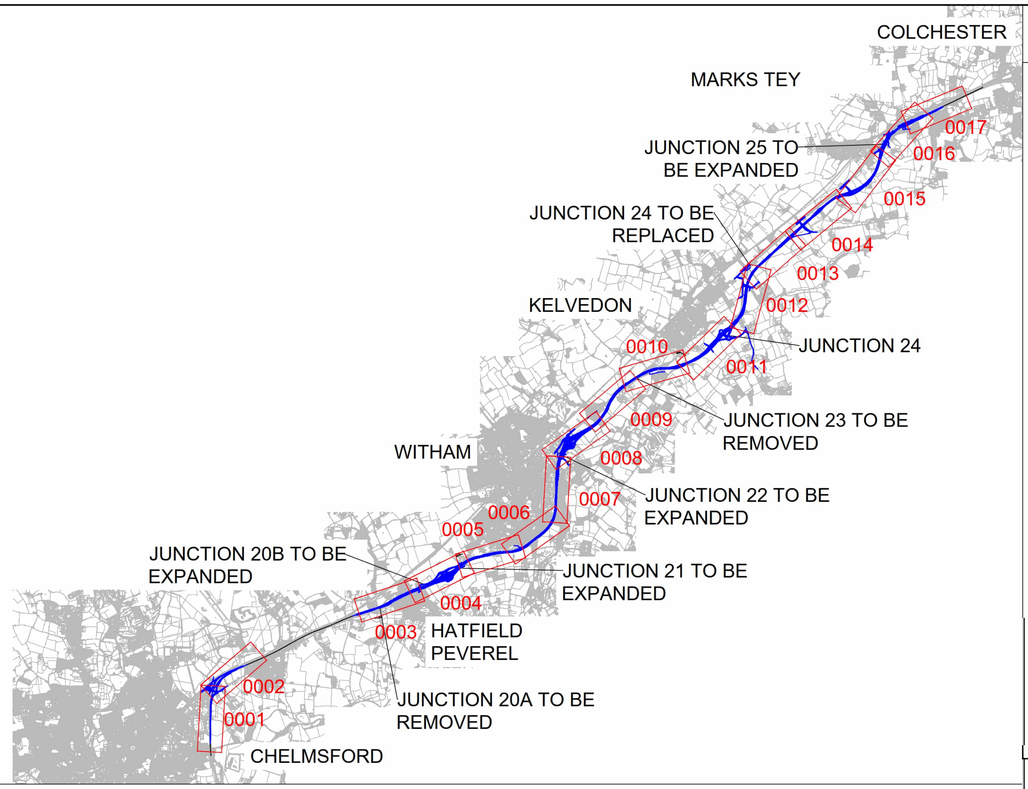
FOR CONTINUATION REFER TO PAGE XX (Cutline)

CUTLINES

EXPLORATORY HOLE LEGEND

- CABLE PERCUSSIVE BOREHOLE
- WINDOWLESS SAMPLE HOLE
- CONE PENETRATION TEST
- PERCUSSIVE BOREHOLE WITH ROTARY FOLLOW-ON
- MACHINE DUG TRIAL PIT
- LIGHT WEIGHT DEFLECTOMETER
- INSPECTION PIT
- ROTARY OPEN HOLE
- HISTORICAL GROUND INVESTIGATION

NOTE. EXPLORATORY HOLES ARE HISTORICAL WHERE THE NUMBER IS PROCEEDED BY "H<XXXX>" WHICH REFERS TO THE PSSR NUMBERING SYSTEM APPLIED DURING DIGITISATION. WHERE ADDITIONAL HISTORICAL HOLES HAVE SUBSEQUENTLY BEEN ADDED DURING PRODUCTION OF THESE LONG SECTIONS, THEN THE BGS NAMING CONVENTION IS SHOWN E.G., "TL70NW157". EXPLORATORY HOLES SHOWN ON THE SECTIONS WITH A BOX SURROUNDED ARE FROM OUTSIDE OF THE 100m WIDE BUFFER AND HAVE BEEN INCLUDED WHERE 'ON LINE' DATA WAS LIMITED.



NOTES:
1. THIS DRAWING SHOULD BE READ AS PART OF DRAWING SERIES HE551497-JAC-HGT-SCHW-DR-GE-1001 TO 1017. THE PROPOSED DESIGN ELEMENT LAYOUTS ARE BASED ON DESIGN FIX 2.
2. THE VARIOUS NUMERICAL BGS RIVER TERRACE DEPOSIT MEMBERS HAVE BEEN COMPREHENSIVELY PRESENTED AS RIVER TERRACE DEPOSITS FOR THE PURPOSES OF GEOTECHNICAL INTERPRETATION.
3. A LIMITED NUMBER OF REPRESENTATIVE AVAILABLE BOREHOLES ARE DISPLAYED ON THE SECTIONS FOR THE PURPOSE OF CLARITY.
4. THESE DRAWINGS ARE BASED ON AGS DATA FIX 20/08/2021.

HOLE LEGEND

BOREHOLE ID

WATER STRIKES DURING BORING/EXCAVATION

GROUNDWATER RISING LEVEL

GROUNDWATER STRIKE

N=XX

N=XX

N=XX

N=XX

N-VALUES

PROFILE LEGEND

- EXISTING PAVEMENT LEVELS
- PROPOSED PAVEMENT LEVELS
- WESTBOUND EARTHWORK CREST/TOE
- EAST BOUND EARTHWORK CREST/TOE

GEOLOGY LEGEND

- MADE GROUND
- ALLUVIUM
- PEAT
- HEAD DEPOSITS
- RIVER TERRACE DEPOSITS
- GLACIOLACUSTRINE DEPOSITS
- INTERGLACIAL SILT AND CLAY
- LOWESTOFT FORMATION
- GLACIOFLUVIAL DEPOSITS
- LONDON CLAY

HATCHING PATTERNS

- TOPSOIL
- MADE GROUND
- Bituminous Material
- CONCRETE
- CLAY
- Silty CLAY
- Sandy CLAY
- Gravelly CLAY
- Silty sandy CLAY
- Silty sandy gravelly CLAY
- SILT/CLAY
- SILT
- Clay/Silt
- Sandy SILT
- Gravelly SILT
- Sandy gravelly SILT
- SAND
- Clayey SAND
- Silty SAND
- Gravelly SAND
- SAND and GRAVEL
- GRAVEL
- Clayey GRAVEL
- Silty GRAVEL
- Sandy GRAVEL
- PEAT
- MUDSTONE
- SILTSTONE
- SANDSTONE
- LIMESTONE
- No Recovery

STRUCTURES AND DRAINAGE

- FOOTBRIDGES
- EXISTING BRIDGES
- PROPOSED BRIDGES
- CULVERTS
- PONDS

BGS GEOLOGY

- ALLUVIUM
- HEAD DEPOSITS
- RIVER TERRACE DEPOSITS
- BRICKEARTH
- GLACIOLACUSTRINE DEPOSITS
- LOWESTOFT FORMATION
- GLACIOFLUVIAL DEPOSITS
- LONDON CLAY FORMATION
- BURIED CHANNEL
- LANDFILL

EARTHWORKS

PROPOSED CUTTINGS

PROPOSED EMBANKMENTS

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following :

CONSTRUCTION
- Not Applicable

MAINTENANCE / CLEANING
- Not Applicable

DECOMMISSIONING / DEMOLITION
- Not Applicabble

0 — 200

SCALE 1:2500 — METRES

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P01	23/04/21	FIRST ISSUE	DS	MH	CLM	PB
P02	15/06/21	SECOND ISSUE	DS	MH	CLM	RC
P03	25/11/21	THIRD ISSUE	TE	MH	CLM	DT

Contractor: COSTAIN

Designer: Jacobs
2nd Floor Cottons Centre, Cottons Lane
London SE1 2QG. Tel: +44 (0)203 9802000
www.jacobs.com

Client: national highways

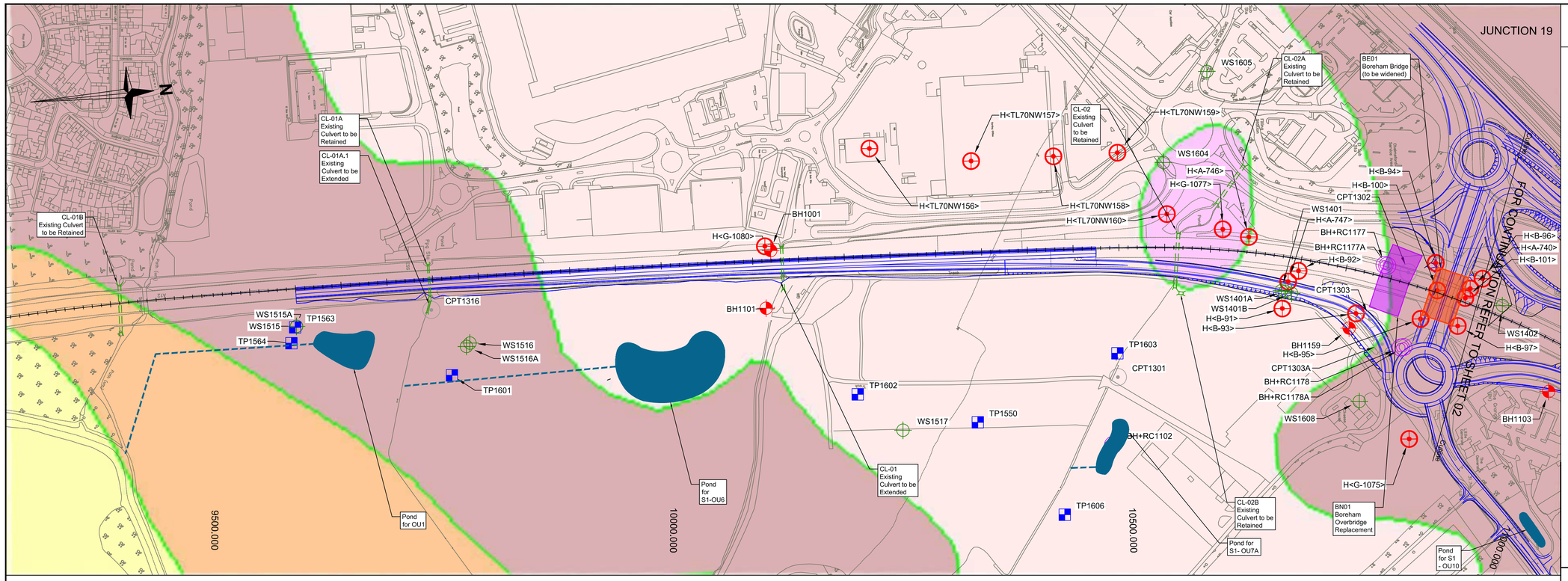
Project: REGIONAL DELIVERY PARTNERSHIP
A12 CHELMSFORD TO A120 WIDENING SCHEME

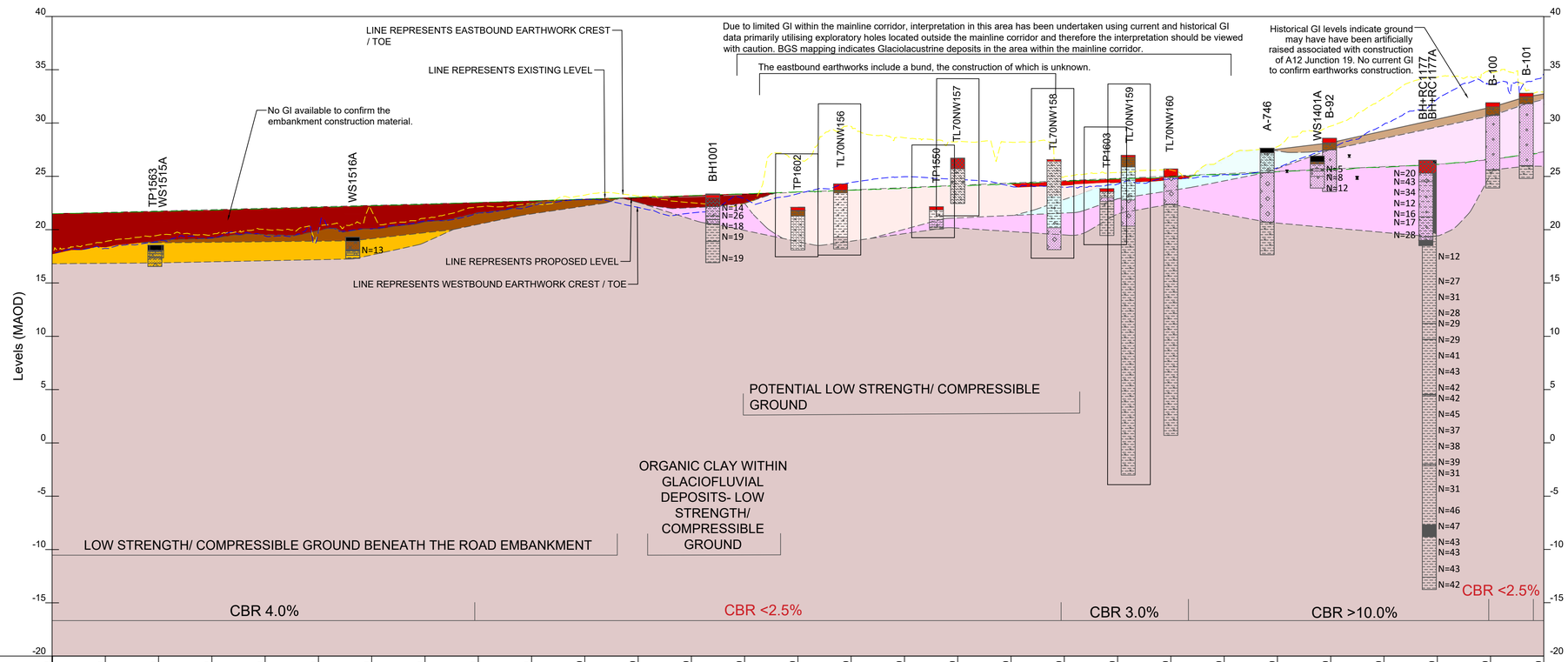
Drawing title: EXPLORATORY HOLE LOCATION PLAN AND GEOLOGICAL LONG SECTION LEGEND PLAN

Drawing status: S3 - SUITABLE FOR REVIEW AND COMMENT

State Code	Preliminary		
Project Stage	PCF 3		
Scale	N/A	DO NOT SCALE	
Jacobs No.	B36601D1	Rev	P03
Client no.	HE551497		

Drawing number
PIN | Originator | Volume | Location | Type | Role | Number
HE551497 - JAC - HGT - SCHW -DR-GE-1000





CHAINAGE (m)	EXISTING LEVELS (mAOD)	PROPOSED LEVELS (mAOD)
9500.00	21.485	21.485
9550.00	21.619	21.619
9600.00	21.752	21.752
9650.00	21.885	21.885
9700.00	22.018	22.018
9750.00	22.151	22.151
9800.00	22.284	22.284
9850.00	22.417	22.417
9900.00	22.551	22.551
9950.00	22.684	22.684
10000.00	22.817	22.817
10050.00	22.950	22.950
10100.00	23.097	23.097
10150.00	23.292	23.292
10200.00	23.509	23.509
10250.00	23.727	23.727
10300.00	23.944	23.944
10350.00	24.161	24.161
10400.00	24.379	24.379
10450.00	24.596	24.596
10500.00	24.813	24.813
10550.00	25.031	25.031
10600.00	25.248	25.248
10650.00	25.466	25.466
10700.00	25.683	25.683
10750.00	25.900	25.900
10800.00	26.133	26.133
10850.00	26.580	26.580
10900.00	27.306	27.306

NOTES:
1. ALL MEASUREMENTS TO BE IN METERS UNLESS SPECIFIED OTHERWISE.
2. FOR GENERAL NOTES AND LEGEND PLEASE REFER TO DRAWING HE551497-JAC-HGT-SCHW-DR-GE-1000.
3. ANY GEOLOGICAL BOUNDARIES SHOWN IN THE PROFILE CORRESPOND TO INTERPOLATION OF THE LIKELY DEPTHS THAT ARE PRESENT ALONG THE CENTRELINE OF THE A12 ALIGNMENT.
4. THESE DRAWINGS ARE BASED ON AGS DATA FIX 20/08/2021.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following :

CONSTRUCTION
- Not Applicable

MAINTENANCE / CLEANING
- Not Applicable

DECOMMISSIONING / DEMOLITION
- Not Applicabble

0 — 200
SCALE 1:2500 METRES

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P01	23/04/21	FIRST ISSUE	DS	MH	CLM	PB
P02	15/06/21	SECOND ISSUE	DS	MH	CLM	RC
P03	24/11/21	THIRD ISSUE	BS	MH	CLM	DT

Contractor: COSTAIN

Designer: Jacobs
1 City Walk, Leeds, LS11 9DX
Tel:+44(0)113 242 6771 Fax:+44(0)113 389 1389
www.jacobs.com

Client: national highways

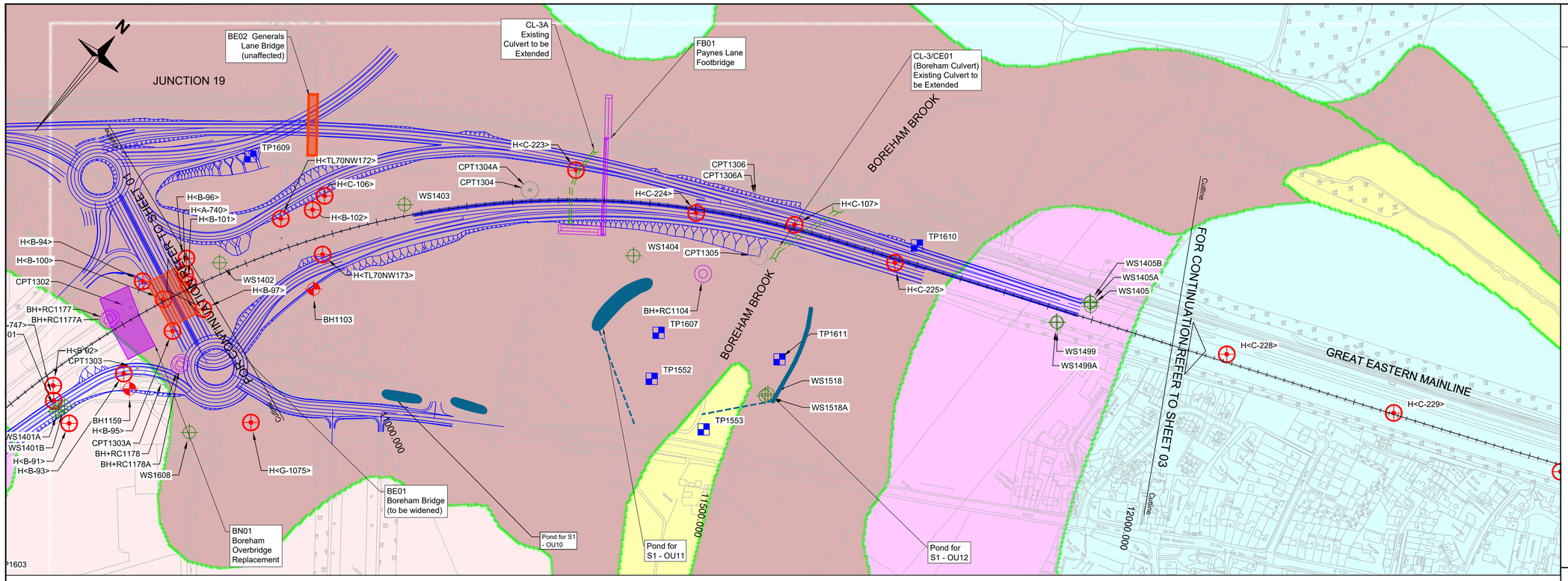
Project
REGIONAL DELIVERY PARTNERSHIP
A12 CHELMSFORD TO A120 WIDENING SCHEME

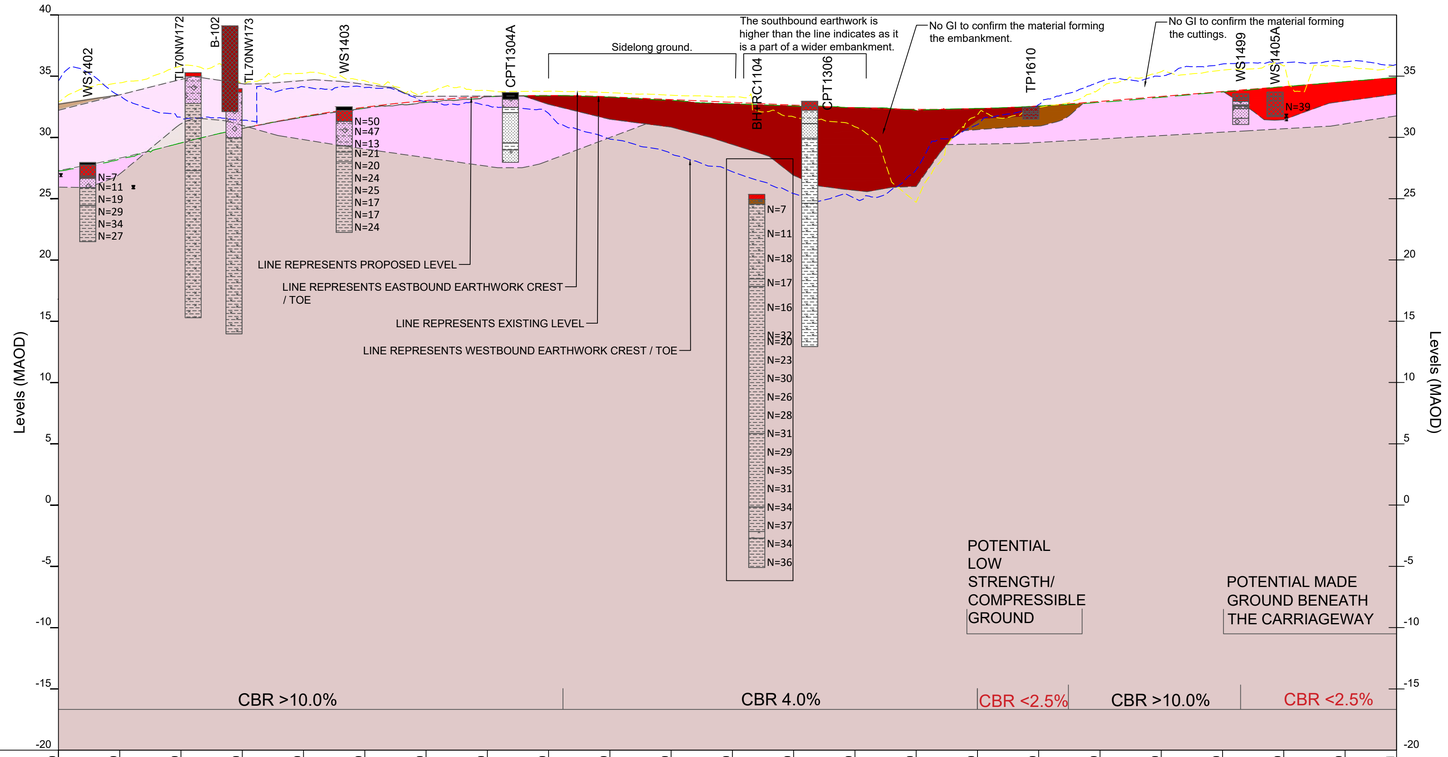
Drawing title
EXPLORATORY HOLE LOCATION PLAN AND GEOLOGICAL LONG SECTION SHEET 1 OF 17

Drawing status
S3 - SUITABLE FOR REVIEW AND COMMENT

State Code	Preliminary
Project Stage	PCF 3
Scale	1:2500 — DO NOT SCALE
Jacobs No.	B36601D1
Client no.	HE551497
Rev	P03

Drawing number
PIN HE551497 - | Originator JAC - | Volume HGT - | Location SCHW | Type -DR- | Role -GE- | Number -1001





CHAINAGE (m)	EXISTING LEVELS (mAOD)	PROPOSED LEVELS (mAOD)
10900.00	27.306	27.306
10950.00	28.309	28.309
11000.00	29.541	29.541
11050.00	30.729	30.729
11100.00	31.703	31.703
11150.00	32.460	32.460
11200.00	32.999	32.999
11250.00	33.321	33.321
11300.00	33.426	33.426
11350.00	33.313	33.313
11400.00	33.087	33.087
11450.00	32.860	32.860
11500.00	32.634	32.634
11550.00	32.410	32.410
11600.00	32.295	32.295
11650.00	32.347	32.347
11700.00	32.565	32.565
11750.00	32.938	32.938
11800.00	33.341	33.341
11850.00	33.744	33.744
11900.00	34.147	34.147
11950.00	34.550	34.550
11992.11	34.889	34.889

NOTES:
1. ALL MEASUREMENTS TO BE IN METERS UNLESS SPECIFIED OTHERWISE.
2. FOR GENERAL NOTES AND LEGEND PLEASE REFER TO DRAWING HE551497-JAC-HGT-SCHW-DR-GE-1000.
3. ANY GEOLOGICAL BOUNDARIES SHOWN IN THE PROFILE CORRESPOND TO INTERPOLATION OF THE LIKELY DEPTHS THAT ARE PRESENT ALONG THE CENTRELINE OF THE A12 ALIGNMENT.
4. THESE DRAWINGS ARE BASED ON AGS DATA FIX 20/08/2021.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following :

CONSTRUCTION
- Not Applicable

MAINTENANCE / CLEANING
- Not Applicable

DECOMMISSIONING / DEMOLITION
- Not Applicable

0 200
SCALE 1:2500 METRES

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P01	23/04/21	FIRST ISSUE	DS	MH	CLM	PB
P02	15/06/21	SECOND ISSUE	DS	MH	CLM	RC
P03	24/11/21	THIRD ISSUE	BS	MH	CLM	DT

Contractor: COSTAIN

Designer: Jacobs
1 City Walk, Leeds, LS11 9DX
Tel:+44(0)113 242 6771 Fax:+44(0)113 389 1389
www.jacobs.com

Client: national highways

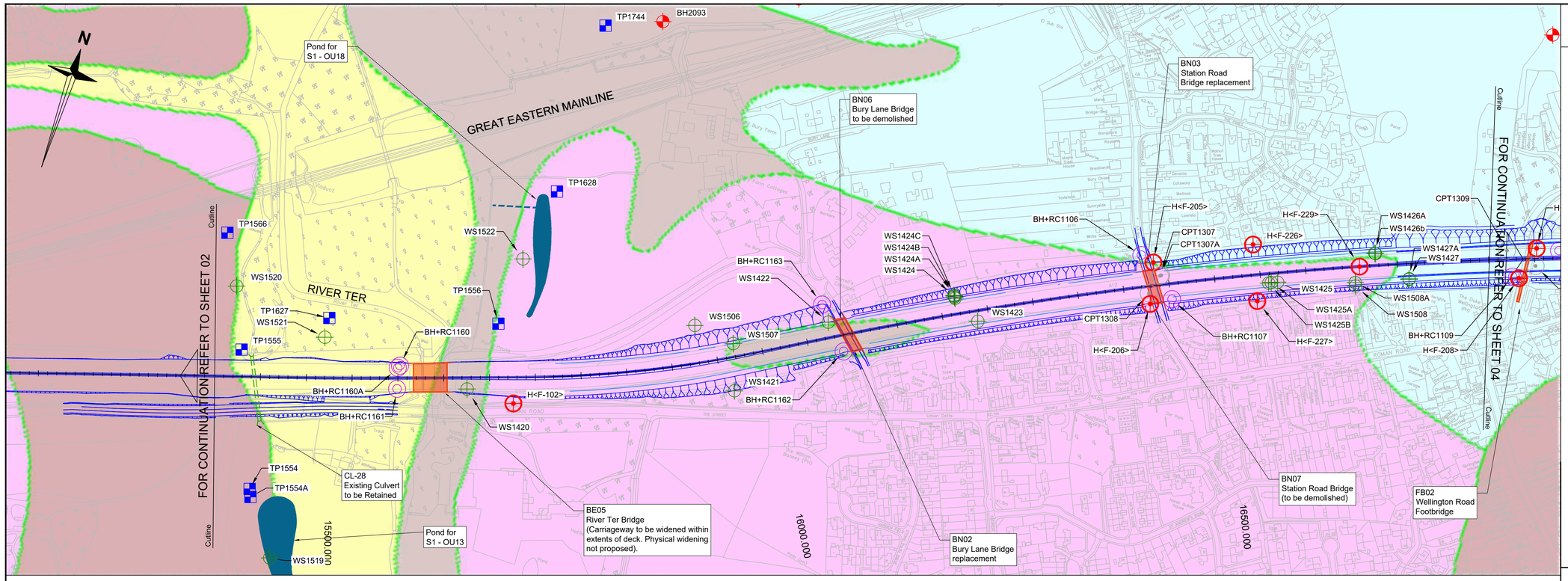
Project
REGIONAL DELIVERY PARTNERSHIP
A12 CHELMSFORD TO A120 WIDENING SCHEME

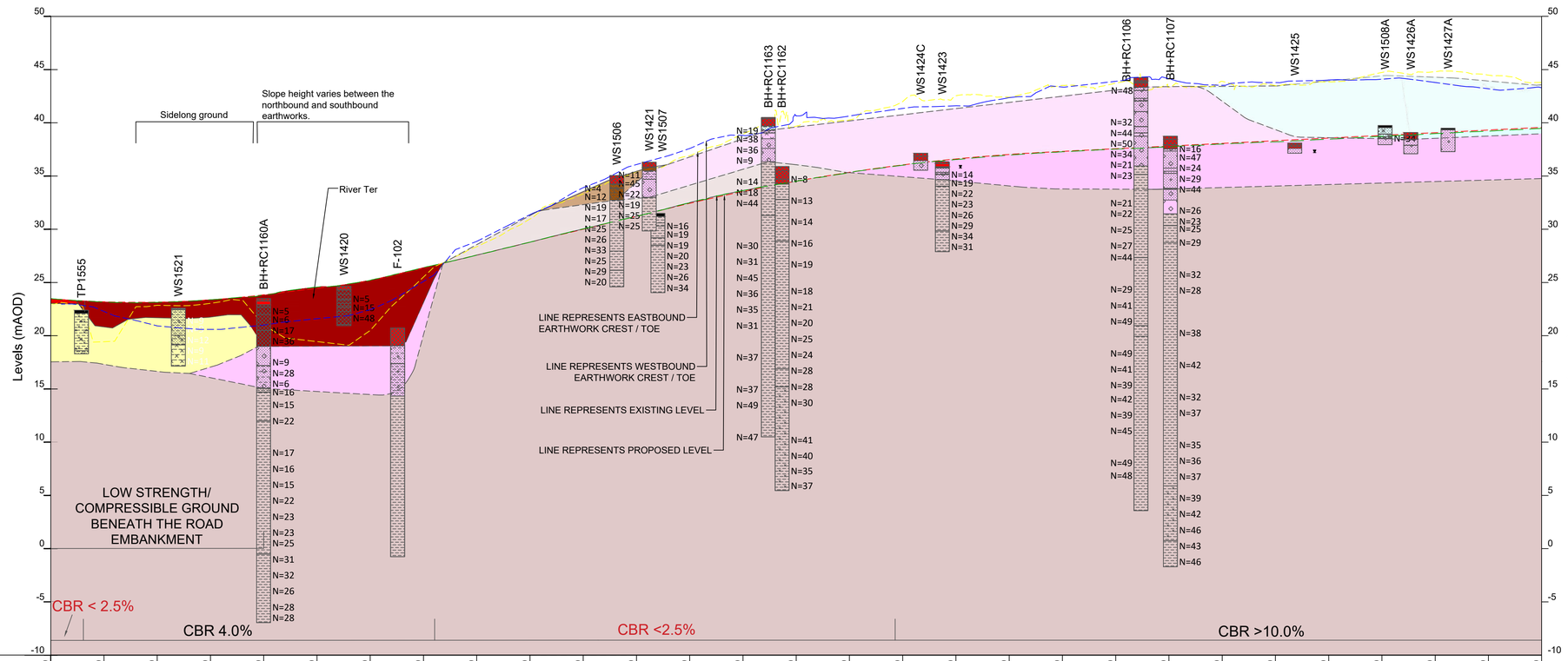
Drawing title
EXPLORATORY HOLE LOCATION PLAN AND GEOLOGICAL LONG SECTION SHEET 2 OF 17

Drawing status
S3 - SUITABLE FOR REVIEW AND COMMENT

State Code	Preliminary
Project Stage	PCF 3
Scale	1:2500 — DO NOT SCALE
Jacobs No.	B36601D1
Client no.	HE551497
Rev	P03

Drawing number
PIN HE551497 - | Originator JAC | Volume - HGT - | Location SCHW | Type | Role | Number -DR-GE-1002





CHAINAGE (m)	EXISTING LEVELS (mAOD)	PROPOSED LEVELS (mAOD)
15400.00	23.480	23.480
15450.00	23.197	23.197
15500.00	23.163	23.163
15550.00	23.380	23.380
15600.00	23.846	23.846
15650.00	24.466	24.466
15700.00	25.202	25.202
15750.00	26.355	26.355
15800.00	27.574	27.574
15850.00	28.792	28.792
15900.00	30.011	30.011
15950.00	31.230	31.230
16000.00	32.442	32.442
16050.00	33.550	33.550
16100.00	34.521	34.521
16150.00	35.355	35.355
16200.00	36.051	36.051
16250.00	36.610	36.610
16300.00	37.031	37.031
16350.00	37.320	37.320
16400.00	37.570	37.570
16450.00	37.820	37.820
16500.00	38.070	38.070
16550.00	38.321	38.321
16600.00	38.571	38.571
16650.00	38.821	38.821
16700.00	39.072	39.072
16750.00	39.322	39.322
16800.00	39.572	39.572

NOTES:
1. ALL MEASUREMENTS TO BE IN METERS UNLESS SPECIFIED OTHERWISE.
2. FOR GENERAL NOTES AND LEGEND PLEASE REFER TO DRAWING HE551497-JAC-HGT-SCHW-DR-GE-1000.
3. ANY GEOLOGICAL BOUNDARIES SHOWN IN THE PROFILE CORRESPOND TO INTERPOLATION OF THE LIKELY DEPTHS THAT ARE PRESENT ALONG THE CENTRELINE OF THE A12 ALIGNMENT.
4. THESE DRAWINGS ARE BASED ON AGS DATA FIX 20/08/2021.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following :

CONSTRUCTION
- Not Applicable

MAINTENANCE / CLEANING
- Not Applicable

DECOMMISSIONING / DEMOLITION
- Not Applicabble

0 — 200
SCALE 1:2500 METRES

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P01	23/04/21	FIRST ISSUE	DS	MH	CLM	PB
P02	15/06/21	SECOND ISSUE	DS	MH	CLM	RC
P03	24/11/21	THIRD ISSUE	BS	MH	CLM	DT

Contractor: COSTAIN

Designer: Jacobs
1 City Walk, Leeds, LS11 9DX
Tel:+44(0)113 242 6771 Fax:+44(0)113 389 1389
www.jacobs.com

Client: national highways

Project
REGIONAL DELIVERY PARTNERSHIP
A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing title
EXPLORATORY HOLE LOCATION PLAN AND GEOLOGICAL LONG SECTION SHEET 3 OF 17

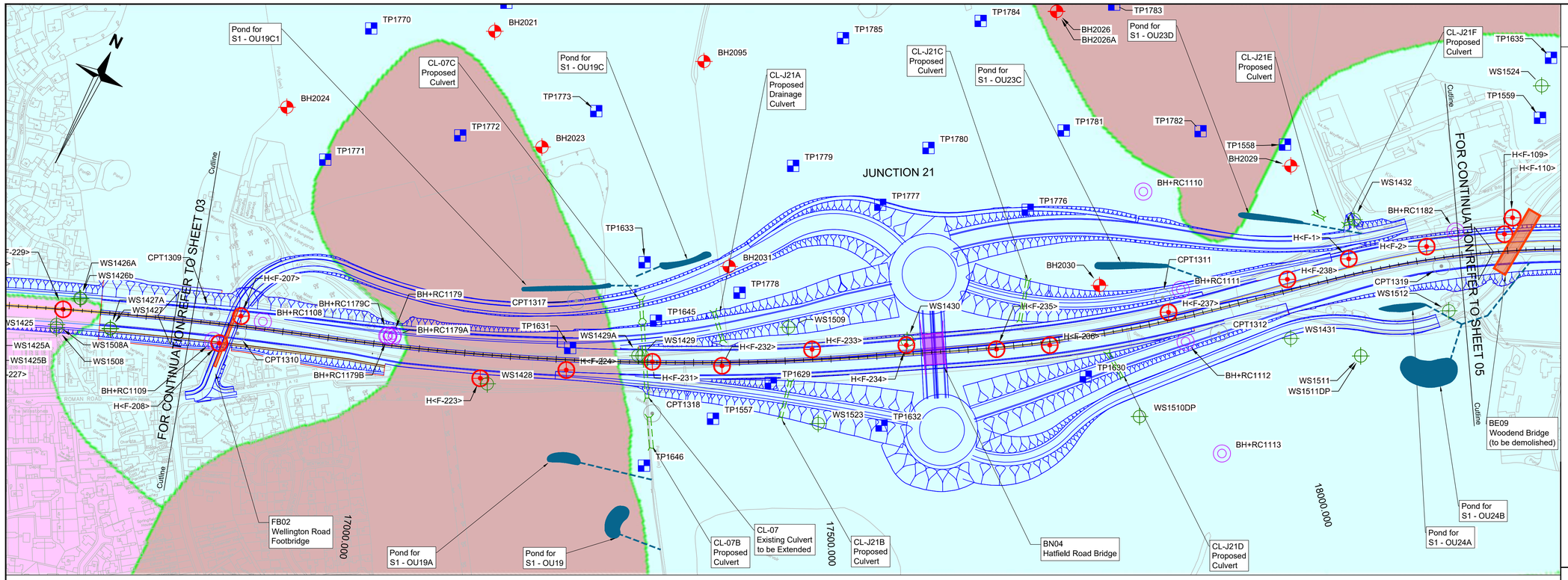
Drawing status
S3 - SUITABLE FOR REVIEW AND COMMENT

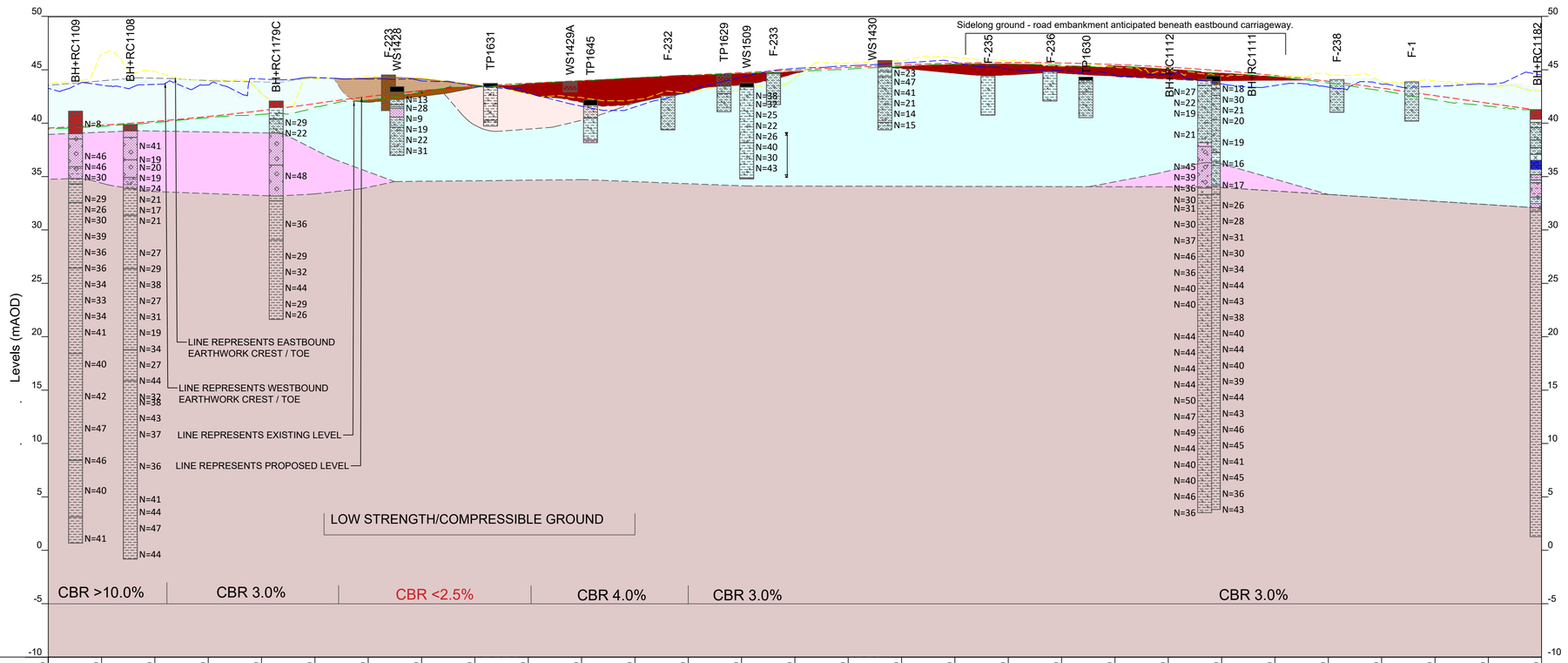
State Code	Preliminary
Project Stage	PCF 3
Scale	1:2500
Jacobs No.	B36601D1
Client no.	HE551497

DO NOT SCALE

Rev P03

Drawing number
PIN | Originator | Volume
HE551497 - JAC - HGT -
Location | Type | Role | Number
SCHW -DR-GE-1003





CHAINAGE (m)	16800.00	16850.00	16900.00	16950.00	17000.00	17050.00	17100.00	17150.00	17200.00	17250.00	17300.00	17350.00	17400.00	17450.00	17500.00	17550.00	17600.00	17650.00	17700.00	17750.00	17800.00	17850.00	17900.00	17950.00	18000.00	18050.00	18100.00	18150.00	18200.00
EXISTING LEVELS (mAOD)	39.572	39.838	40.193	40.649	41.204	41.859	42.521	43.063	43.480	43.773	44.019	44.265	44.512	44.758	45.004	45.250	45.489	45.647	45.705	45.663	45.520	45.278	44.936	44.494	43.952	43.310	42.603	41.896	41.187
PROPOSED LEVELS (mAOD)	39.572	39.838	40.193	40.649	41.204	41.859	42.521	43.063	43.480	43.773	44.019	44.265	44.512	44.758	45.004	45.250	45.489	45.647	45.705	45.663	45.520	45.278	44.936	44.494	43.952	43.310	42.603	41.896	41.187

NOTES:
1. ALL MEASUREMENTS TO BE IN METERS UNLESS SPECIFIED OTHERWISE.
2. FOR GENERAL NOTES AND LEGEND PLEASE REFER TO DRAWING HE551497-JAC-HGT-SCHW-DR-GE-1000.
3. ANY GEOLOGICAL BOUNDARIES SHOWN IN THE PROFILE CORRESPOND TO INTERPOLATION OF THE LIKELY DEPTHS THAT ARE PRESENT ALONG THE CENTRELINE OF THE A12 ALIGNMENT.
4. THESE DRAWINGS ARE BASED ON AGS DATA FIX 20/08/2021.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following :

CONSTRUCTION
- Not Applicable

MAINTENANCE / CLEANING
- Not Applicable

DECOMMISSIONING / DEMOLITION
- Not Applicabble

0 — 200
SCALE 1:2500 METRES

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P01	23/04/21	FIRST ISSUE	DS	MH	CLM	PB
P02	15/06/21	SECOND ISSUE	DS	MH	CLM	RC
P03	24/11/21	THIRD ISSUE	BS	MH	CLM	DT

Contractor: COSTAIN

Designer: Jacobs
1 City Walk, Leeds, LS11 9DX
Tel:+44(0)113 242 6771 Fax:+44(0)113 389 1389
www.jacobs.com

Client: national highways

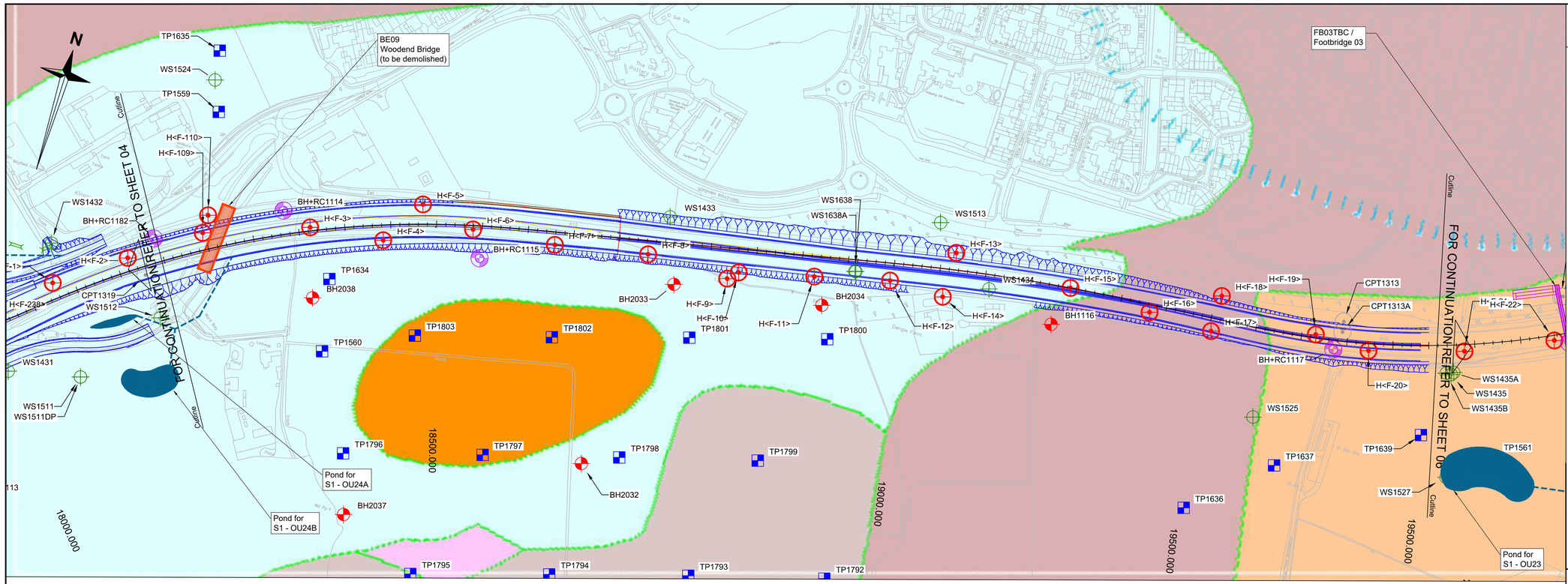
Project
REGIONAL DELIVERY PARTNERSHIP
A12 CHELMSFORD TO A120 WIDENING SCHEME

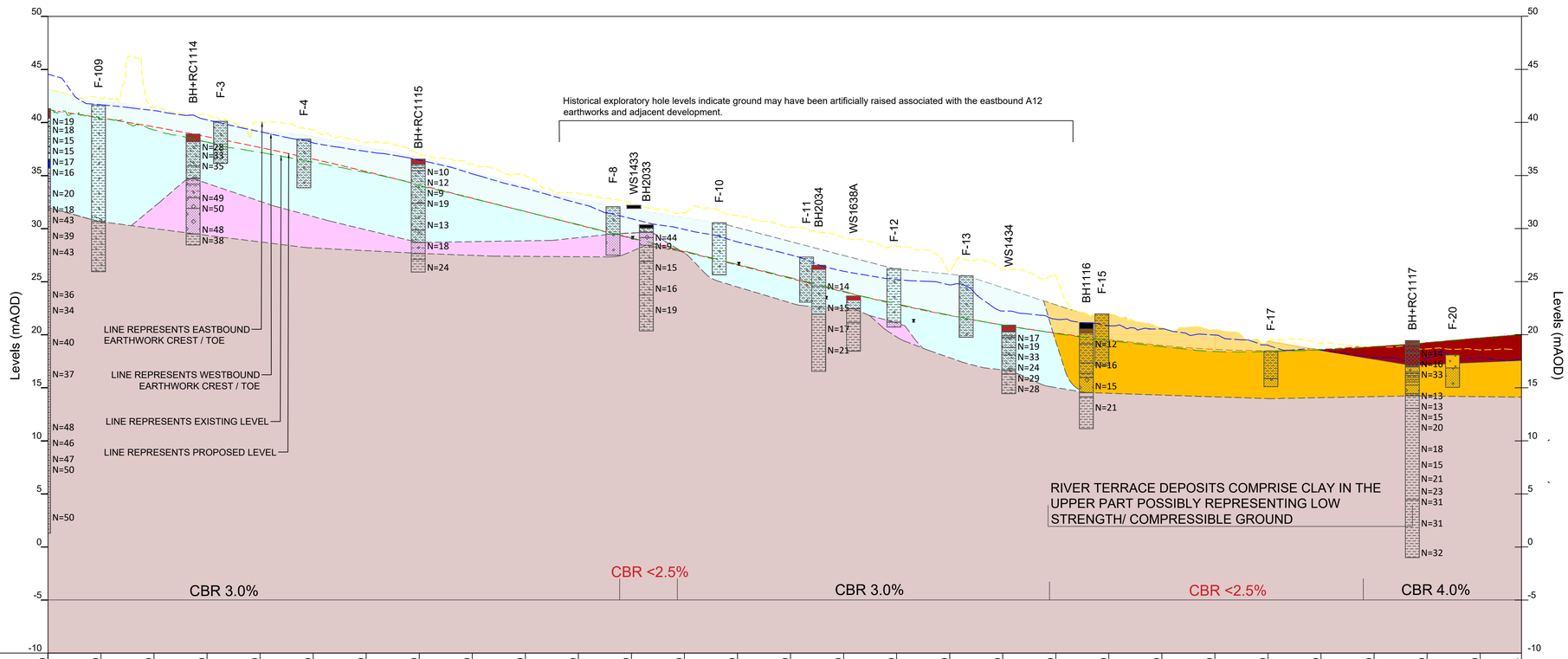
Drawing title
EXPLORATORY HOLE LOCATION PLAN AND GEOLOGICAL LONG SECTION SHEET 4 OF 17

Drawing status
S3 - SUITABLE FOR REVIEW AND COMMENT

State Code	Preliminary
Project Stage	PCF 3
Scale	1:2500 — DO NOT SCALE
Jacobs No.	B36601D1
Client no.	HE551497
Rev	P03

Drawing number
PIN HE551497 - | Originator JAC - | Volume HGT - | Location SCHW | Type | Role | Number -DR-GE-1004





CHAINAGE (m)	EXISTING LEVELS (mAOD)	PROPOSED LEVELS (mAOD)
18200.00	41.187	41.187
18250.00	40.427	40.427
18300.00	39.583	39.583
18350.00	38.656	38.656
18400.00	37.646	37.646
18450.00	36.552	36.552
18500.00	35.375	35.375
18550.00	34.125	34.125
18600.00	32.865	32.865
18650.00	31.605	31.605
18700.00	30.345	30.345
18750.00	29.084	29.084
18800.00	27.824	27.824
18850.00	26.564	26.564
18900.00	25.304	25.304
18950.00	24.043	24.043
19000.00	22.856	22.856
19050.00	21.812	21.812
19100.00	20.911	20.911
19150.00	20.152	20.152
19200.00	19.536	19.536
19250.00	18.987	18.987
19300.00	18.614	18.614
19350.00	18.492	18.492
19400.00	18.619	18.619
19450.00	18.987	18.987
19500.00	19.422	19.422
19550.00	19.856	19.856
19589.04		

NOTES:
1. ALL MEASUREMENTS TO BE IN METERS UNLESS SPECIFIED OTHERWISE.
2. FOR GENERAL NOTES AND LEGEND PLEASE REFER TO DRAWING HE551497-JAC-HGT-SCHW-DR-GE-1000.
3. ANY GEOLOGICAL BOUNDARIES SHOWN IN THE PROFILE CORRESPOND TO INTERPOLATION OF THE LIKELY DEPTHS THAT ARE PRESENT ALONG THE CENTRELINE OF THE A12 ALIGNMENT.
4. THESE DRAWINGS ARE BASED ON AGS DATA FIX 20/08/2021.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following :

CONSTRUCTION
- Not Applicable

MAINTENANCE / CLEANING
- Not Applicable

DECOMMISSIONING / DEMOLITION
- Not Applicabble

0 200
SCALE 1:2500 METRES

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P01	23/04/21	FIRST ISSUE	DS	MH	CLM	PB
P02	15/06/21	SECOND ISSUE	DS	MH	CLM	RC
P03	24/11/21	THIRD ISSUE	BS	MH	CLM	DT

Contractor: COSTAIN

Designer: Jacobs
1 City Walk, Leeds, LS11 9DX
Tel:+44(0)113 242 6771 Fax:+44(0)113 389 1389
www.jacobs.com

Client: national highways

Project
REGIONAL DELIVERY PARTNERSHIP
A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing title
EXPLORATORY HOLE LOCATION PLAN AND GEOLOGICAL LONG SECTION SHEET 5 OF 17

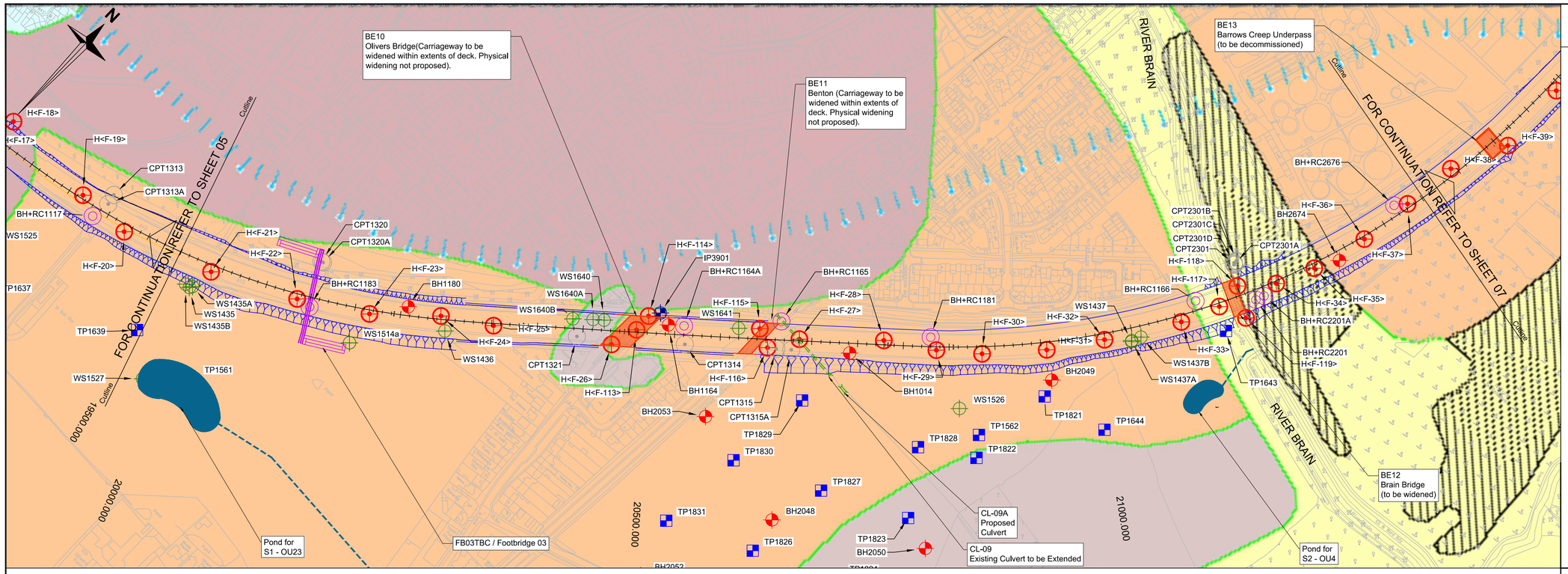
Drawing status
S3 - SUITABLE FOR REVIEW AND COMMENT

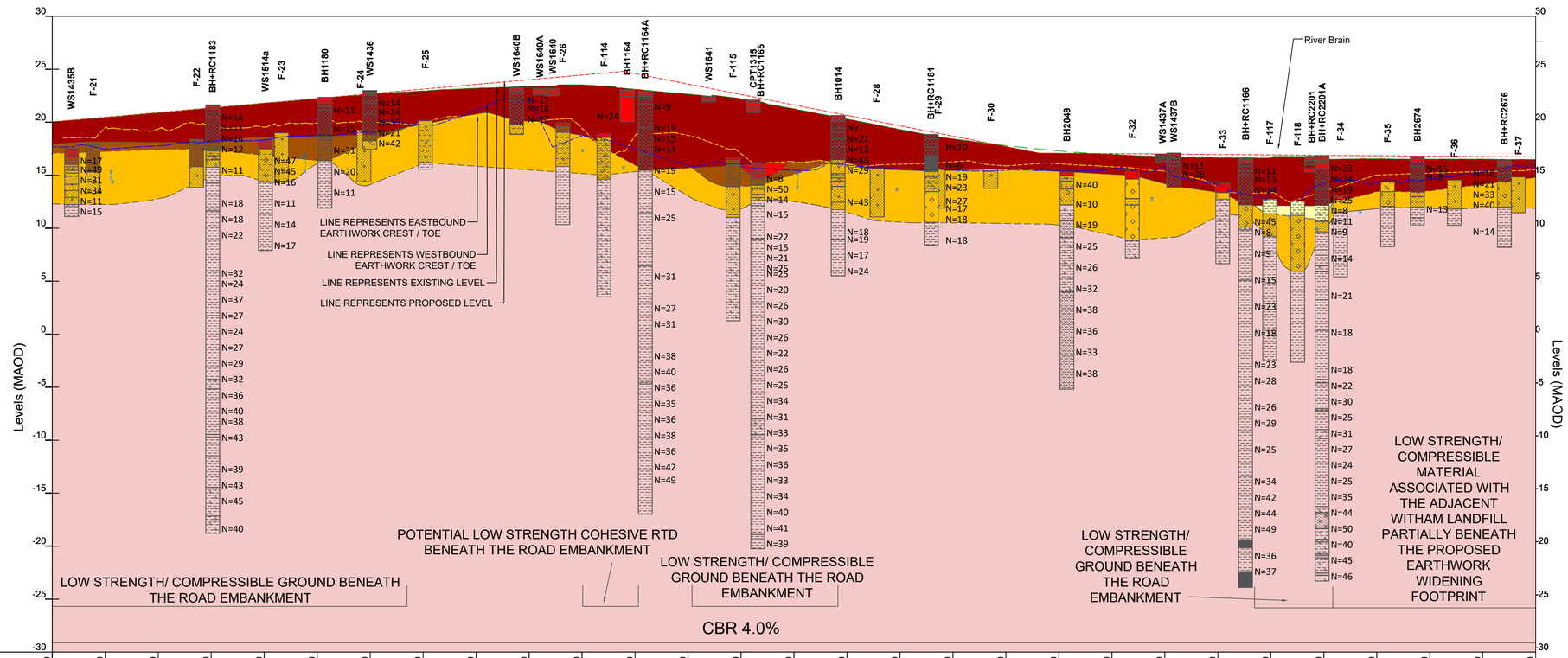
State Code	Preliminary
Project Stage	PCF 3
Scale	1:2500
Jacobs No.	B36601D1
Client no.	HE551497

DO NOT SCALE

Rev P03

Drawing number
PIN | Originator | Volume
HE551497 - JAC - HGT -
Location | Type | Role | Number
SCHW -DR-GE-1005





CHAINAGE (m)	EXISTING LEVELS (mAOD)	PROPOSED LEVELS (mAOD)
20000.00	20.033	20.033
20050.00	20.449	20.475
20100.00	20.877	20.918
20150.00	21.326	21.360
20200.00	21.806	21.803
20250.00	22.231	22.245
20300.00	22.635	22.688
20350.00	22.963	23.110
20400.00	23.213	23.386
20450.00	23.381	23.496
20500.00	23.518	23.439
20550.00	23.113	23.216
20600.00	22.656	22.826
20650.00	22.219	22.269
20700.00	21.268	21.545
20750.00	20.308	20.655
20800.00	19.318	19.676
20850.00	18.429	18.811
20900.00	17.799	18.113
20950.00	17.303	17.581
21000.00	16.972	17.216
21050.00	16.757	17.018
21100.00	16.665	16.961
21150.00	16.712	16.922
21200.00	16.513	16.882
21250.00	16.547	16.843
21300.00	16.510	16.803
21350.00	16.506	16.764
21400.00	16.480	16.724

NOTES:
1. ALL MEASUREMENTS TO BE IN METERS UNLESS SPECIFIED OTHERWISE.
2. FOR GENERAL NOTES AND LEGEND PLEASE REFER TO DRAWING HE551497-JAC-HGT-SCHW-DR-GE-1000.
3. ANY GEOLOGICAL BOUNDARIES SHOWN IN THE PROFILE CORRESPOND TO INTERPOLATION OF THE LIKELY DEPTHS THAT ARE PRESENT ALONG THE CENTRELINE OF THE A12 ALIGNMENT.
4. THESE DRAWINGS ARE BASED ON AGS DATA FIX 20/08/2021.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following :

CONSTRUCTION
- Not Applicable

MAINTENANCE / CLEANING
- Not Applicable

DECOMMISSIONING / DEMOLITION
- Not Applicabble

0 — 200
SCALE 1:2500 METRES

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P01	15/06/21	FIRST ISSUE	DS	MH	CLM	RC
P02	24/11/21	SECOND ISSUE	BS	MH	CLM	DT

Contractor: COSTAIN

Designer: Jacobs
1 City Walk, Leeds, LS11 9DX
Tel:+44(0)113 242 6771 Fax:+44(0)113 389 1389
www.jacobs.com

Client: national highways

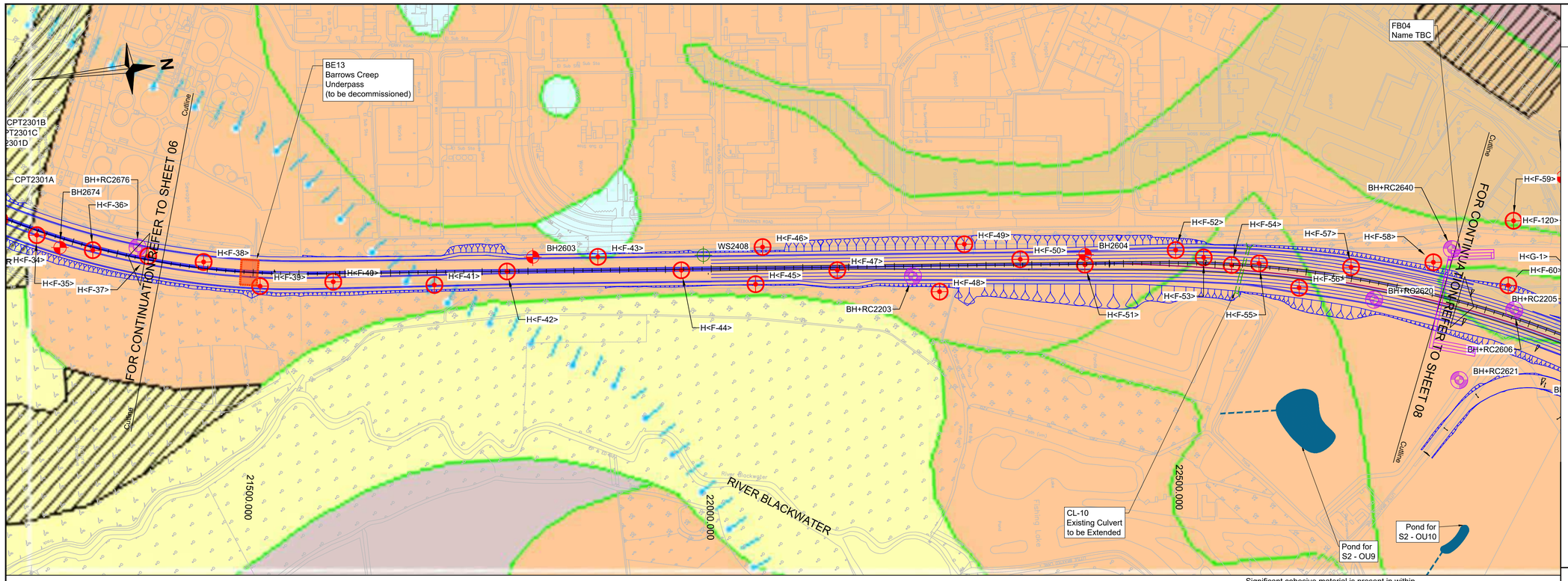
Project: REGIONAL DELIVERY PARTNERSHIP
A12 CHELMSFORD TO A120 WIDENING SCHEME

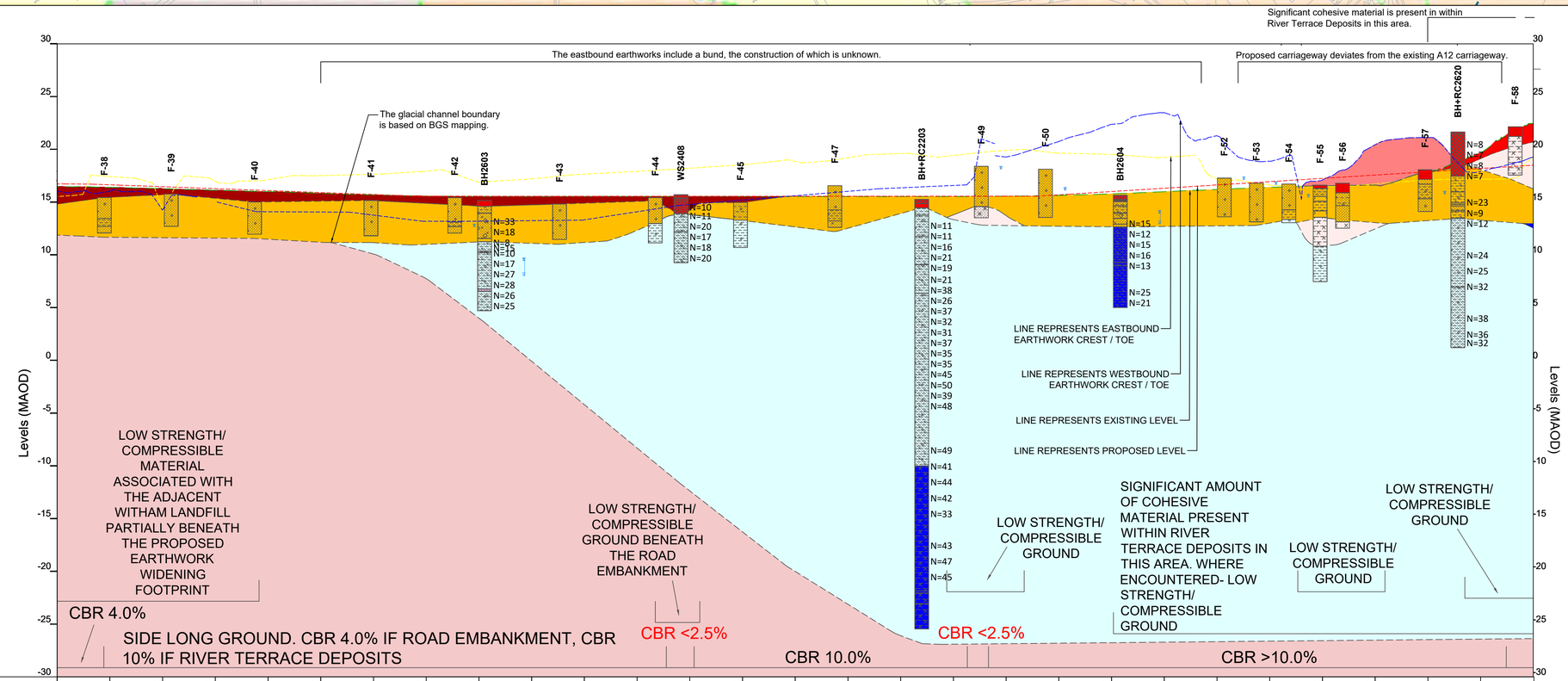
Drawing title: EXPLORATORY HOLE LOCATION PLAN AND GEOLOGICAL LONG SECTION SHEET 6 OF 17

Drawing status: S3 - SUITABLE FOR REVIEW AND COMMENT

State Code	Preliminary
Project Stage	PCF 3
Scale	1:2500 — DO NOT SCALE
Jacobs No.	B36601D1
Client no.	HE551497
Rev	P02

Drawing number
PIN HE551497 - Originator JAC - Volume HGT - Location SCHW - Type - Role - Number -DR-GE-1006





CHAINAGE (m)	EXISTING LEVELS (mAOD)	PROPOSED LEVELS (mAOD)
21400.00	16.480	16.724
21450.00	16.396	16.635
21500.00	16.281	16.454
21550.00	16.122	16.270
21600.00	15.987	16.086
21650.00	15.818	15.902
21700.00	15.673	15.718
21750.00	15.569	15.564
21800.00	15.520	15.556
21850.00	15.514	15.555
21900.00	15.532	15.555
21950.00	15.527	15.555
22000.00	15.534	15.554
22050.00	15.534	15.554
22100.00	15.516	15.553
22150.00	15.521	15.553
22200.00	15.520	15.553
22250.00	15.519	15.552
22300.00	15.557	15.552
22350.00	15.631	15.690
22400.00	15.780	15.997
22450.00	15.980	16.309
22500.00	16.196	16.622
22550.00	16.396	16.934
22600.00	16.530	17.246
22650.00	16.610	17.558
22700.00	17.833	17.870
22750.00	19.670	18.183
22800.00	22.491	18.495

NOTES:
1. ALL MEASUREMENTS TO BE IN METERS UNLESS SPECIFIED OTHERWISE.
2. FOR GENERAL NOTES AND LEGEND PLEASE REFER TO DRAWING HE551497-JAC-HGT-SCHW-DR-GE-1000.
3. ANY GEOLOGICAL BOUNDARIES SHOWN IN THE PROFILE CORRESPOND TO INTERPOLATION OF THE LIKELY DEPTHS THAT ARE PRESENT ALONG THE CENTRELINE OF THE A12 ALIGNMENT.
4. THESE DRAWINGS ARE BASED ON AGS DATA FIX 20/08/2021.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following :

CONSTRUCTION
- Not Applicable

MAINTENANCE / CLEANING
- Not Applicable

DECOMMISSIONING / DEMOLITION
- Not Applicabble

0 — 200
SCALE 1:2500 METRES

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P01	15/06/21	FIRST ISSUE	DS	MH	CLM	RC
P02	24/11/21	SECOND ISSUE	BS	MH	CLM	DT

Contractor: COSTAIN

Designer: Jacobs
1 City Walk, Leeds, LS11 9DX
Tel:+44(0)113 242 6771 Fax:+44(0)113 389 1389
www.jacobs.com

Client: national highways

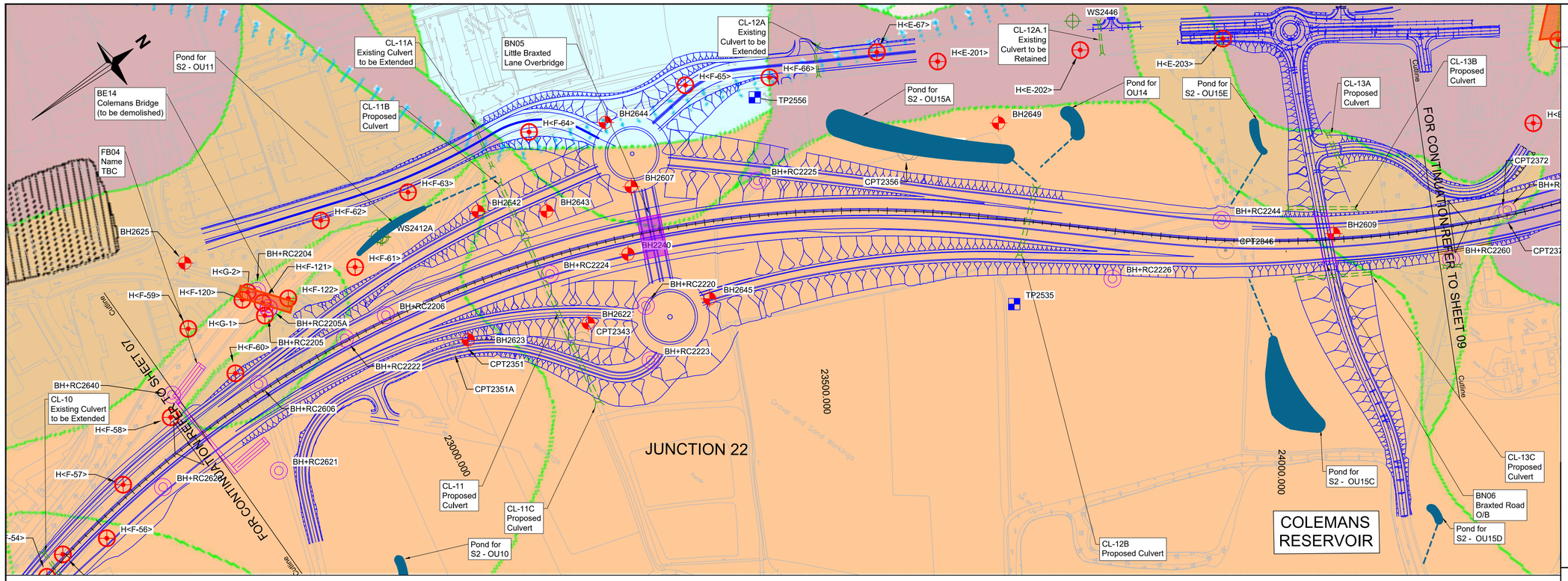
Project
REGIONAL DELIVERY PARTNERSHIP
A12 CHELMSFORD TO A120 WIDENING SCHEME

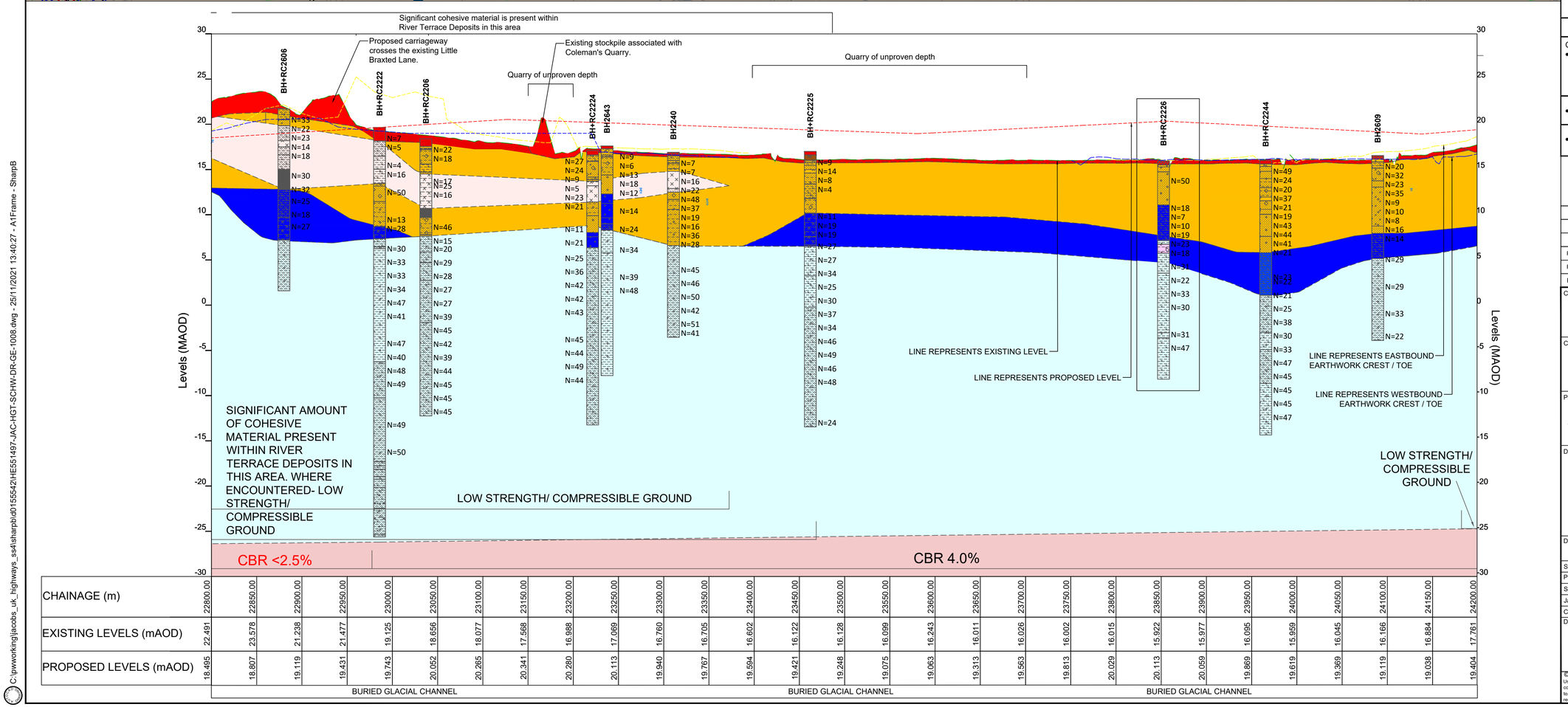
Drawing title
EXPLORATORY HOLE LOCATION PLAN AND GEOLOGICAL LONG SECTION SHEET 7 OF 17

Drawing status
S3 - SUITABLE FOR REVIEW AND COMMENT

State Code	Preliminary
Project Stage	PCF 3
Scale	1:2500 — DO NOT SCALE
Jacobs No.	B36601D1
Client no.	HE551497
Rev	P02

Drawing number
PIN HE551497 - Originator JAC - Volume HGT - Location SCHW - Type DR - Role GE - Number 1007





CHAINAGE (m)	EXISTING LEVELS (mAOD)	PROPOSED LEVELS (mAOD)
22800.00	22.491	18.495
22850.00	23.578	18.807
22900.00	21.238	19.119
22950.00	21.477	19.431
23000.00	19.125	19.743
23050.00	18.656	20.052
23100.00	18.077	20.265
23150.00	17.568	20.341
23200.00	16.988	20.280
23250.00	17.069	20.113
23300.00	16.760	19.940
23350.00	16.705	19.767
23400.00	16.602	19.594
23450.00	16.122	19.421
23500.00	16.128	19.248
23550.00	16.099	19.075
23600.00	16.243	19.063
23650.00	16.011	19.313
23700.00	16.026	19.563
23750.00	16.002	19.813
23800.00	16.015	20.029
23850.00	15.922	20.113
23900.00	15.977	20.059
23950.00	16.095	19.869
24000.00	15.959	19.619
24050.00	16.045	19.369
24100.00	16.166	19.119
24150.00	16.884	19.038
24200.00	17.761	19.404

NOTES:
1. ALL MEASUREMENTS TO BE IN METERS UNLESS SPECIFIED OTHERWISE.
2. FOR GENERAL NOTES AND LEGEND PLEASE REFER TO DRAWING HE551497-JAC-HGT-SCHW-DR-GE-1000.
3. ANY GEOLOGICAL BOUNDARIES SHOWN IN THE PROFILE CORRESPOND TO INTERPOLATION OF THE LIKELY DEPTHS THAT ARE PRESENT ALONG THE CENTRELINE OF THE A12 ALIGNMENT.
4. THESE DRAWINGS ARE BASED ON AGS DATA FIX 20/08/2021.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following :

CONSTRUCTION
- Not Applicable

MAINTENANCE / CLEANING
- Not Applicable

DECOMMISSIONING / DEMOLITION
- Not Applicabble

0 — 200
SCALE 1:2500 METRES

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P01	15/06/21	FIRST ISSUE	DS	MH	CLM	RC
P02	24/11/21	SECOND ISSUE	BS	MH	CLM	DT

Contractor: COSTAIN

Designer: Jacobs
1 City Walk, Leeds, LS11 9DX
Tel:+44(0)113 242 6771 Fax:+44(0)113 389 1389
www.jacobs.com

Client: national highways

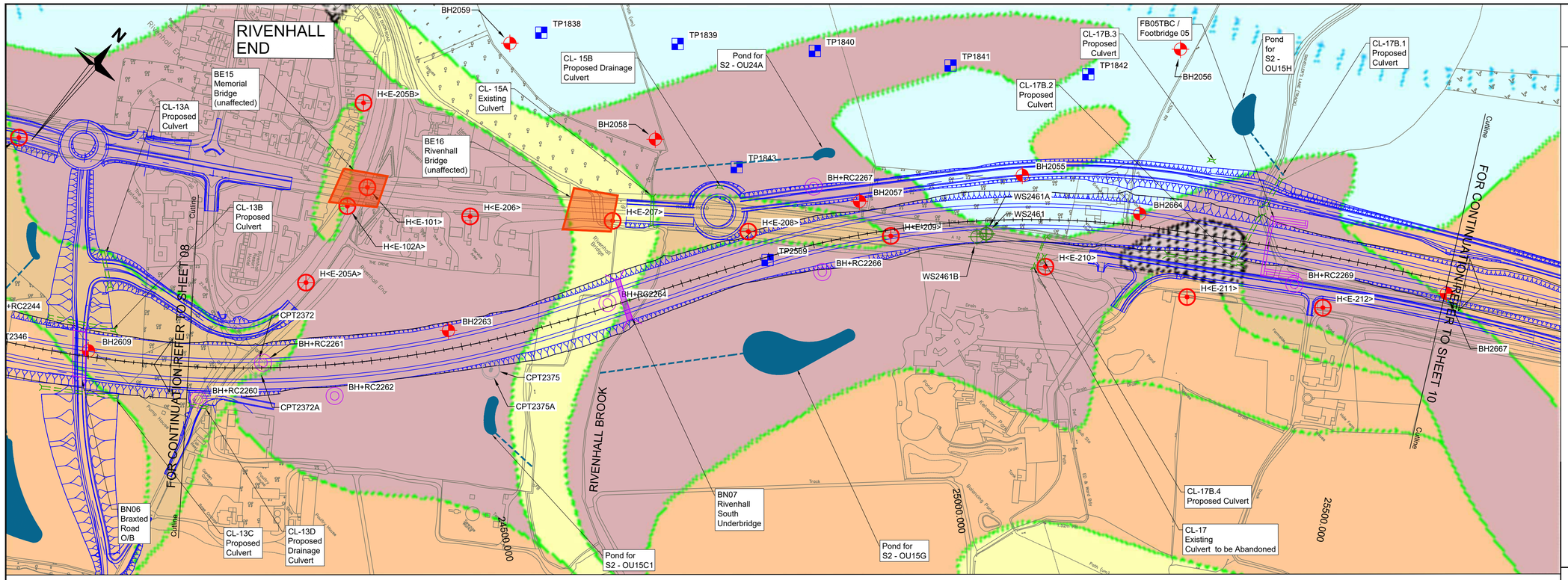
Project: REGIONAL DELIVERY PARTNERSHIP
A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing title: EXPLORATORY HOLE LOCATION PLAN AND GEOLOGICAL LONG SECTION SHEET 8 OF 17

Drawing status: S3 - SUITABLE FOR REVIEW AND COMMENT

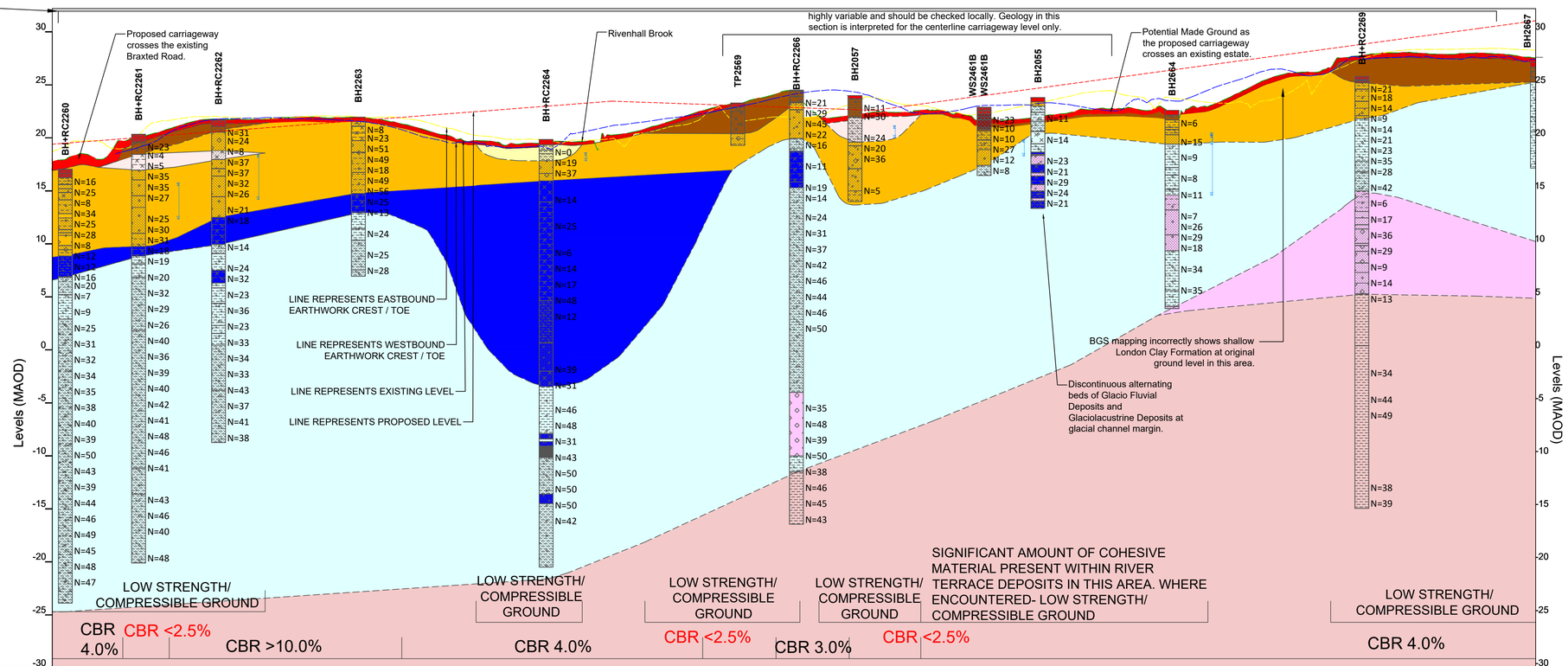
State Code	Preliminary
Project Stage	PCF 3
Scale	1:2500 — DO NOT SCALE
Jacobs No.	B36601D1
Client no.	HE551497
Rev	P02

Drawing number
PIN HE551497 - Originator JAC - Volume HGT - Location SCHW - Type DR - Role GE - Number 1008



NOTES:
1. ALL MEASUREMENTS TO BE IN METERS UNLESS SPECIFIED OTHERWISE.
2. FOR GENERAL NOTES AND LEGEND PLEASE REFER TO DRAWING HE551497-JAC-HGT-SCHW-DR-GE-1000.
3. ANY GEOLOGICAL BOUNDARIES SHOWN IN THE PROFILE CORRESPOND TO INTERPOLATION OF THE LIKELY DEPTHS THAT ARE PRESENT ALONG THE CENTRELINE OF THE A12 ALIGNMENT.
4. THESE DRAWINGS ARE BASED ON AGS DATA FIX 20/08/2021.

The alignment between approximate Chainage 24+150 and 25+550 overlies the northern boundary of a buried channel. As such, the associated superficial geological boundaries and London Clay Formation boundary are subject to significant local variation of up to 20m from the eastbound carriageway to the westbound carriageway. Further analysis and ground investigation may required for detailed design in this area.



CHAINAGE (m)	EXISTING LEVELS (mAOD)	PROPOSED LEVELS (mAOD)
24200.00	17.761	19.404
24250.00	18.126	19.789
24300.00	20.507	20.173
24350.00	21.771	20.558
24400.00	21.764	20.942
24450.00	21.950	21.327
24500.00	21.849	21.712
24550.00	20.820	22.096
24600.00	19.755	22.481
24650.00	19.503	22.821
24700.00	19.662	23.047
24750.00	20.596	23.159
24800.00	22.143	23.156
24850.00	23.290	23.039
24900.00	24.051	22.865
24950.00	22.065	22.695
25000.00	22.410	22.933
25050.00	22.248	23.603
25100.00	21.692	24.280
25150.00	22.247	24.958
25200.00	22.754	25.635
25250.00	22.732	26.313
25300.00	23.328	26.990
25350.00	25.648	27.668
25400.00	26.457	28.345
25450.00	27.944	29.023
25500.00	27.912	29.700
25550.00	28.007	30.377
25600.00	27.547	30.982

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following :

CONSTRUCTION
- Not Applicable

MAINTENANCE / CLEANING
- Not Applicable

DECOMMISSIONING / DEMOLITION
- Not Applicabble

0 — 200
SCALE 1:2500 METRES

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P01	15/06/21	FIRST ISSUE	DS	MH	CLM	RC
P02	24/11/21	SECOND ISSUE	BS	MH	CLM	DT

Contractor: COSTAIN

Designer: Jacobs
1 City Walk, Leeds, LS11 9DX
Tel:+44(0)113 242 6771 Fax:+44(0)113 389 1389
www.jacobs.com

Client: national highways

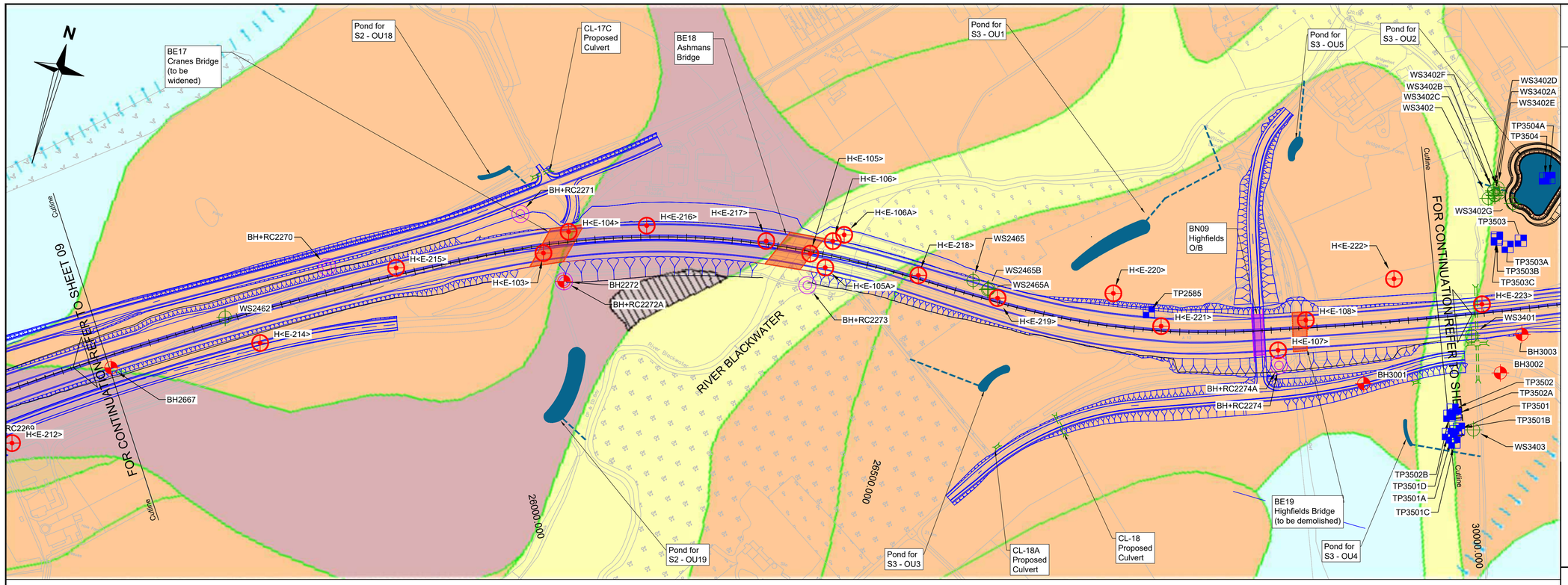
Project: REGIONAL DELIVERY PARTNERSHIP
A12 CHELMSFORD TO A120 WIDENING SCHEME

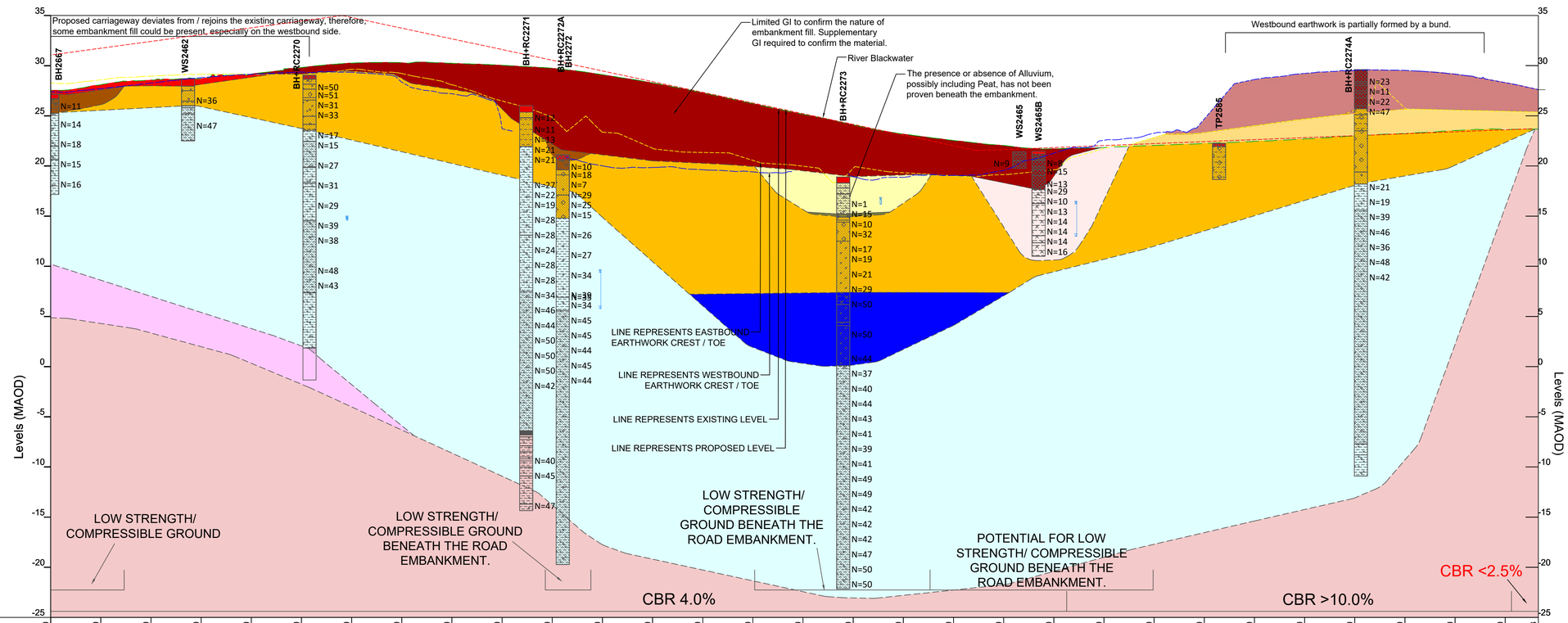
Drawing title: EXPLORATORY HOLE LOCATION PLAN AND GEOLOGICAL LONG SECTION SHEET 9 OF 17

Drawing status: S3 - SUITABLE FOR REVIEW AND COMMENT

State Code	Preliminary
Project Stage	PCF 3
Scale	1:2500 — DO NOT SCALE
Jacobs No.	B36601D1
Client no.	HE551497
Rev	P02

Drawing number
PIN HE551497 - Originator JAC - Volume HGT - Location SCHW - Type DR - Role GE - Number 1009





CHAINAGE (m)	EXISTING LEVELS (mAOD)	PROPOSED LEVELS (mAOD)
25600.00	27.547	30.982
25650.00	28.098	31.462
25700.00	28.582	31.817
25750.00	28.702	32.048
25800.00	29.140	32.153
25850.00	29.812	32.133
25900.00	30.249	31.988
25950.00	30.298	31.718
26000.00	30.231	31.323
26050.00	30.036	30.803
26100.00	29.742	30.158
26150.00	29.098	29.388
26200.00	28.281	28.493
26250.00	27.285	27.474
26300.00	26.216	26.409
26350.00	25.151	25.344
26400.00	24.096	24.280
26450.00	23.180	23.358
26500.00	22.542	22.671
26550.00	22.042	22.217
26600.00	21.711	21.998
26650.00	21.825	22.014
26700.00	22.040	22.202
26750.00	22.238	22.398
26800.00	22.449	22.595
26850.00	22.695	22.792
26900.00	22.989	22.988
26950.00	23.200	23.185
27000.00	23.534	23.382
27050.00	23.634	23.579
27083.03	23.668	23.708

BURIED GLACIAL CHANNEL

BURIED GLACIAL CHANNEL

NOTES:
1. ALL MEASUREMENTS TO BE IN METERS UNLESS SPECIFIED OTHERWISE.
2. FOR GENERAL NOTES AND LEGEND PLEASE REFER TO DRAWING HE551497-JAC-HGT-SCHW-DR-GE-1000.
3. ANY GEOLOGICAL BOUNDARIES SHOWN IN THE PROFILE CORRESPOND TO INTERPOLATION OF THE LIKELY DEPTHS THAT ARE PRESENT ALONG THE CENTRELINE OF THE A12 ALIGNMENT.
4. THESE DRAWINGS ARE BASED ON AGS DATA FIX 20/08/2021.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following :

CONSTRUCTION
- Not Applicable

MAINTENANCE / CLEANING
- Not Applicable

DECOMMISSIONING / DEMOLITION
- Not Applicabble

0 200
SCALE 1:2500 METRES

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P01	15/06/21	FIRST ISSUE	DS	MH	CLM	RC
P02	24/11/21	SECOND ISSUE	BS	MH	CLM	DT

Contractor: COSTAIN

Designer: Jacobs
1 City Walk, Leeds, LS11 9DX
Tel:+44(0)113 242 6771 Fax:+44(0)113 389 1389
www.jacobs.com

Client: national highways

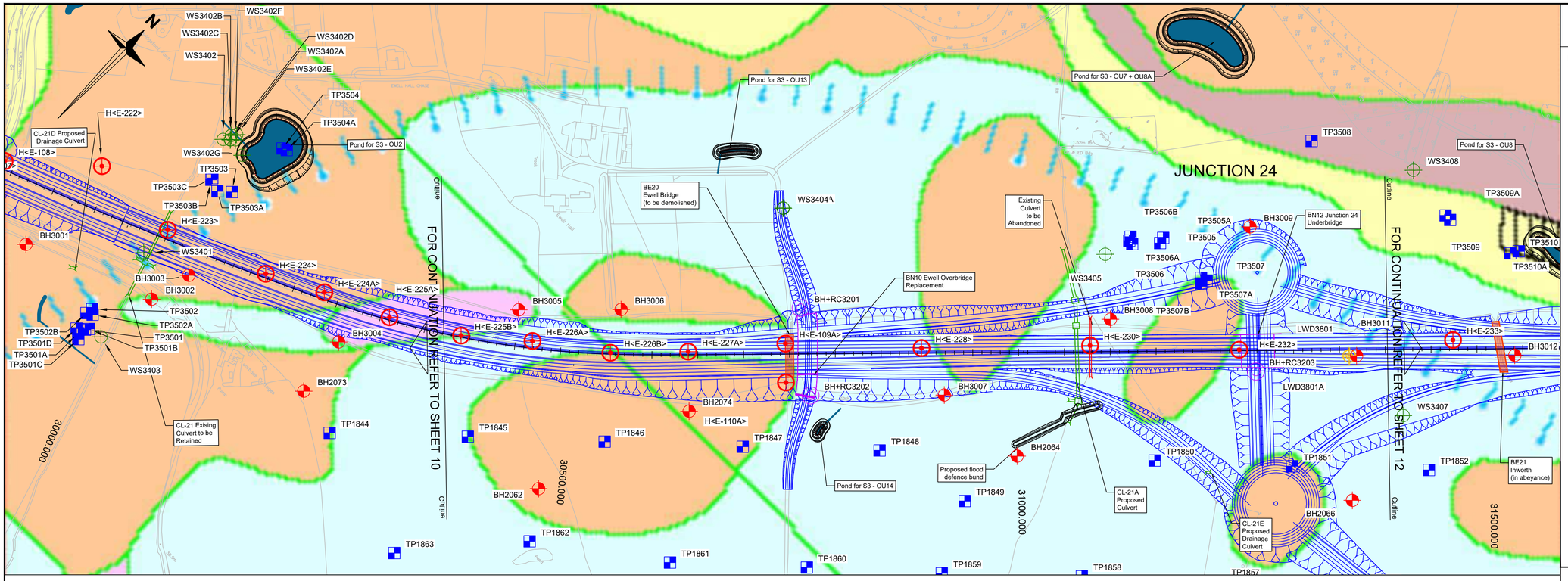
Project
REGIONAL DELIVERY PARTNERSHIP
A12 CHELMSFORD TO A120 WIDENING SCHEME

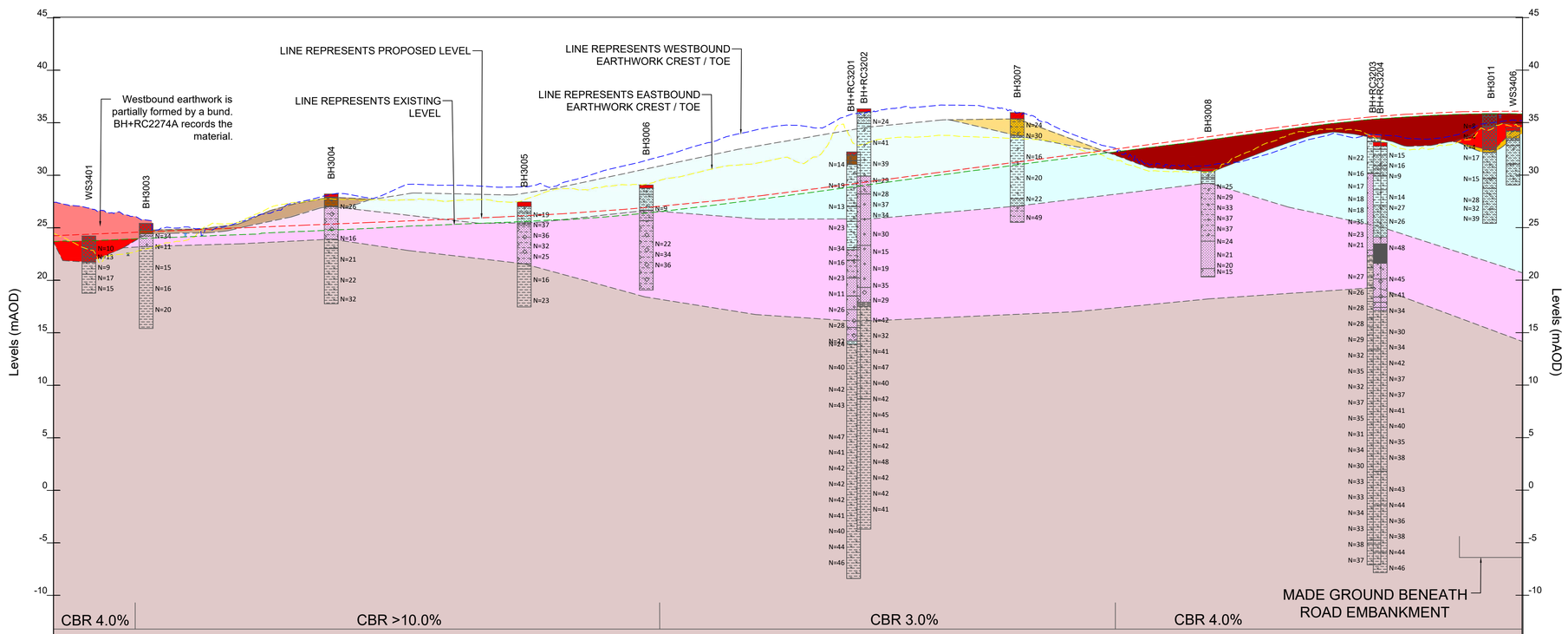
Drawing title
EXPLORATORY HOLE LOCATION PLAN AND GEOLOGICAL LONG SECTION SHEET 10 OF 17

Drawing status
S3 - SUITABLE FOR REVIEW AND COMMENT

State Code	Preliminary		
Project Stage	PCF 3		
Scale	1:2500	DO NOT SCALE	
Jacobs No.	B36601D1	Rev	P02
Client no.	HE551497		

Drawing number
PIN HE551497 - | Originator JAC | Volume - HGT - | Location SCHW | Type | Role | Number -DR-GE-1010





CHAINAGE (m)	EXISTING LEVELS (mAOD)	PROPOSED LEVELS (mAOD)
30050.00	23.809	24.434
30100.00	24.021	24.643
30150.00	24.220	24.852
30200.00	24.475	25.061
30250.00	24.695	25.270
30300.00	24.918	25.479
30350.00	25.178	25.688
30400.00	25.383	25.897
30450.00	25.596	26.119
30500.00	25.822	26.412
30550.00	26.230	26.781
30600.00	26.775	27.228
30650.00	27.396	27.751
30700.00	28.048	28.351
30750.00	28.721	29.010
30800.00	29.394	29.671
30850.00	30.067	30.332
30900.00	30.722	30.994
30950.00	31.400	31.655
31000.00	32.059	32.316
31050.00	32.689	32.978
31100.00	33.337	33.639
31150.00	34.020	34.301
31200.00	34.679	34.955
31250.00	35.248	35.485
31300.00	35.590	35.852
31350.00	35.809	36.053
31400.00	35.822	36.090

NOTES:
1. ALL MEASUREMENTS TO BE IN METERS UNLESS SPECIFIED OTHERWISE.
2. FOR GENERAL NOTES AND LEGEND PLEASE REFER TO DRAWING HE551497-JAC-HGT-SCHW-DR-GE-1000.
3. ANY GEOLOGICAL BOUNDARIES SHOWN IN THE PROFILE CORRESPOND TO INTERPOLATION OF THE LIKELY DEPTHS THAT ARE PRESENT ALONG THE CENTRELINE OF THE A12 ALIGNMENT.
4. THESE DRAWINGS ARE BASED ON AGS DATA FIX 20/08/2021.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following :

CONSTRUCTION
- Not Applicable

MAINTENANCE / CLEANING
- Not Applicable

DECOMMISSIONING / DEMOLITION
- Not Applicabble

0 — 200
SCALE 1:2500 METRES

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P01	24/11/21	FIRST ISSUE	TE	MH	CLM	DT

Contractor: COSTAIN

Designer: Jacobs
1 City Walk, Leeds, LS11 9DX
Tel:+44(0)113 242 6771 Fax:+44(0)113 389 1389
www.jacobs.com

Client: national highways

Project: REGIONAL DELIVERY PARTNERSHIP
A12 CHELMSFORD TO A120 WIDENING SCHEME

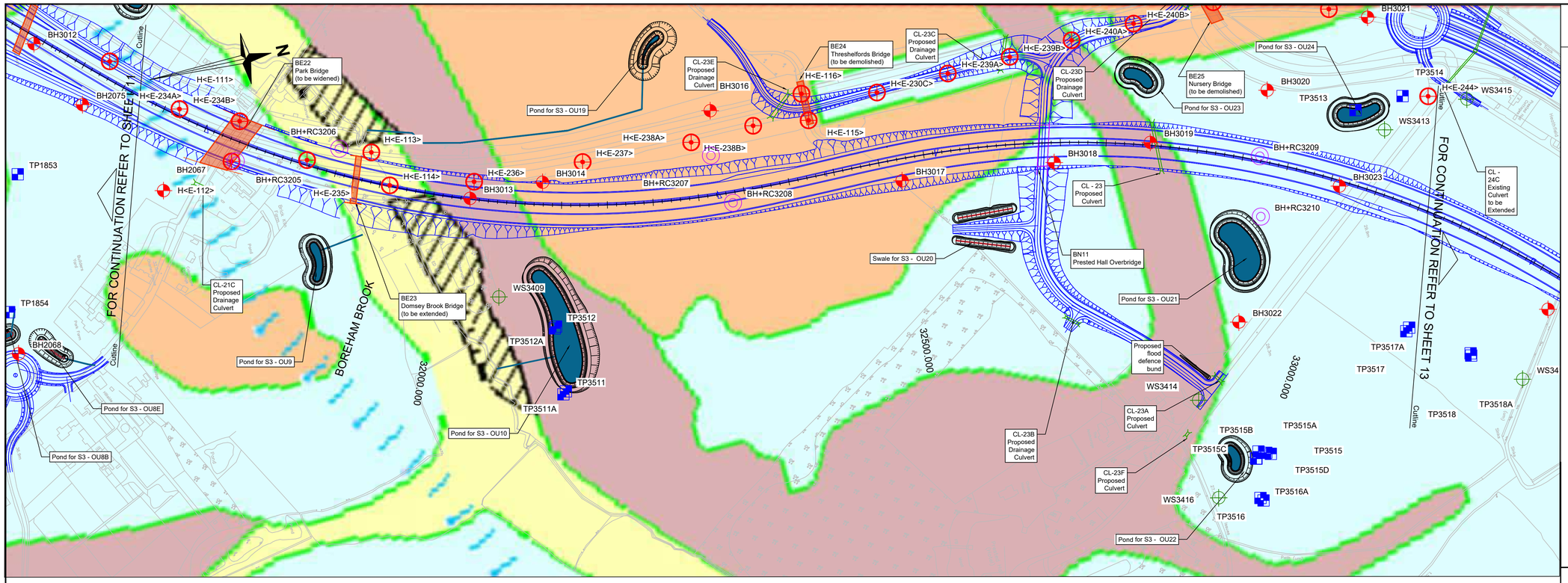
Drawing title: EXPLORATORY HOLE LOCATION PLAN AND GEOLOGICAL LONG SECTION SHEET 11 OF 17

Drawing status: S3 - SUITABLE FOR REVIEW AND COMMENT

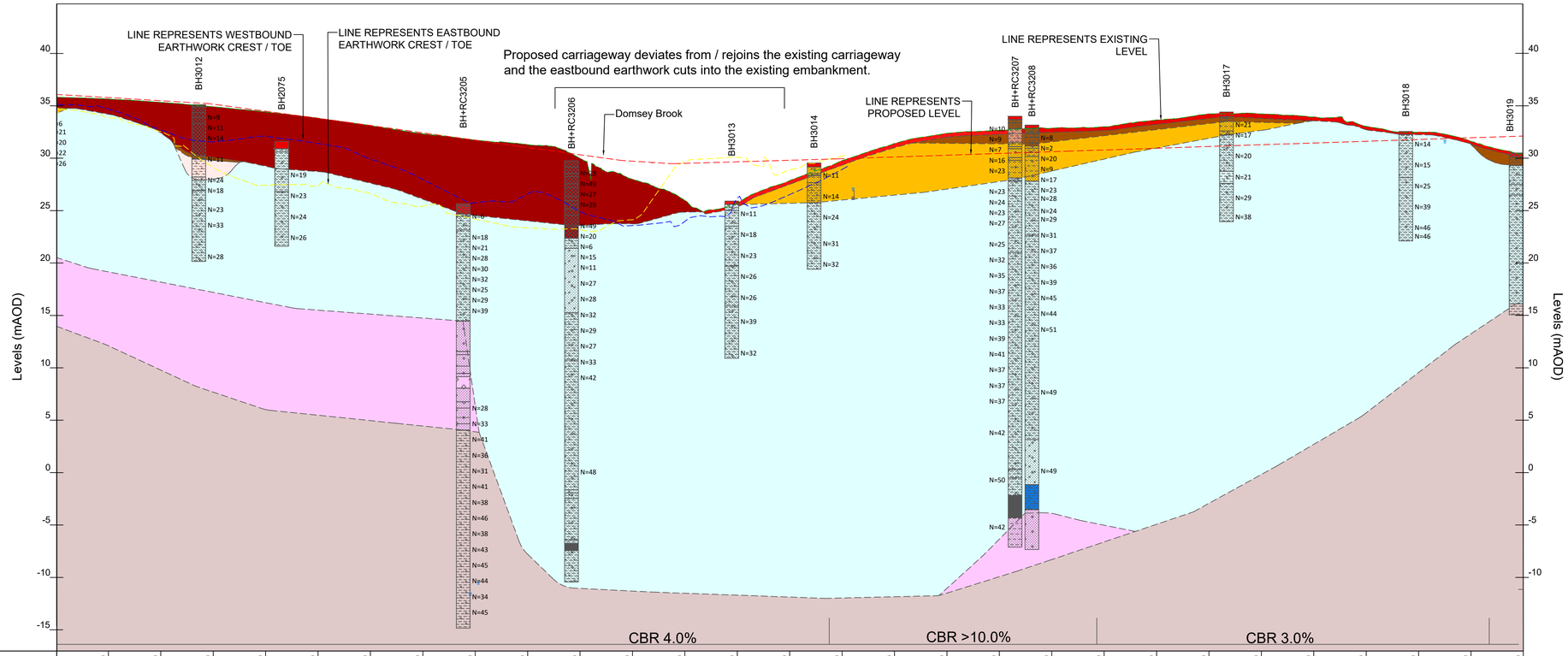
State Code	Preliminary
Project Stage	PCF3
Scale	1:2500
Jacobs No.	B36601D1
Client no.	HE551497

DO NOT SCALE
Rev P01

Drawing number
PIN HE551497 - Originator JAC - Volume HGT - Location SCHW - Type DR - Role GE - Number 1011



NOTES:
1. ALL MEASUREMENTS TO BE IN METERS UNLESS SPECIFIED OTHERWISE.
2. FOR GENERAL NOTES AND LEGEND PLEASE REFER TO DRAWING HE551497-JAC-HGT-SCHW-DR-GE-1000.
3. ANY GEOLOGICAL BOUNDARIES SHOWN IN THE PROFILE CORRESPOND TO INTERPOLATION OF THE LIKELY DEPTHS THAT ARE PRESENT ALONG THE CENTRELINE OF THE A12 ALIGNMENT.
4. THESE DRAWINGS ARE BASED ON AGS DATA FIX 20/08/2021.



CHAINAGE (m)	EXISTING LEVELS (mAOD)	PROPOSED LEVELS (mAOD)
31450.00	35.672	35.963
31500.00	35.366	35.671
31550.00	34.945	35.215
31600.00	34.461	34.594
31650.00	33.894	33.893
31700.00	33.189	33.192
31750.00	32.396	32.490
31800.00	31.789	31.789
31850.00	31.346	31.087
31900.00	30.250	30.386
31950.00	28.163	29.722
32000.00	26.280	29.463
32050.00	25.512	29.599
32100.00	27.651	29.766
32150.00	29.551	29.932
32200.00	31.223	30.099
32250.00	32.298	30.266
32300.00	32.645	30.432
32350.00	32.846	30.599
32400.00	32.966	30.765
32450.00	33.581	30.932
32500.00	34.160	31.098
32550.00	34.250	31.265
32600.00	33.953	31.431
32650.00	33.164	31.598
32700.00	32.465	31.764
32750.00	31.781	31.931
32800.00	30.440	32.097

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following :

CONSTRUCTION
- Not Applicable

MAINTENANCE / CLEANING
- Not Applicable

DECOMMISSIONING / DEMOLITION
- Not Applicabble

0 200
SCALE 1:2500 METRES

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P01	24/11/21	FIRST ISSUE	TE	MH	CLM	DT

Contractor: COSTAIN

Designer: Jacobs
1 City Walk, Leeds, LS11 9DX
Tel:+44(0)113 242 6771 Fax:+44(0)113 389 1389
www.jacobs.com

Client: national highways

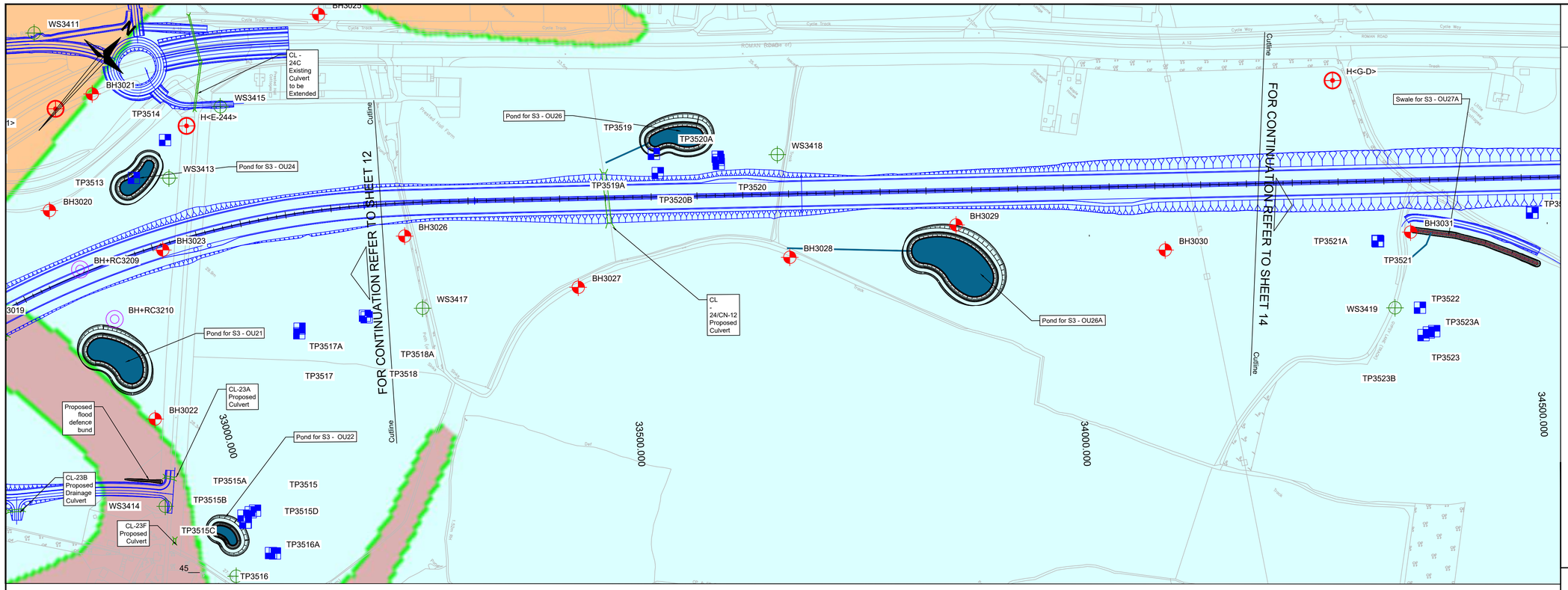
Project
REGIONAL DELIVERY PARTNERSHIP
A12 CHELMSFORD TO A120 WIDENING SCHEME

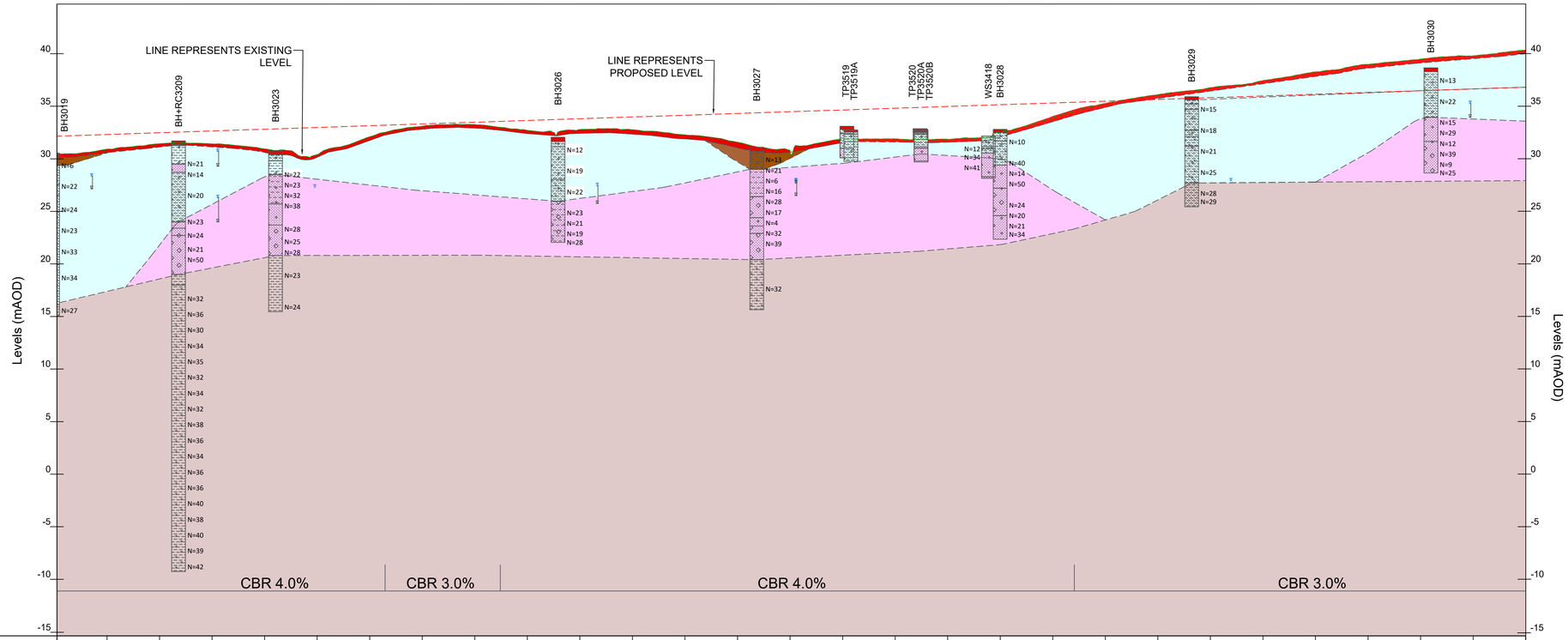
Drawing title
EXPLORATORY HOLE LOCATION PLAN AND GEOLOGICAL LONG SECTION SHEET 12 OF 17

Drawing status
S3 - SUITABLE FOR REVIEW AND COMMENT

State Code	Preliminary
Project Stage	PCF3
Scale	1:2500 — DO NOT SCALE
Jacobs No.	B36601D1
Client no.	HE551497
Rev	P01

Drawing number
PIN HE551497 - Originator JAC - Volume HGT - Location SCHW - Type DR - Role GE - Number 1012





CHAINAGE (m)	EXISTING LEVELS (mAOD)	PROPOSED LEVELS (mAOD)
32850.00	30.869	32.264
32900.00	31.383	32.430
32950.00	31.366	32.597
33000.00	30.886	32.763
33050.00	30.360	32.930
33100.00	32.047	33.096
33150.00	33.049	33.263
33200.00	33.195	33.429
33250.00	32.653	33.596
33300.00	32.740	33.762
33350.00	32.714	33.929
33400.00	32.223	34.096
33450.00	31.522	34.262
33500.00	30.577	34.429
33550.00	31.821	34.595
33600.00	31.847	34.762
33650.00	31.805	34.928
33700.00	32.522	35.095
33750.00	33.864	35.261
33800.00	35.224	35.428
33850.00	36.046	35.594
33900.00	36.721	35.761
33950.00	37.395	35.927
34000.00	38.215	36.094
34050.00	38.941	36.260
34100.00	39.432	36.427
34150.00	39.741	36.593
34200.00	40.305	36.760

NOTES:
1. ALL MEASUREMENTS TO BE IN METERS UNLESS SPECIFIED OTHERWISE.
2. FOR GENERAL NOTES AND LEGEND PLEASE REFER TO DRAWING HE551497-JAC-HGT-SCHW-DR-GE-1000.
3. ANY GEOLOGICAL BOUNDARIES SHOWN IN THE PROFILE CORRESPOND TO INTERPOLATION OF THE LIKELY DEPTHS THAT ARE PRESENT ALONG THE CENTRELINE OF THE A12 ALIGNMENT.
4. THESE DRAWINGS ARE BASED ON AGS DATA FIX 20/08/2021.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following :

CONSTRUCTION
- Not Applicable

MAINTENANCE / CLEANING
- Not Applicable

DECOMMISSIONING / DEMOLITION
- Not Applicabble

0 200
SCALE 1:2500 METRES

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P01	24/11/21	FIRST ISSUE	TE	MH	CLM	DT

Contractor: COSTAIN

Designer: Jacobs
1 City Walk, Leeds, LS11 9DX
Tel:+44(0)113 242 6771 Fax:+44(0)113 389 1389
www.jacobs.com

Client: national highways

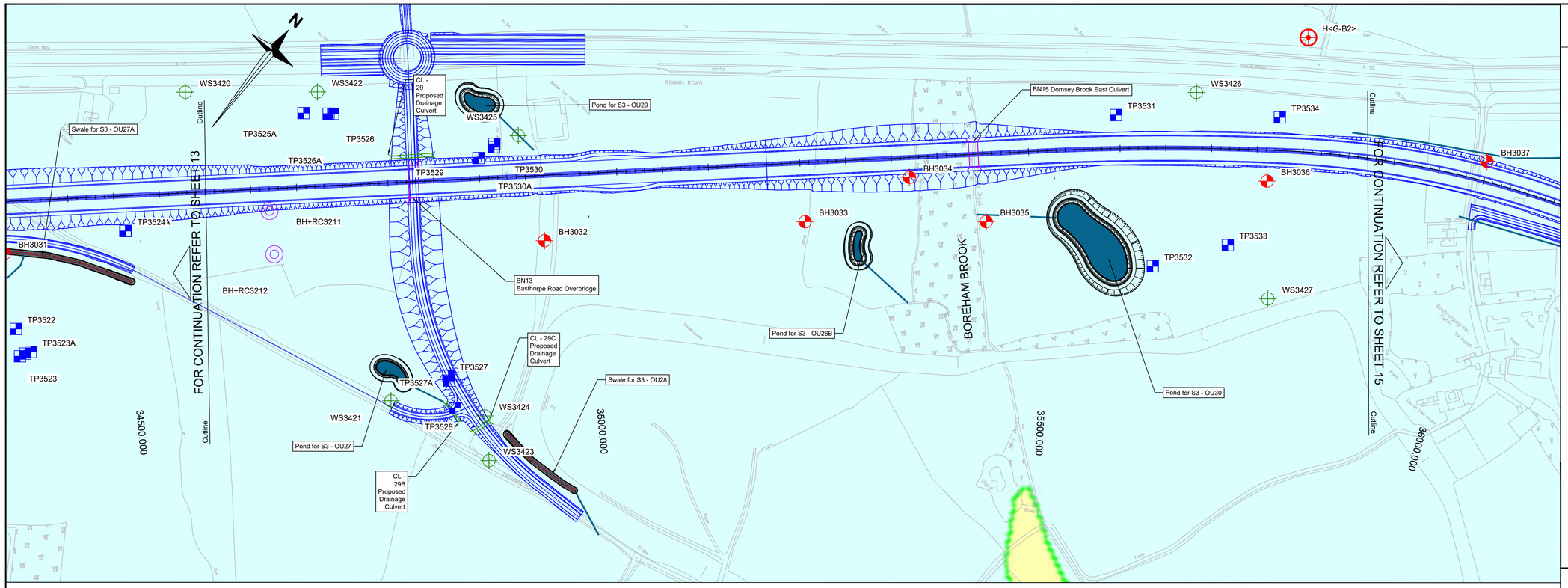
Project
REGIONAL DELIVERY PARTNERSHIP
A12 CHELMSFORD TO A120 WIDENING SCHEME

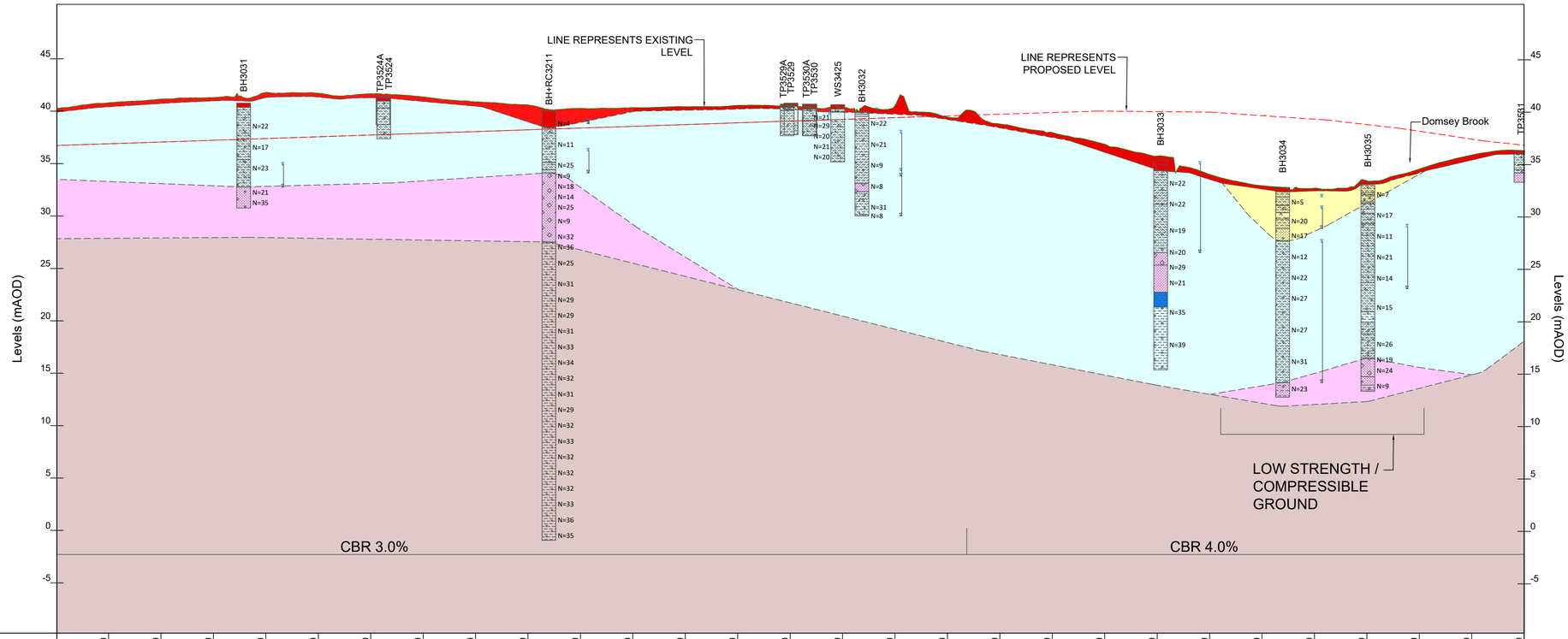
Drawing title
EXPLORATORY HOLE LOCATION PLAN AND GEOLOGICAL LONG SECTION SHEET 13 OF 17

Drawing status
S3 - SUITABLE FOR REVIEW AND COMMENT

State Code	Preliminary		
Project Stage	PCF3		
Scale	1:2500	DO NOT SCALE	
Jacobs No.	B36601D1	Rev	P01
Client no.	HE551497		

Drawing number
PIN HE551497 - Originator JAC - Volume HGT - Location SCHW - Type DR - Role GE - Number 1013





CHAINAGE (m)	EXISTING LEVELS (mAOD)	PROPOSED LEVELS (mAOD)
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34300.00	41.200	37.093
34350.00	41.352	37.259
34400.00	41.829	37.426
34450.00	41.743	37.593
34500.00	41.718	37.759
34550.00	41.401	37.926
34600.00	40.930	38.092
34650.00	40.627	38.259
34700.00	40.311	38.425
34750.00	40.377	38.592
34800.00	40.450	38.758
34850.00	40.593	38.925
34900.00	40.576	39.091
34950.00	40.376	39.258
35000.00	40.688	39.424
35050.00	39.461	39.591
35100.00	38.802	39.757
35150.00	37.971	39.924
35200.00	36.866	40.057
35250.00	35.764	40.065
35300.00	33.980	39.941
35350.00	32.922	39.686
35400.00	32.692	39.299
35450.00	33.382	38.780
35500.00	34.541	38.130
35550.00	35.870	37.357
35600.00	36.273	36.715

NOTES:
1. ALL MEASUREMENTS TO BE IN METERS UNLESS SPECIFIED OTHERWISE.
2. FOR GENERAL NOTES AND LEGEND PLEASE REFER TO DRAWING HE551497-JAC-HGT-SCHW-DR-GE-1000.
3. ANY GEOLOGICAL BOUNDARIES SHOWN IN THE PROFILE CORRESPOND TO INTERPOLATION OF THE LIKELY DEPTHS THAT ARE PRESENT ALONG THE CENTRELINE OF THE A12 ALIGNMENT.
4. THESE DRAWINGS ARE BASED ON AGS DATA FIX 20/08/2021.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following :

CONSTRUCTION
- Not Applicable

MAINTENANCE / CLEANING
- Not Applicable

DECOMMISSIONING / DEMOLITION
- Not Applicabble

0 200
SCALE 1:2500 METRES

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P01	24/11/21	FIRST ISSUE	TE	MH	CLM	DT

Contractor: COSTAIN

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1 City Walk, Leeds, LS11 9DX
Tel:+44(0)113 242 6771 Fax:+44(0)113 389 1389
www.jacobs.com

Client: national highways

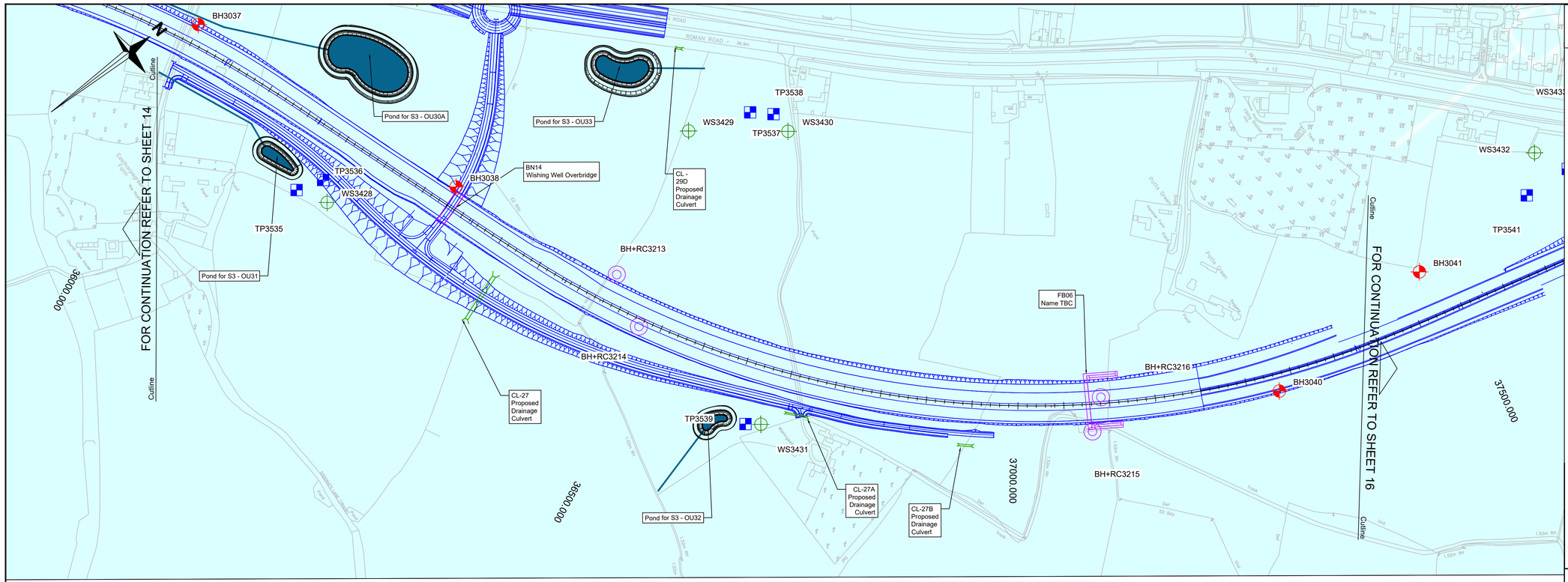
Project
REGIONAL DELIVERY PARTNERSHIP
A12 CHELMSFORD TO A120 WIDENING SCHEME

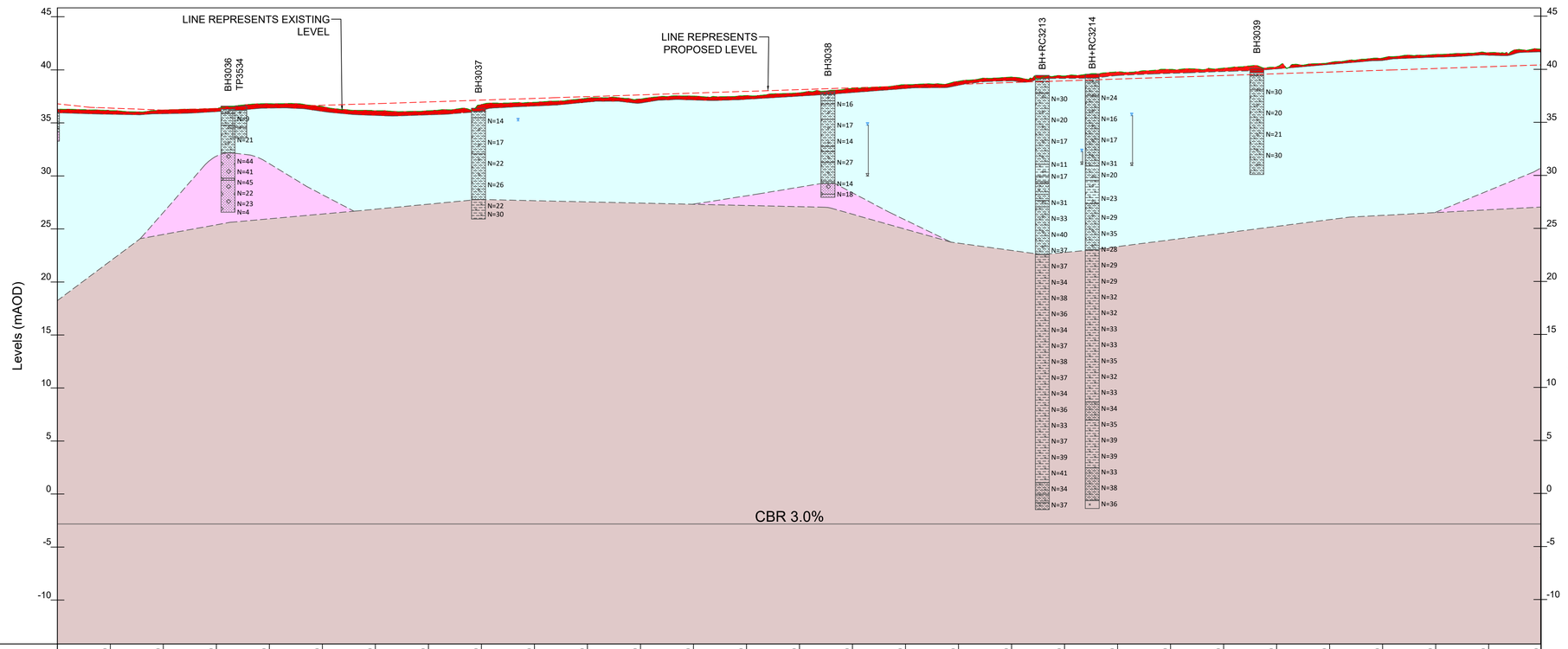
Drawing title
EXPLORATORY HOLE LOCATION PLAN AND GEOLOGICAL LONG SECTION SHEET 14 OF 17

Drawing status
S3 - SUITABLE FOR REVIEW AND COMMENT

State Code	Preliminary
Project Stage	PCF3
Scale	1:2500 — DO NOT SCALE
Jacobs No.	B36601D1
Client no.	HE551497
Rev	P01

Drawing number
PIN HE551497 - Originator JAC - Volume HGT - Location SCHW - Type DR - Role GE - Number 1014





CHAINAGE (m)	EXISTING LEVELS (mAOD)	PROPOSED LEVELS (mAOD)
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35700.00	36.169	36.181
35750.00	36.328	36.280
35800.00	36.780	36.446
35850.00	36.526	36.612
35900.00	36.113	36.778
35950.00	36.115	36.944
36000.00	36.671	37.110
36050.00	36.910	37.276
36100.00	37.293	37.442
36150.00	37.202	37.608
36200.00	37.498	37.774
36250.00	37.540	37.940
36300.00	37.801	38.106
36350.00	38.204	38.272
36400.00	38.579	38.438
36450.00	38.877	38.604
36500.00	39.285	38.770
36550.00	39.383	38.936
36600.00	39.780	39.102
36650.00	40.021	39.268
36700.00	40.131	39.434
36750.00	40.247	39.600
36800.00	40.639	39.766
36850.00	41.073	39.932
36900.00	41.417	40.098
36950.00	41.590	40.264
37000.00	41.926	40.430

NOTES:
1. ALL MEASUREMENTS TO BE IN METERS UNLESS SPECIFIED OTHERWISE.
2. FOR GENERAL NOTES AND LEGEND PLEASE REFER TO DRAWING HE551497-JAC-HGT-SCHW-DR-GE-1000.
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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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CONSTRUCTION
- Not Applicable

MAINTENANCE / CLEANING
- Not Applicable

DECOMMISSIONING / DEMOLITION
- Not Applicabble

0 200
SCALE 1:2500 METRES

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P01	24/11/21	FIRST ISSUE	TE	MH	CLM	DT

Contractor: COSTAIN

Designer: Jacobs
1 City Walk, Leeds, LS11 9DX
Tel:+44(0)113 242 6771 Fax:+44(0)113 389 1389
www.jacobs.com

Client: national highways

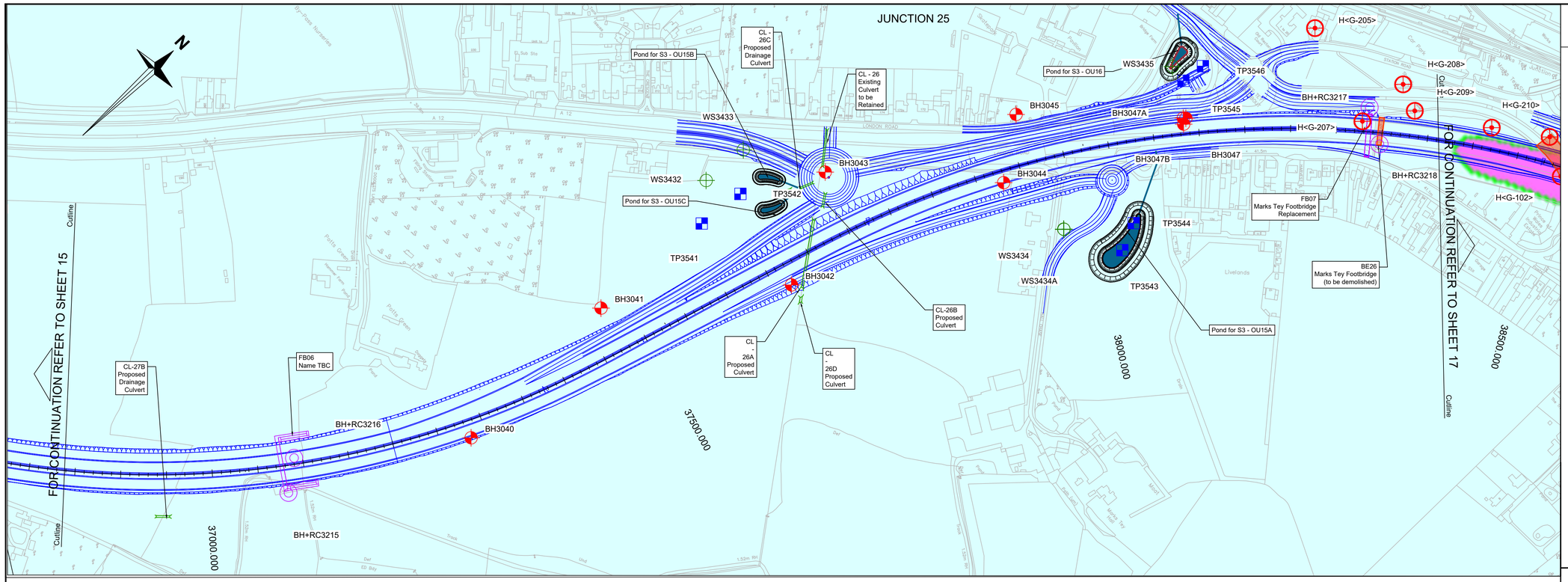
Project
REGIONAL DELIVERY PARTNERSHIP
A12 CHELMSFORD TO A120 WIDENING SCHEME

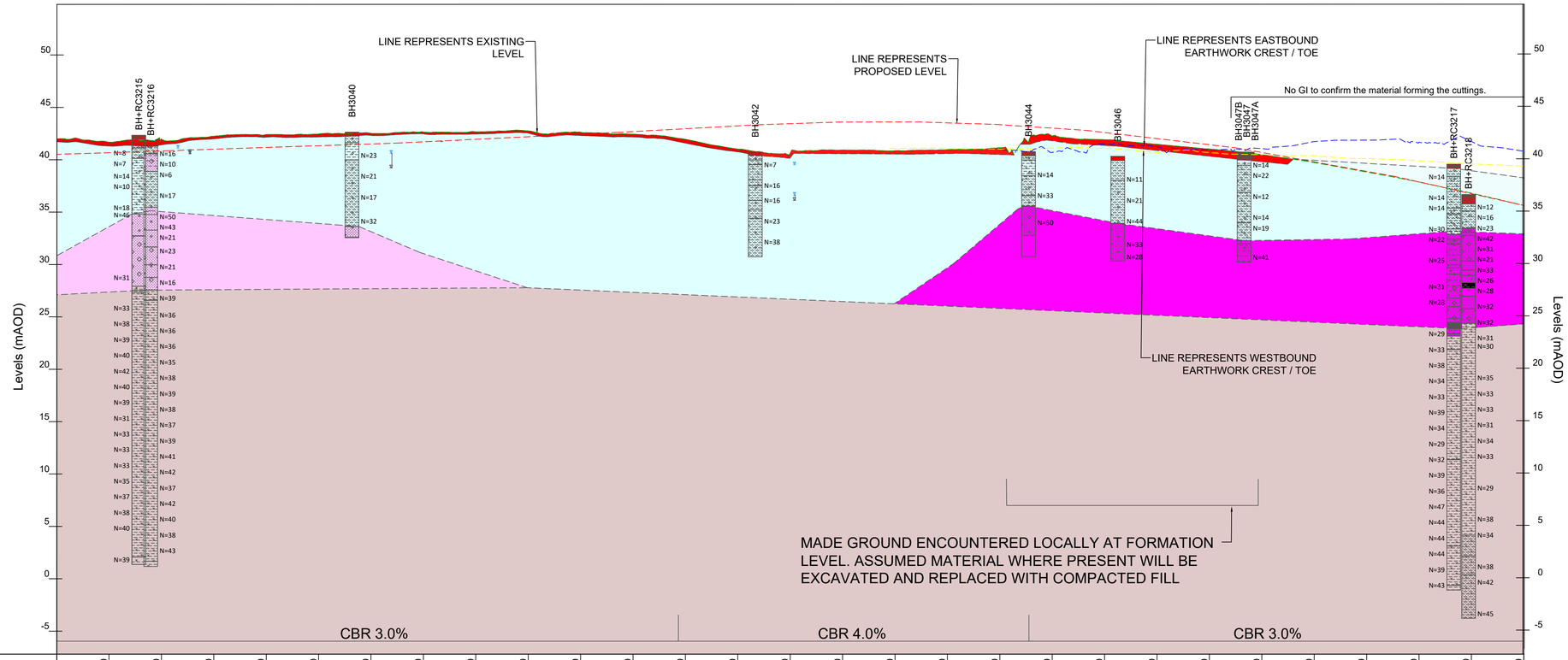
Drawing title
EXPLORATORY HOLE LOCATION PLAN AND GEOLOGICAL LONG SECTION SHEET 15 OF 17

Drawing status
S3 - SUITABLE FOR REVIEW AND COMMENT

State Code	Preliminary		
Project Stage	PCF3		
Scale	1:2500	DO NOT SCALE	
Jacobs No.	B36601D1	Rev	P01
Client no.	HE551497		

Drawing number
PIN HE551497 - Originator JAC - Volume HGT - Location SCHW - Type DR - Role GE - Number 1015





CHAINAGE (m)	EXISTING LEVELS (mAOD)	PROPOSED LEVELS (mAOD)
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37100.00	41.709	40.762
37150.00	42.170	40.928
37200.00	42.301	41.094
37250.00	42.370	41.260
37300.00	42.462	41.426
37350.00	42.587	41.592
37400.00	42.600	41.792
37450.00	42.684	42.064
37500.00	42.560	42.336
37550.00	42.362	42.609
37600.00	41.892	42.881
37650.00	40.955	43.153
37700.00	40.402	43.394
37750.00	40.852	43.529
37800.00	40.784	43.556
37850.00	40.890	43.474
37900.00	41.072	43.283
37950.00	42.247	42.984
38000.00	41.846	42.576
38050.00	41.412	42.059
38100.00	40.956	41.434
38150.00	40.426	40.700
38200.00	39.668	39.857
38250.00	38.763	38.905
38300.00	37.812	37.845
38350.00	36.756	36.715
38400.00	35.563	35.583

NOTES:
1. ALL MEASUREMENTS TO BE IN METERS UNLESS SPECIFIED OTHERWISE.
2. FOR GENERAL NOTES AND LEGEND PLEASE REFER TO DRAWING HE551497-JAC-HGT-SCHW-DR-GE-1000.
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MAINTENANCE / CLEANING
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DECOMMISSIONING / DEMOLITION
- Not Applicabble

0 — 200
SCALE 1:2500 METRES

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P01	24/11/21	FIRST ISSUE	TE	MH	CLM	DT

Contractor: COSTAIN

Designer: Jacobs
1 City Walk, Leeds, LS11 9DX
Tel:+44(0)113 242 6771 Fax:+44(0)113 389 1389
www.jacobs.com

Client: highways england

Project
REGIONAL DELIVERY PARTNERSHIP
A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing title
EXPLORATORY HOLE LOCATION PLAN AND GEOLOGICAL LONG SECTION SHEET 16 OF 17

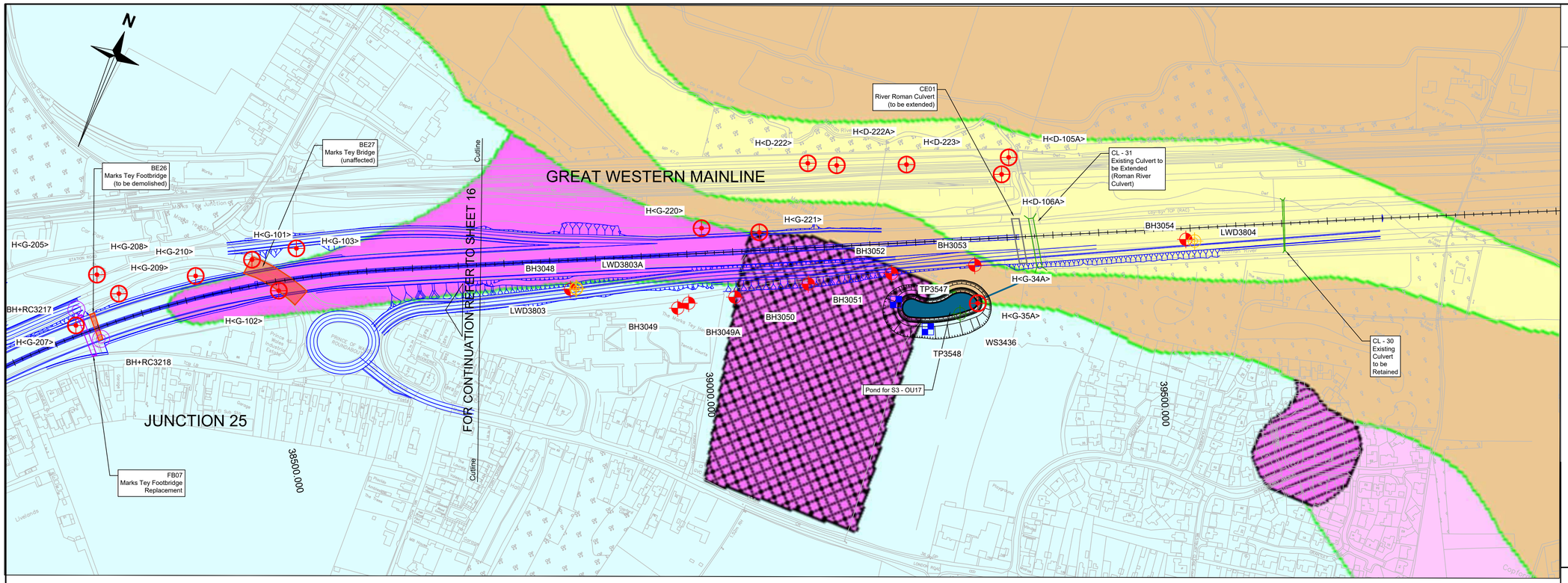
Drawing status
S3 - SUITABLE FOR REVIEW AND COMMENT

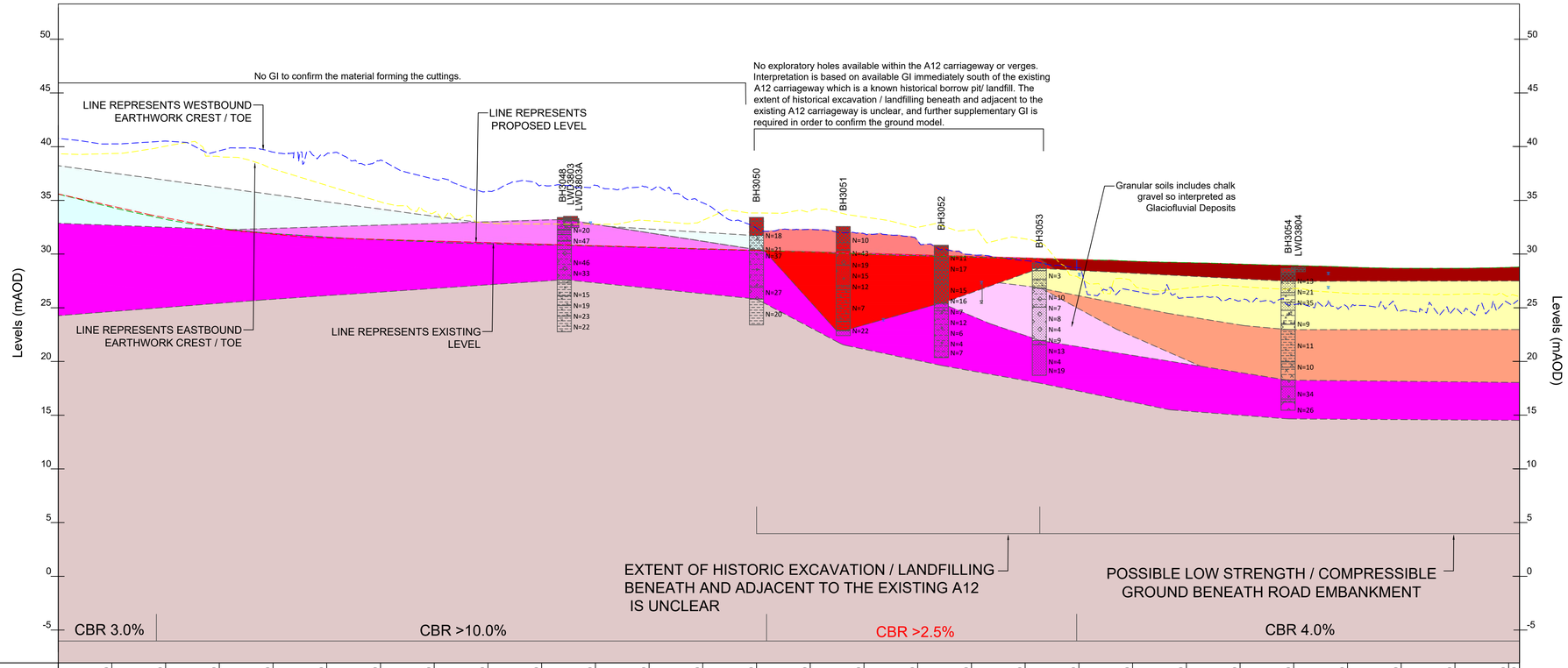
State Code	Preliminary
Project Stage	PCF3
Scale	1:2500
Jacobs No.	B36601D1
Client no.	HE551497

DO NOT SCALE

Rev P01

Drawing number
PIN HE551497 - Originator JAC - Volume HGT - Location SCHW - Type DR - Role GE - Number 1016





CHAINAGE (m)	EXISTING LEVELS (mAOD)	PROPOSED LEVELS (mAOD)
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38500.00	33.222	33.319
38550.00	32.391	32.354
38600.00	31.906	31.745
38650.00	31.559	31.487
38700.00	31.310	31.343
38750.00	31.078	31.199
38800.00	30.953	31.055
38850.00	30.864	30.912
38900.00	30.726	30.768
38950.00	30.597	30.624
39000.00	30.446	30.481
39050.00	30.310	30.337
39100.00	30.177	30.193
39150.00	29.994	30.049
39200.00	29.850	29.906
39250.00	29.710	29.762
39300.00	29.582	29.618
39350.00	29.479	29.475
39400.00	29.320	
39450.00	29.186	
39500.00	29.051	
39550.00	28.922	
39600.00	28.782	
39650.00	28.664	
39700.00	28.659	
39750.00	28.747	
39760.00	28.789	

NOTES:
1. ALL MEASUREMENTS TO BE IN METERS UNLESS SPECIFIED OTHERWISE.
2. FOR GENERAL NOTES AND LEGEND PLEASE REFER TO DRAWING HE551497-JAC-HGT-SCHW-DR-GE-1000.
3. ANY GEOLOGICAL BOUNDARIES SHOWN IN THE PROFILE CORRESPOND TO INTERPOLATION OF THE LIKELY DEPTHS THAT ARE PRESENT ALONG THE CENTRELINE OF THE A12 ALIGNMENT.
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MAINTENANCE / CLEANING
- Not Applicable

DECOMMISSIONING / DEMOLITION
- Not Applicabble

0 200
SCALE 1:2500 METRES

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P01	24/11/21	FIRST ISSUE	TE	MH	CLM	DT

Contractor: COSTAIN

Designer: Jacobs
1 City Walk, Leeds, LS11 9DX
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www.jacobs.com

Client: national highways

Project
REGIONAL DELIVERY PARTNERSHIP
A12 CHELMSFORD TO A120 WIDENING SCHEME

Drawing title
EXPLORATORY HOLE LOCATION PLAN AND GEOLOGICAL LONG SECTION SHEET 17 OF 17

Drawing status
S3 - SUITABLE FOR REVIEW AND COMMENT

State Code	Preliminary
Project Stage	PCF3
Scale	1:2500 — DO NOT SCALE
Jacobs No.	B36601D1
Client no.	HE551497
Rev	P01

Drawing number
PIN HE551497 - Originator JAC - Volume HGT - Location SCHW - Type DR - Role GE - Number 1017

ANNEX B:

SUMMARY OF GROUND INVESTIGATION BOREHOLE AND WINDOW SAMPLE DATA

DESIGN SECTION 1:

Junction 19 Boreham Interchange to Junction 21 Lynfield Motors Interchange.

BOREHOLE / WINDOW SAMPLE No.	Easting	Northing	Level (AOD)	Soil & O/B Thickness	Mineral Thickness	Ratio (OB/min)
BH+RC1102	574288.0	209037.0	23.85	10.10	0.55	18.36
BH+RC1104	574569.0	209804.5	25.35	0.40	0.40	1.00
BH+RC1106	579029.0	211900.5	44.25	0.50	7.80	0.06
BH+RC1107	579076.0	211865.5	38.75	1.20	6.10	0.20
BH+RC1108	579460.0	212049.5	39.90	0.60	5.40	0.11
BH+RC1109	579421.0	212006.5	41.15	2.60	11.50	0.23
BH+RC1110	580256.5	212605.5	45.75	6.00	4.53	1.32
BH+RC1111	580341.0	212528.0	44.45	0.50	0.30	1.67
BH+RC1112	580371.0	212479.5	44.15	5.55	4.65	1.19
BH+RC1113	580461.0	212388.0	42.40	9.20	0.00	BARREN
BH+RC1114	580707.0	212789.0	38.90	4.20	5.20	0.81
BH+RC1115	580926.0	212802.0	36.55	7.85	1.05	7.48
BH+RC1117	581843.0	212980.0	19.45	2.90	2.30	1.26
BH+RC1160	578299.5	211530.0	23.50	4.50	0.00	BARREN
BH+RC1160A	578298.0	211527.0	23.50	4.50	3.95	1.14
BH+RC1161	578304.5	211505.0	23.65	5.20	4.00	1.30
BH+RC1162	578754.0	211698.0	35.90	1.65	0.00	BARREN
BH+RC1163	578715.5	211739.0	40.50	1.20	2.95	0.41
BH+RC1164A	582406.0	213317.5	22.95	7.50	0.00	BARREN
BH+RC1165	582482.5	213391.5	16.20	1.50	2.10	0.71
BH+RC1166	582806.5	213707.5	16.60	1.50	5.00	0.30
BH+RC1177	574109.0	209344.0	26.50	0.35	7.15	0.05
BH+RC1178	574200.0	209356.5	33.35	5.40	4.00	1.35
BH+RC1179C	579588.5	212096.0	42.10	3.00	5.90	0.51
BH+RC1181	582616.0	213486.5	18.85	2.40	5.90	0.41
BH1001	574055.0	208676.0	23.35	2.40	0.40	6.00

BOREHOLE / WINDOW SAMPLE No.	Easting	Northing	Level (AOD)	Soil & O/B Thickness	Mineral Thickness	Ratio (OB/min)
BH1014	582561.0	213415.0	20.65	0.55	8.35	0.07
BH1101	574117.5	208667.5	21.10	1.80	1.20	1.50
BH1103	574257.0	209515.0	33.55	0.90	1.40	0.64
BH1116	581541.5	212916.0	21.15	0.60	6.00	0.10
BH1159	574175.5	209301.5	29.55	3.10	1.10	2.82
WS1401	574130.5	209230.0	26.80	0.75	1.25	0.60
WS1401A	574131.5	209234.0	26.90	1.40	1.60	0.88
WS1401B	574134.0	209241.0	27.25	0.30	1.70	0.18
WS1402	574160.5	209470.0	27.95	1.10	0.95	1.16
WS1403	574272.5	209649.5	32.50	1.20	2.00	0.60
WS1404	574498.5	209770.0	27.95	0.40	0.20	2.00
WS1405	574913.0	210053.0	33.75	0.80	0.20	4.00
WS1421	578654.5	211619.5	36.30	0.50	2.80	0.18
WS1423	578882.5	211775.5	36.35	0.60	2.10	0.29
WS1424	578849.0	211794.0	38.05	0.30	1.24	0.24
WS1424A	578849.5	211793.5	37.85	0.30	1.25	0.24
WS1424B	578850.0	211792.5	37.55	0.30	1.27	0.24
WS1424C	578851.0	211791.5	37.15	0.70	0.90	0.78
WS1425	579179.5	211919.5	38.10	0.50	0.45	1.11
WS1425A	579173.0	211917.0	38.05	0.60	1.40	0.43
WS1425B	579170.5	211915.5	38.00	1.40	0.60	2.33
WS1426A	579271.0	211983.0	39.10	0.65	1.35	0.48
WS1426b	579270.0	211983.0	39.05	0.65	0.55	1.18
WS1427	579314.5	211968.0	39.95	0.15	1.05	0.14
WS1427A	579314.5	211968.5	39.50	0.15	2.05	0.07
WS1428	579709.5	212098.0	43.45	0.50	0.70	0.71
WS1435B	581968.0	212991.5	17.55	0.80	4.50	0.18
WS1436	582214.0	213140.5	23.00	2.20	3.35	0.66

BOREHOLE / WINDOW SAMPLE No.	Easting	Northing	Level (AOD)	Soil & O/B Thickness	Mineral Thickness	Ratio (OB/min)
WS1499	574897.0	210016.0	33.55	0.60	1.90	0.32
WS1499A	574896.0	210015.5	33.55	0.63	0.82	0.77
WS1506	578591.0	211673.5	35.05	0.80	1.50	0.53
WS1508	579261.5	211942.5	41.55	1.85	0.25	7.40
WS1508A	579260.0	211946.0	39.75	1.20	0.60	2.00
WS1511	580549.0	212551.0	42.25	4.65	0.35	13.29
WS1514	582144.5	213062.0	18.25	0.60	4.85	0.12
WS1514a	582144.5	213062.0	18.35	0.90	3.10	0.29
WS1515	574108.0	208154.5	18.55	0.50	0.70	0.71
WS1515A	574108.0	208154.5	18.55	0.50	0.70	0.71
WS1516	574137.0	208342.5	19.30	0.40	1.60	0.25
WS1516A	574140.5	208338.5	19.30	0.40	1.60	0.25
WS1517	574259.0	208809.0	21.80	0.40	1.60	0.25
WS1518A	574707.0	209747.5	26.90	0.30	0.62	0.48
WS1519	578231.0	211286.0	19.50	0.50	3.30	0.15
WS1520	578103.0	211556.0	22.55	2.35	1.85	1.27
WS1522	578390.0	211683.0	20.70	0.30	3.30	0.09
WS1525	581781.0	212884.0	17.05	0.40	3.60	0.11
WS1526	582691.0	213449.0	15.25	0.80	3.00	0.27
WS1527	582001.0	212883.0	16.40	0.40	3.99	0.10
WS1604	573983.5	209109.5	27.60	2.40	1.60	1.50
WS1605	573887.0	209162.5	29.05	0.40	3.10	0.13
WS1608	574256.0	209308.0	32.00	3.10	1.35	2.30
WS1640B	582310.0	213243.0	23.30	3.10	0.95	3.26

DESIGN SECTION 2:

Junction 21 Lynfield Motors Interchange to Junction 23 Kelvedon South.

BH/WS No.	Easting	Northing	Level	Soil & O/B	Mineral	Ratio
			(AOD)	Thickness	Thickness	(OB/min)
BH+RC1182	580581.00	212718.50	41.30	6.65	2.55	2.61
BH+RC1183	582086.00	213062.50	21.65	1.20	4.70	0.26
BH+RC2201A	582859.00	213761.00	16.85	6.20	1.00	6.20
BH+RC2203	582981.50	214772.00	15.25	0.80	0.70	1.14
BH+RC2204	582997.50	215507.00	18.75	1.20	6.60	0.18
BH+RC2205	583018.50	215498.50	18.25	0.60	4.90	0.12
BH+RC2205A	583019.00	215499.50	18.30	0.90	0.30	3.00
BH+RC2206	583127.50	215566.50	18.40	0.85	5.10	0.17
BH+RC2220	583353.50	215738.50	17.00	0.10	7.15	0.01
BH+RC2222	583105.50	215520.00	19.65	1.50	9.45	0.16
BH+RC2223	583392.00	215693.00	15.85	0.60	5.60	0.11
BH+RC2224	583248.00	215706.50	17.10	0.50	8.55	0.06
BH+RC2225	583374.50	215920.50	17.00	1.00	5.80	0.17
BH+RC2226	583752.50	216056.50	15.95	0.45	4.40	0.10
BH+RC2244	583813.00	216177.50	16.00	0.40	9.80	0.04
BH+RC2260	584042.50	216287.00	17.05	0.80	7.40	0.11
BH+RC2261	584061.50	216366.00	20.35	0.75	9.85	0.08
BH+RC2262	584141.50	216398.00	21.70	0.65	8.55	0.08
BH+RC2264	584271.50	216684.50	19.85	2.00	1.90	1.05
BH+RC2266	584407.50	216878.50	24.50	0.05	4.50	0.01
BH+RC2267	584333.00	216935.50	23.70	6.20	8.30	0.75
BH+RC2269	584770.00	217245.00	25.80	7.40	6.60	1.12
BH+RC2270	585087.00	217530.00	29.05	0.40	5.10	0.08
BH+RC2271	585274.00	217644.00	26.00	0.65	3.40	0.19
BH+RC2273	585596.50	217656.00	18.90	4.00	7.50	0.53
BH+RC2274	586115.50	217714.50	29.60	3.75	4.53	0.83
BH+RC2274A	586115.50	217714.50	29.60	3.90	7.50	0.52
BH+RC2606	583057.50	215425.00	21.70	1.20	5.50	0.22
BH+RC2620	583037.00	215273.00	21.65	4.20	3.30	1.27
BH+RC2621	583130.00	215360.50	18.85	0.50	2.60	0.19
BH+RC2640	582987.00	215361.00	17.60	0.80	8.70	0.09
BH+RC2676	582900.00	213929.00	16.40	1.20	3.20	0.38
BH2240	583305.00	215773.50	16.90	0.40	9.90	0.04
BH2263	584174.50	216537.50	21.95	0.40	6.80	0.06

BH/WS No.	Easting	Northing	Level	Soil & O/B	Mineral	Ratio
			(AOD)	Thickness	Thickness	(OB/min)
BH2272	585340.00	217586.50	21.10	0.50	5.80	0.09
BH2603	582936.00	214359.00	15.15	0.55	3.35	0.16
BH2604	582969.00	214961.00	15.65	1.70	1.30	1.31
BH2607	583265.50	215835.50	18.70	0.40	5.34	0.07
BH2609	583921.50	216236.00	16.55	0.40	8.20	0.05
BH2622	583313.00	215687.00	16.65	0.30	7.40	0.04
BH2623	583216.50	215596.50	18.25	0.40	5.40	0.07
BH2625	582915.50	215486.50	22.35	0.75	9.85	0.08
BH2643	583205.50	215760.50	17.60	0.30	5.00	0.06
BH2645	583406.00	215785.00	16.35	0.50	6.90	0.07
BH2649	583553.00	216123.50	16.55	0.30	7.10	0.04
BH2664	584598.50	217174.50	22.60	5.25	8.00	0.66
BH2667	584891.00	217359.00	27.15	0.45	1.45	0.31
BH2674	582895.00	213844.50	16.80	1.00	4.80	0.21
WS2408	582945.00	214545.00	15.70	0.60	1.20	0.50
WS2412	583074.00	215633.00	20.15	0.40	2.01	0.20
WS2412A	583075.50	215634.00	20.15	0.40	1.99	0.20
WS2412B	583070.50	215631.50	20.15	0.40	2.85	0.14
WS2446	583555.00	216261.00	18.00	1.20	2.60	0.46
WS2461B	584495.00	217028.00	22.90	2.05	3.45	0.59
WS2462	584995.50	217446.50	28.70	0.75	1.95	0.38
WS2465	585769.00	217711.00	21.42	0.30	0.60	0.50
WS2465B	585788.00	217707.00	21.45	0.90	2.90	0.31

DESIGN SECTION 3:

Junction 23 Kelvedon South to Junction 25 Marks Tey

BH/WS No.	Easting	Northing	Level (AOD)	Soil & O/B Thickness	Mineral Thickness	Ratio (OB/min)
BH+RC3201	586865.00	218259.50	32.20	8.35	9.65	0.87
BH+RC3202	586939.00	218198.50	36.30	6.40	12.00	0.53
BH+RC3203	587269.50	218555.50	33.85	3.70	7.80	0.47
BH+RC3204	587234.50	218599.50	33.10	9.00	7.00	1.29
BH+RC3205	587641.00	218944.50	25.65	11.20	10.40	1.08
BH+RC3206	587657.00	219057.20	29.76	19.00	0.00	BARREN
BH+RC3207	587769.50	219447.00	34.00	1.62	5.58	0.29
BH+RC3208	587825.50	219457.00	33.15	0.30	5.05	0.06
BH+RC3209	587925.50	220025.50	31.65	6.90	5.80	1.19
BH+RC3210	587989.50	220009.50	30.30	6.45	5.95	1.08
BH+RC3211	589186.50	221231.50	40.05	5.90	6.60	0.89
BH+RC3212	589220.50	221198.50	39.75	6.50	4.40	1.48
BH+RC3213	590670.50	222314.00	39.45	16.90	0.00	BARREN
BH+RC3214	590730.00	222298.50	39.55	16.55	0.00	BARREN
BH+RC3215	591122.50	222619.50	42.25	7.50	6.90	1.09
BH+RC3216	591098.50	222649.50	41.70	4.60	9.60	0.48
BH+RC3217	591604.00	223776.00	39.50	6.70	9.70	0.69
BH+RC3218	591641.00	223757.00	36.60	2.60	9.70	0.27
BH+RC3219	578358.00	211517.50	22.05	4.00	0.00	BARREN
BH+RC3220	578347.00	211551.50	19.30	2.00	4.60	0.43
BH+RC3221	578320.50	211541.00	18.75	2.20	1.45	1.52
BH3001	586210.00	217721.00	26.60	0.35	6.85	0.05
BH3002	586350.10	217773.40	25.53	0.30	1.60	0.19
BH3003	586361.00	217820.50	25.40	0.65	1.55	0.42
BH3004	586529.00	217882.00	28.20	0.30	4.00	0.08
BH3005	586648.10	218041.40	27.45	2.00	3.90	0.51
BH3006	586725.50	218122.10	29.03	2.40	7.60	0.32
BH3007	587043.50	218300.50	35.95	0.60	1.60	0.38
BH3008	587115.80	218486.00	30.62	1.40	8.85	0.16
BH3009	587155.20	218664.70	32.23	10.00	0.00	BARREN
BH3010	587502.00	218432.50	38.05	2.80	7.20	0.39
BH3011	587336.50	218644.50	35.85	3.45	0.25	13.80
BH3012	587460.00	218765.00	35.10	5.20	0.00	BARREN
BH3013	587746.50	219181.00	25.90	15.00	0.00	BARREN

BH/WS No.	Easting	Northing	Level (AOD)	Soil & O/B Thickness	Mineral Thickness	Ratio (OB/min)
BH3014	587750.00	219262.00	29.55	0.40	3.40	0.12
BH3015	587551.00	219436.00	30.85	2.15	6.25	0.34
BH3016	587721.90	219459.00	29.55	0.40	1.80	0.22
BH3017	587850.00	219641.50	34.40	0.45	1.75	0.26
BH3018	587874.00	219807.00	32.55	10.45	0.00	BARREN
BH3019	587880.00	219914.00	30.50	0.40	0.80	0.50
BH3020	587858.00	220052.00	33.00	10.10	2.50	4.04
BH3021	587809.50	220178.50	33.50	4.50	9.70	0.46
BH3023	587979.50	220101.00	30.65	2.20	7.70	0.29
BH3024	587856.00	220302.00	35.20	8.60	1.85	4.65
BH3025	587938.50	220406.50	33.80	6.60	3.40	1.94
BH3026	588168.50	220286.00	32.00	6.10	3.90	1.56
BH3027	588348.00	220368.50	31.05	0.40	10.30	0.04
BH3028	588500.50	220545.00	32.75	3.40	7.05	0.48
BH3029	588614.00	220691.00	35.85	8.20	0.00	BARREN
BH3030	588803.00	220822.00	38.70	4.70	5.30	0.89
BH3031	588993.00	221011.50	40.80	8.00	2.00	4.00
BH3037	590176.50	222120.00	36.35	8.60	0.00	BARREN
BH3038	590488.00	222234.00	37.95	8.70	1.30	6.69
BH3039	590840.00	222412.00	40.10	10.00	0.00	BARREN
BH3040	591212.00	222807.50	42.55	9.00	1.07	8.41
BH3041	591202.50	223007.50	42.20	7.30	3.14	2.32
BH3042	591323.50	223178.50	40.65	10.00	0.00	BARREN
BH3043	591257.00	223288.50	40.40	5.20	4.80	1.08
BH3044	591396.50	223425.00	40.70	5.20	4.80	1.08
BH3045	591350.50	223485.00	41.25	3.30	6.70	0.49
BH3046	591459.00	223486.00	40.25	6.40	3.60	1.78
BH3047B	591481.20	223613.40	40.60	8.40	2.05	BARREN
BH3048	592093.50	224003.50	33.40	0.20	5.60	0.04
BH3049A	592218.50	224039.00	35.15	4.60	3.10	1.48
BH3050	592262.50	224064.50	33.40	3.00	4.60	0.65
BH3051	592331.00	224108.50	32.55	2.20	7.96	0.28
BH3052	592410.50	224154.00	30.80	5.40	5.05	1.07
BH3053	592491.00	224197.00	29.15	2.30	8.15	0.28
BH3054	592693.00	224311.50	28.65	10.40	2.80	3.71
WS3401	586308.50	217804.00	24.20	2.50	0.00	BARREN
WS3402G	586311.50	217955.00	21.95	1.20	0.40	3.00
WS3403	586339.00	217700.10	25.35	0.30	1.30	0.23
WS3404A	586775.00	218324.50	29.50	0.50	0.50	1.00

BH/WS No.	Easting	Northing	Level (AOD)	Soil & O/B Thickness	Mineral Thickness	Ratio (OB/min)
WS3405	587062.50	218533.00	29.85	5.45	0.00	BARREN
WS3406	587326.50	218686.50	34.50	0.30	0.70	0.43
WS3407	587418.50	218633.00	35.70	5.30	0.00	BARREN
WS3408	587240.00	218833.00	25.40	2.10	1.75	1.20
WS3409	587858.50	219183.50	24.20	5.45	0.00	BARREN
WS3410	587694.00	220031.00	36.10	3.55	0.75	4.73
WS3411	587718.00	220187.00	34.45	5.45	0.00	BARREN
WS3412A	587763.00	220283.00	33.10	0.40	1.60	0.25
WS3413	587933.00	220164.50	31.15	5.45	0.00	BARREN
WS3415	587924.00	220260.00	31.55	4.00	1.45	2.76
WS3417	588235.00	220239.50	31.05	0.90	4.10	0.22
WS3418	588416.50	220620.50	32.10	1.60	2.40	0.67
WS3419	589034.50	220938.00	39.95	5.45	0.00	BARREN
WS3420	589033.00	221273.00	41.35	5.45	0.00	BARREN
WS3421	589420.50	221156.50	38.75	5.00	0.00	BARREN
WS3422	589144.00	221365.00	41.15	5.45	0.00	BARREN
WS3423	589544.50	221174.50	39.10	4.00	0.00	BARREN
WS3425	589343.50	221468.00	40.65	5.45	0.00	BARREN
WS3427	590087.50	221852.00	36.35	5.45	0.00	BARREN
WS3428	590415.50	222112.50	37.45	4.00	1.00	4.00
WS3429	590594.50	222471.50	38.50	5.45	0.00	BARREN
WS3430	590661.00	222557.00	38.80	5.45	0.00	BARREN
WS3431	590895.50	222338.50	39.75	5.45	0.00	BARREN
WS3432	591176.50	223186.00	40.70	5.45	0.00	BARREN
WS3433	591179.00	223238.50	41.30	5.45	0.00	BARREN
WS3434A	591478.00	223439.50	39.85	3.10	1.90	1.63
WS3435	591426.50	223646.50	39.75	1.90	0.70	2.71
WS3436	592496.60	224142.10	31.67	1.00	4.55	0.22

ANNEX C:

SUMMARY OF PARTICLE SIZE DISTRIBUTION RESULTS OF BULK SAMPLES

DESIGN SECTION 1:

Junction 19 Boreham Interchange to Junction 21 Lynfield Motors Interchange.

BOREHOLE / WINDOW SAMPLE REF.	SAMPLE REF	SAMPLE DEPTH	GRADING ANALYSIS					DESCRIPTION	SAFEGUARDED RESOURCE
			COBBLES (%)	GRAVEL (%)	SAND (%)	FINES (%)	TOTAL (%)		
BH+RC1106	14L	3.2	0	85	14	1	100	GRAVEL	GLACIOFLUVIAL
BH+RC1106	25L	7.2	0	85	15	0	100	GRAVEL	GLACIOFLUVIAL
BH+RC1107	13	4.0	0	60	35	5	100	GRAVEL	GLACIOFLUVIAL
BH+RC1107	16	5.0	0	84	15	1	100	GRAVEL	GLACIOFLUVIAL
BH+RC1108	11B	4.0	0	100	0	0	100	GRAVEL	GLACIOFLUVIAL
BH+RC1109	16L	5.8	0	70	27	3	100	GRAVEL	GLACIOFLUVIAL
BH+RC1110	30L	8.2	0	73	25	2	100	GRAVEL	GLACIOFLUVIAL
BH+RC1112	24L	7.2	0	65	32	3	100	GRAVEL	GLACIOFLUVIAL
BH+RC1112	25D	7.9	0	73	25	2	100	GRAVEL	GLACIOFLUVIAL
BH+RC1114	20L	7.0	0	92	7	1	100	GRAVEL	GLACIOFLUVIAL
BH+RC1160A	11B	4.5	0	48	45	7	100	S & G	GLACIOFLUVIAL
BH+RC1160A	16B	7.0	0	95	5	0	100	GRAVEL	GLACIOFLUVIAL
BH+RC1161	13L	4.2	0	54	30	16	100	GRAVEL	GLACIOFLUVIAL
BH+RC1161	19L	6.2	0	98	2	0	100	GRAVEL	GLACIOFLUVIAL
BH+RC1163	11L	3.0	0	63	27	10	100	GRAVEL	GLACIOFLUVIAL
BH+RC1165	8L	2.5	0	60	39	1	100	GRAVEL	RIVER TERRACE
BH+RC1166	17L	5.0	0	85	14	1	100	GRAVEL	RIVER TERRACE
BH+RC1177	7B	2.5	0	14	85	1	100	SAND	GLACIOFLUVIAL
BH+RC1177	14B	5.0	0	25	73	2	100	SAND	GLACIOFLUVIAL
BH+RC1178	25L	7.2	0	70	27	3	100	GRAVEL	GLACIOFLUVIAL
BH+RC1179C	18B	6.5	0	96	4	0	100	GRAVEL	GLACIOFLUVIAL
BH+RC1181	10B	3.5	0	65	27	8	100	GRAVEL	RIVER TERRACE
BH+RC1181	16B	7.0	0	75	21	4	100	GRAVEL	RIVER TERRACE
WS1401	3ES	1.0	0	45	42	13	100	S & G	GLACIOFLUVIAL
WS1403	6L	2.0	0	75	18	7	100	GRAVEL	GLACIOFLUVIAL
WS1421	11L	2.0	0	53	37	10	100	GRAVEL	GLACIOFLUVIAL
WS1425A	3B	0.8	0	56	40	4	100	GRAVEL	GLACIOFLUVIAL
WS1428	2B	1.0	0	62	25	13	100	GRAVEL	HEAD
WS1435B	14L	3.0	3	46	46	5	100	S & G	RIVER TERRACE
WS1435B	17L	4.0	0	70	29	1	100	GRAVEL	RIVER TERRACE
WS1499	2B	1.0	0	60	28	12	100	GRAVEL	GLACIOFLUVIAL
WS1514A	5B	0.9	0	68	21	11	100	GRAVEL	RIVER TERRACE
WS1520	14	8.1	8	59	21	12	100	GRAVEL	GLACIOFLUVIAL
WS1522	11L	2.0	0	13	43	44	100	CLAY	HEAD

BOREHOLE / WINDOW SAMPLE REF.	SAMPLE REF	SAMPLE DEPTH	GRADING ANALYSIS					DESCRIPTION	SAFEGUARDED RESOURCE
			COBBLES (%)	GRAVEL (%)	SAND (%)	FINES (%)	TOTAL (%)		
WS1605	2B	0.4	0	63	24	13	100	GRAVEL	GLACIOFLUVIAL
WS1605	5L	1.2	0	13	81	6	100	SAND	GLACIOFLUVIAL
WS1608	7	2.0	0	1	79	20	100	SAND	GLACIOFLUVIAL
WS1608	11	3.0	0	10	72	18	100	SAND	GLACIOFLUVIAL

DESIGN SECTION 2:

Junction 21 Lynfield Motors Interchange to Junction 23 Kelvedon South.

BOREHOLE / WINDOW SAMPLE REF.	SAMPLE REF	SAMPLE DEPTH	GRADING ANALYSIS					DESCRIPTION	SAFEGUARDED RESOURCE
			COBBLES (%)	GRAVEL (%)	SAND (%)	FINES (%)	TOTAL (%)		
BH+RC1183	13L	4.20	0	60	17	23	100	GRAVEL	RIVER TERRACE
BH+RC2205	4B	0.90	0	14	83	3	100	SAND	RIVER TERRACE
BH+RC2206	5L	1.20	0	66	24	10	100	GRAVEL	HEAD
BH+RC2206	20L	8.80	0	50	44	6	100	GRAVEL	GLACIOFLUVIAL
BH+RC2220	5	2.20	0	70	19	11	100	GRAVEL	RIVER TERRACE
BH+RC2220	12	5.20	0	98	2	1	100	GRAVEL	RIVER TERRACE
BH+RC2222	23L	7.20	0	58	41	1	100	GRAVEL	RIVER TERRACE
BH+RC2222	25L	8.20	0	1	95	4	100	SAND	RIVER TERRACE
BH+RC2223	5L	1.20	0	63	28	9	100	GRAVEL	RIVER TERRACE
BH+RC2223	11L	3.20	0	13	80	7	100	SAND	RIVER TERRACE
BH+RC2223	17L	5.20	0	9	89	2	100	SAND	RIVER TERRACE
BH+RC2224	4	1.20	0	60	32	8	100	GRAVEL	RIVER TERRACE
BH+RC2224	14	5.20	0	29	36	35	100	SAND	RIVER TERRACE
BH+RC2224	18	6.20	0	37	58	5	100	SAND	RIVER TERRACE
BH+RC2225	11L	2.20	0	26	51	23	100	SAND	RIVER TERRACE
BH+RC2225	16L	4.20	0	12	16	72	100	SILT	RIVER TERRACE
BH+RC2225	18L	5.20	0	66	31	3	100	GRAVEL	RIVER TERRACE
BH+RC2226	9	3.20	0	68	30	2	100	GRAVEL	RIVER TERRACE
BH+RC2226	21	10.20	0	77	5	18	100	GRAVEL	GLACIOFLUVIAL
BH+RC2244	10	3.20	0	70	24	6	100	GRAVEL	RIVER TERRACE
BH+RC2244	23	9.20	0	7	91	3	100	SAND	RIVER TERRACE
BH+RC2260	10	3.20	0	20	44	35	100	SAND	RIVER TERRACE
BH+RC2260	15	5.20	0	84	10	6	100	GRAVEL	RIVER TERRACE
BH+RC2261	21D	9.75	0	6	88	6	100	SAND	RIVER TERRACE
BH+RC2262	4B	1.20	0	84	15	1	100	GRAVEL	RIVER TERRACE
BH+RC2264	4L	2.20	0	54	36	10	100	GRAVEL	RIVER TERRACE
BH+RC2266	8	2.20	0	14	76	10	100	SAND	RIVER TERRACE
BH+RC2273	18L	7.20	0	99	1	0	100	GRAVEL	RIVER TERRACE
BH+RC2273	37C	15.70	0	0	3	97	100	CLAY	GLACIOFLUVIAL
BH+RC2274	13L	4.00	0	61	27	12	100	GRAVEL	RIVER TERRACE
BH+RC2274A	25L	8.20	0	96	3	1	100	GRAVEL	RIVER TERRACE
BH+RC2606	5L	1.20	0	2	87	11	100	SAND	RIVER TERRACE
BH+RC2606	7L	2.20	0	0	15	85	100	SILT	RIVER TERRACE

BOREHOLE / WINDOW SAMPLE REF.	SAMPLE REF	SAMPLE DEPTH	GRADING ANALYSIS					DESCRIPTION	SAFEGUARDED RESOURCE
			COBBLES (%)	GRAVEL (%)	SAND (%)	FINES (%)	TOTAL (%)		
BH+RC2606	11L	4.20	0	0	36	64	100	CLAY	RIVER TERRACE
BH+RC2620	22L	7.05	0	74	24	2	100	GRAVEL	RIVER TERRACE
BH2240	2B	0.60	0	3	17	80	100	SILT	HEAD
BH2240	4B	1.20	0	74	25	1	100	GRAVEL	HEAD
BH2240	14B	5.20	0	42	56	2	100	SAND	RIVER TERRACE
BH2240	20B	8.20	0	7	91	2	100	SAND	RIVER TERRACE
BH2263	10B	4.00	0	17	80	3	100	SAND	RIVER TERRACE
BH2263	12B	6.00	0	8	84	8	100	SAND	RIVER TERRACE
BH2272	7B	3.00	0	52	25	23	100	GRAVEL	RIVER TERRACE
BH2272	9B	5.00	0	85	15	0	100	GRAVEL	RIVER TERRACE
BH2603	4B	1.20	0	82	17	1	100	GRAVEL	RIVER TERRACE
BH2607	10	3.20	0	44	50	6	100	SAND	RIVER TERRACE
BH2609	9B	3.20	0	86	13	1	100	GRAVEL	RIVER TERRACE
BH2609	13B	5.20	0	5	92	3	100	SAND	RIVER TERRACE
BH2622	6	1.20	0	9	35	56	100	SILT	RIVER TERRACE
BH2622	9	3.20	0	47	50	3	100	SAND	RIVER TERRACE
BH2622	17	7.20	0	9	84	8	100	SAND	RIVER TERRACE
BH2623	3B	1.00	0	67	19	14	100	GRAVEL	RIVER TERRACE
BH2623	6B	2.20	0	47	9	44	100	CLAY	RIVER TERRACE
BH2623	10B	4.20	0	57	41	2	100	GRAVEL	RIVER TERRACE
BH2625	11L	3.20	0	3	90	7	100	SAND	RIVER TERRACE
BH2625	23L	7.60	0	1	95	4	100	SAND	RIVER TERRACE
BH2625	29L	9.60	0	9	89	2	100	SAND	RIVER TERRACE
BH2643	2	0.50	0	48	19	33	100	GRAVEL	HEAD
BH2643	6	2.20	0	74	20	6	100	GRAVEL	RIVER TERRACE
BH2643	11	4.20	0	8	90	3	100	SAND	RIVER TERRACE
BH2645	7	2.20	0	78	19	4	100	GRAVEL	RIVER TERRACE
BH2645	12	5.20	0	84	16	1	100	GRAVEL	RIVER TERRACE
BH2649	5B	1.20	0	4	34	62	100	SILT	HEAD
BH2649	9B	3.20	0	72	25	3	100	GRAVEL	RIVER TERRACE
BH2649	18B	7.20	0	8	83	9	100	SAND	RIVER TERRACE
BH2664	21B	9.00	0	12	78	10	100	SAND	GLACIOFLUVIAL
BH2664	39B	18.00	0	34	41	25	100	SAND	GLACIOFLUVIAL
BH2667	3B	1.00	0	26	36	38	100	SILT	HEAD
BH2674	10B	4.00	0	83	16	1	100	GRAVEL	RIVER TERRACE
WS2408	5B	1.00	0	36	30	34	100	CLAY	RIVER TERRACE
WS2412B	3B	1.00	0	26	48	26	100	SAND	RIVER TERRACE
WS2412B	8B	2.00	0	17	74	9	100	SAND	RIVER TERRACE
WS2446	15L	3.00	0	28	28	44	100	CLAY	RIVER TERRACE
WS2461B	14L	4.00	0	8	62	30	100	SAND	RIVER TERRACE

BOREHOLE / WINDOW SAMPLE REF.	SAMPLE REF	SAMPLE DEPTH	GRADING ANALYSIS					DESCRIPTION	SAFEGUARDED RESOURCE
			COBBLES (%)	GRAVEL (%)	SAND (%)	FINES (%)	TOTAL (%)		
WS2461B	17L	5.00	0	13	20	67	100	CLAY	RIVER TERRACE
WS2462	5	1.20	0	9	77	14	100	SAND	RIVER TERRACE

DESIGN SECTION 3:

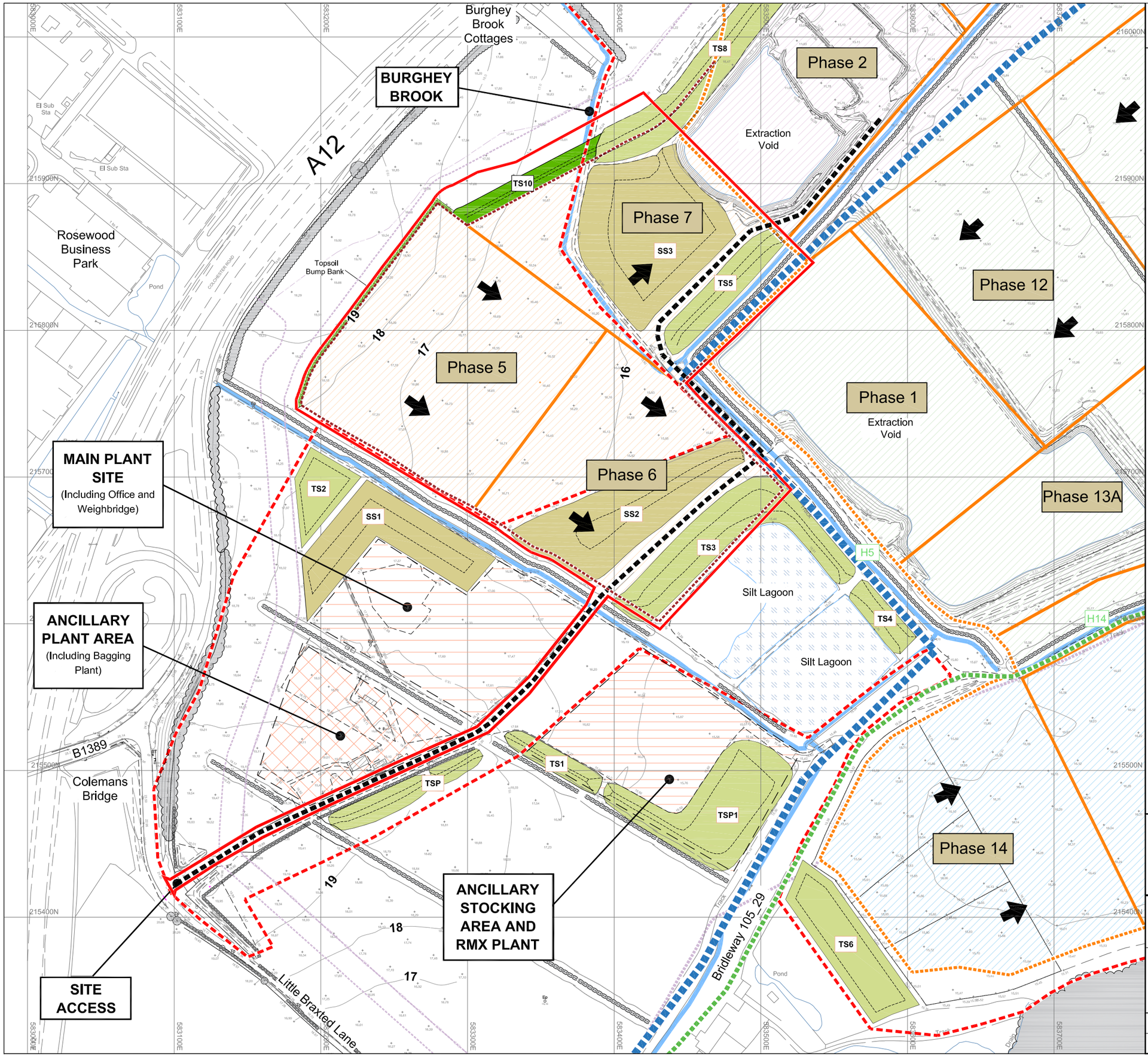
Junction 23 Kelvedon South to Junction 25 Marks Tey

BOREHOLE / WINDOW SAMPLE REF.	SAMPLE REF	SAMPLE DEPTH	GRADING ANALYSIS					DESCRIPTION	SAFEGUARDED RESOURCE
			COBBLES	GRAVEL	SAND	FINES	TOTAL		
			(%)	(%)	(%)	(%)	(%)		
BH+RC3201	39B	10.5	0	38	57	5	100	SAND	GLACIOFLUVIAL
BH+RC3202	32B	9.1	0	12	86	2	100	SAND	GLACIOFLUVIAL
BH+RC3202	43B	15.2	0	74	26	0	100	GRAVEL	GLACIOFLUVIAL
BH+RC3203	21B	6.1	0	36	55	9	100	SAND	GLACIOFLUVIAL
BH+RC3204	39C	11.5	0	11	88	1	100	SAND	GLACIOFLUVIAL
BH+RC3205	39L	12	0	5	93	2	100	SAND	GLACIOFLUVIAL
BH+RC3207	20L	4.2	0	16	78	6	100	SAND	RIVER TERRACE
BH+RC3208	17L	4.2	0	13	83	0	96	SAND	RIVER TERRACE
BH+RC3209	35B	11.3	0	70	29	1	100	GRAVEL	GLACIOFLUVIAL
BH+RC3210	28B	8.5	0	56	43	1	100	GRAVEL	GLACIOFLUVIAL
BH+RC3211	29B	9.2	0	90	10	0	100	GRAVEL	GLACIOFLUVIAL
BH+RC3215	30B	8.6	0	45	52	3	100	SAND	GLACIOFLUVIAL
BH+RC3215	36B	12.1	0	71	28	1	100	GRAVEL	GLACIOFLUVIAL
BH+RC3216	39B	14.2	0	1	13	86	100	CLAY	GLACIOFLUVIAL
BH+RC3217	29L	8.2	0	22	75	3	100	SAND	KESGRAVE CATCHMENT
BH+RC3217	36L	10.2	0	70	24	6	100	GRAVEL	KESGRAVE CATCHMENT
BH+RC3218	22L	5.2	0	85	14	1	100	GRAVEL	KESGRAVE CATCHMENT
BH+RC3218	33L	9.2	0	0	70	30	100	SAND	KESGRAVE CATCHMENT
BH3001	14B	4.2	0	2	23	75	100	CLAY	RIVER TERRACE
BH3002	7B	1.2	4	83	12	1	100	GRAVEL	GLACIOFLUVIAL
BH3003	8B	1.2	0	0	1	99	100	CLAY	GLACIOFLUVIAL
BH3004	5B	3.2	0	64	35	1	100	GRAVEL	GLACIOFLUVIAL
BH3005	17B	5.2	0	85	14	1	100	GRAVEL	GLACIOFLUVIAL
BH3006	13B	3.4	0	73	25	2	100	GRAVEL	GLACIOFLUVIAL
BH3006	20B	6.6	4	75	21	0	100	GRAVEL	GLACIOFLUVIAL
BH3007	32B	9.2	0	3	78	19	100	SAND	GLACIOFLUVIAL
BH3008	15B	2.7	0	8	90	2	100	SAND	GLACIOFLUVIAL
BH3008	24B	5.7	0	33	64	3	100	SAND	GLACIOFLUVIAL
BH3010	22B	6.4	0	24	75	1	100	SAND	GLACIOFLUVIAL
BH3020	34B	10.1	0	23	73	4	100	SAND	GLACIOFLUVIAL
BH3021	17L	5.2	0	5	81	14	100	SAND	GLACIOFLUVIAL
BH3021	30L	11.7	0	86	13	1	100	GRAVEL	GLACIOFLUVIAL
BH3023	17B	4.2	0	4	90	6	100	SAND	GLACIOFLUVIAL
BH3025	25B	7.2	0	27	71	2	100	SAND	GLACIOFLUVIAL

BOREHOLE / WINDOW SAMPLE REF.	SAMPLE REF	SAMPLE DEPTH	GRADING ANALYSIS					DESCRIPTION	SAFEGUARDED RESOURCE
			COBBLES	GRAVEL	SAND	FINES	TOTAL		
			(%)	(%)	(%)	(%)	(%)		
BH3026	30B	9.2	0	73	26	1	100	GRAVEL	GLACIOFLUVIAL
BH3027	13B	3.2	0	0	93	7	100	SAND	GLACIOFLUVIAL
BH3027	25B	8.2	0	67	33	0	100	GRAVEL	GLACIOFLUVIAL
BH3028	17B	3.5	0	31	62	7	100	SAND	GLACIOFLUVIAL
BH3028	23B	6.2	0	60	39	1	100	GRAVEL	GLACIOFLUVIAL
BH3030	22B	6.2	0	54	38	8	100	GRAVEL	GLACIOFLUVIAL
BH3030	26B	8.2	0	93	7	0	100	GRAVEL	GLACIOFLUVIAL
BH3031	28B	9.5	0	62	36	2	100	GRAVEL	GLACIOFLUVIAL
BH3041	34B	9.2	0	83	16	1	100	GRAVEL	GLACIOFLUVIAL
BH3043	24B	7	0	96	4	0	100	GRAVEL	GLACIOFLUVIAL
BH3044	19B	5.2	0	55	44	1	100	GRAVEL	KESGRAVE CATCHMENT
BH3046	23B	7.2	0	27	71	2	100	SAND	KESGRAVE CATCHMENT
BH3048	17L	4.2	0	68	30	2	100	GRAVEL	KESGRAVE CATCHMENT
BH3049A	16B	6.2	0	59	40	1	100	GRAVEL	KESGRAVE CATCHMENT
BH3050	18B	3.6	0	8	78	14	100	SAND	KESGRAVE CATCHMENT
BH3050	26B	7	0	63	37	0	100	GRAVEL	KESGRAVE CATCHMENT
BH3051	13B	3.6	0	48	50	2	100	SAND	KESGRAVE CATCHMENT
BH3052	19B	7.2	0	1	84	15	100	SAND	KESGRAVE CATCHMENT
BH3053	10B	3.2	0	19	27	54	100	CLAY	GLACIOFLUVIAL
BH3053	18B	7.2	0	54	42	4	100	GRAVEL	KESGRAVE CATCHMENT
WS3408	12L	2	0	29	51	20	100	SAND	RIVER TERRACE
WS3415	17L	4	0	10	31	59	100	CLAY	GLACIOFLUVIAL
WS3417	10L	2	0	0	94	6	100	SAND	GLACIOFLUVIAL
WS3418	10L	2	0	13	84	3	100	SAND	GLACIOFLUVIAL
WS3434A	17L	4	0	39	41	20	100	SAND	GLACIOFLUVIAL
WS3436	5B	1	0	9	51	40	100	SAND	GLACIOFLUVIAL

ANNEX D:

COLEMANS FARM REVISED WORKING PLAN



LEGEND

- CURRENT PERMISSION SITE
- APPLICATION SITE
- APPROVED EXTRACTION AREA
- PROPOSED WESTERN EXTRACTION AREA
- Phase 3 — REVISED PHASING
- EXTENT OF A12 WORKS
- GAS MAIN - HIGH PRESSURE
- GAS MAIN - MEDIUM PRESSURE
- BRIDLEWAY 105_29
- TOPSOIL BUNDS
- SUBSOIL BUNDS
- PROPOSED TOPSOIL BUNDS
- MAIN PLANT SITE
- ANCILLARY PLANT SITE
- ANCILLARY STOCKING AND RMX PLANT
- LAGOONS
- MAIN HAUL ROUTE
- BURGHEY BROOK & OTHER ORDINARY WATERCOURSES WITHIN THE SITE

NOTES

DIVERSION OF BURGHEY BROOK SUBJECT TO ORDINARY WATERCOURSE CONSENT, AND APPROPRIATE SUPERVISION BY AN ECOLOGICAL CLERK OF WORKS. DETAIL SHOWN ON PLAN C45/09/04.

SEE PLAN C45/09/05 FOR DETAILS ON PHASING

ALL AS RAISED MINERALS TO BE TRANSPORTED TO PLANT SITE

0 50 100
Meters

BRICE AGGREGATES

Project: COLEMAN'S FARM QUARRY WITHAM, ESSEX

Title: PROPOSED WORKING PLAN

Scale	1:2500 @ A3	Date	February 2021	Drawing No.
Drawn by	DJA	Checked by	OB	C45/09/03

A12 TO A120 WIDENING SCHEME
MINERAL RESOURCE ASSESSMENT

ANNEX E - FINANCIAL APPRAISAL CALCULATIONS

DESIGN SECTION 1 - FINANCIAL APPRAISAL

Prior Extraction with all minerals taken to Bulls Lodge Quarry

OPERATING COSTS	
Average Aggregate Sales Price (£/T)	£8.25
Gate Price for inert waste tipping (£/T)	£4.80
Haulage of Mineral to nearest operation (£/T)	-£3.00
Earthworks cost - soil and o/b removal (£/m3)	-£2.35
Ground Engineering & compaction of inert fill (£/t)	-£6.15
Site Supervisor	£50,000
Aggregate production costs (£/T)	-£5.00
Aggregate Levy (£/T)	-£2.00
Royalty (£/T)	-£1.00
Waste royalty (£/T)	-£1.68

QUANTITIES		
Aggregate	663,000	tonnes
Soils and Overburden	450,000	m3
Inerts (increased tonnage	696,150	tonnes
to allow 5% compaction)		

PLEASE REFER TO SECTION 8.3 OF THE MINERAL RESOURCE ASSESSMENT FOR EXPLANATION OF ASSUMPTIONS

INCOME	
Aggregate Sales	£5,469,750
Inert Waste Receipts	£3,341,520
Total Income	**£8,811,270**

EXPENDITURE	
Handling Soils and Overburden	-£1,057,500
Aggregate Production Costs	-£3,315,000
Aggregate Haulage (to Bulls Lodge Quarry)	-£1,989,000
Ground Engineering and compaction of inerts	-£5,443,327
Aggregate Levy	-£1,326,000
Site Supervision	£50,000
Total Expenditure	**-£13,080,827**
P & L Summary	**-£4,269,557**

Royalties	
Royalty (paid to mineral owners)	-£663,000
Waste royalty (taken as 30% of gate price)	-£1,113,840
	-£1,776,840

NET PRESENT VALUE	
Annual income	-£4,269,557
Years	1
Discount rate	12.5%
YP	0.889
Capital value	-£3,795,161
Deferment	0
PV of £1	1.000
Net Present Value	-£3,795,161
say	**-£3,795,000**

A12 TO A120 WIDENING SCHEME
MINERAL RESOURCE ASSESSMENT

DESIGN SECTION 2 - FINANCIAL APPRAISAL

Prior Extraction with all minerals taken to Colemans Quarry

OPERATING COSTS	
Average Aggregate Sales Price (£/T)	£8.25
Gate Price for inert waste tipping (£/T)	£4.80
Haulage of Mineral to nearest operation (£/T)	-£3.00
Earthworks cost - soil and o/b removal (£/m3)	-£2.35
Ground Engineering & compaction of inert fill (£/t)	-£6.15
Site Supervisor	£50,000
Aggregate production costs (£/T)	-£5.00
Aggregate Levy (£/T)	-£2.00
Royalty (£/T)	-£1.00
Waste royalty (£/T)	-£1.68

QUANTITIES		
Aggregate	4,952,000	tonnes
Soils and Overburden	1,858,000	m3
Inerts (increased tonnage	5,199,600	tonnes
to allow 5% compaction)		

PLEASE REFER TO SECTION 8.3 OF THE MINERAL RESOURCE ASSESSMENT FOR EXPLANATION OF ASSUMPTIONS

INCOME	
Aggregate Sales	£40,854,000
Inert Waste Receipts	£24,958,080
Total Income	**£65,812,080**

EXPENDITURE	
Handling Soils and Overburden	-£4,366,300
Aggregate Production Costs	-£24,760,000
Aggregate Haulage (to Colemans Quarry)	-£14,856,000
Ground Engineering and compaction of inerts	-£31,412,663
Aggregate Levy	-£9,904,000
Site Supervision	£50,000
Total Expenditure	**-£85,248,963**
P & L Summary	**-£19,436,883**

Royalties	
Royalty (paid to mineral owners)	-£4,952,000
Waste royalty (taken as 30% of gate price)	-£8,319,360
	-£13,271,360

NET PRESENT VALUE	
Annual income	-£19,436,883
Years	1
Discount rate	12.5%
YP	0.889
Capital value	-£17,277,229
Deferment	0
PV of £1	1.000
Net Present Value	-£17,277,229
say	**-£17,277,000**

A12 TO A120 WIDENING SCHEME
MINERAL RESOURCE ASSESSMENT

DESIGN SECTION 3 - FINANCIAL APPRAISAL

Prior Extraction with all minerals taken to Colchester Quarry

OPERATING COSTS	
Average Aggregate Sales Price (£/T)	£8.25
Gate Price for inert waste tipping (£/T)	£4.80
Haulage of Mineral to nearest operation (£/T)	-£3.00
Earthworks cost - soil and o/b removal (£/m3)	-£2.35
Ground Engineering & compaction of inert fill (£/t)	-£6.15
Site Supervisor	£50,000
Aggregate production costs (£/T)	-£5.00
Aggregate Levy (£/T)	-£2.00
Royalty (£/T)	-£1.00
Waste royalty (£/T)	-£1.68

QUANTITIES		
Aggregate	4,506,000	tonnes
Soils and Overburden	5,970,250	m3
Inerts (increased tonnage	4,731,300	tonnes
to allow 5% compaction)		

PLEASE REFER TO SECTION 8.3 OF THE MINERAL RESOURCE ASSESSMENT FOR EXPLANATION OF ASSUMPTIONS

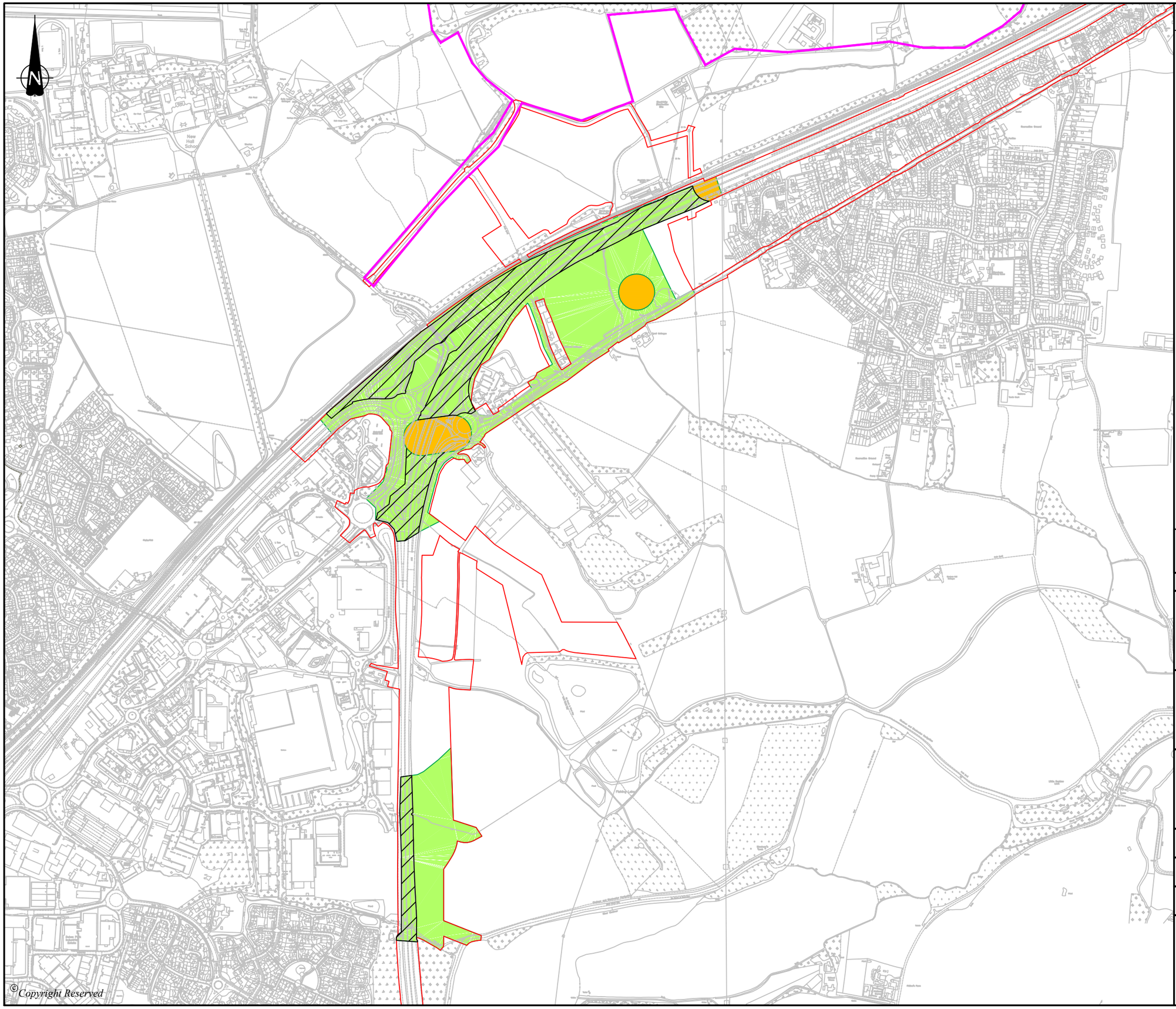
INCOME	
Aggregate Sales	£37,174,500.00
Inert Waste Receipts	£22,710,240.00
Total Income	**£59,884,740.00**

EXPENDITURE	
Handling Soils and Overburden	-£14,030,087.50
Aggregate Production Costs	-£22,530,000.00
Aggregate Haulage (to Colchester Quarry)	-£13,518,000.00
Ground Engineering and compaction of inerts	-£54,902,971.88
Aggregate Levy	-£9,012,000.00
Site Supervision	£50,000.00
Total Expenditure	**-£113,943,059.38**
P & L Summary	**-£54,058,319.38**

Royalties	
Royalty (paid to mineral owners)	-£4,506,000.00
Waste royalty (taken as 30% of gate price)	-£7,570,080.00
	-£12,076,080.00

NET PRESENT VALUE	
Annual income	-£54,058,319
Years	1
Discount rate	12.5%
YP	0.889
Capital value	-£48,051,839
Deferment	0
PV of £1	1.000
Net Present Value	-£48,051,839
say	**-£48,052,000**

DRAWINGS



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LEGEND

Order limits

Sterilised safeguarded sand and gravel (within permanent acquisition land) (excluding borrow pit areas)

Sterilised safeguarded sand & gravel (beneath existing A12)

Areas where sand and gravel is absent or where a high overburden to mineral ratio is present.

Safeguarded mineral site Bulls Lodge Quarry (Sand and gravel)

REVISION	DETAILS	DATE	DR'N	CHK'D	APP'D

CLIENT

NATIONAL HIGHWAYS

PROJECT

A12 CHELMSFORD TO A120 WIDENING SCHEME
MINERAL RESOURCE ASSESSMENT

DRAWING TITLE

DESIGN SECTION 1
(Chainage 09400 - 11920)
SAND AND GRAVEL RESOURCES

DRG No.		REV
CA12096-001		P0
DRG SIZE	SCALE	DATE
A3	1:10,000	MAY 2022
DRAWN BY	CHECKED BY	APPROVED BY
DNH	DL	CH

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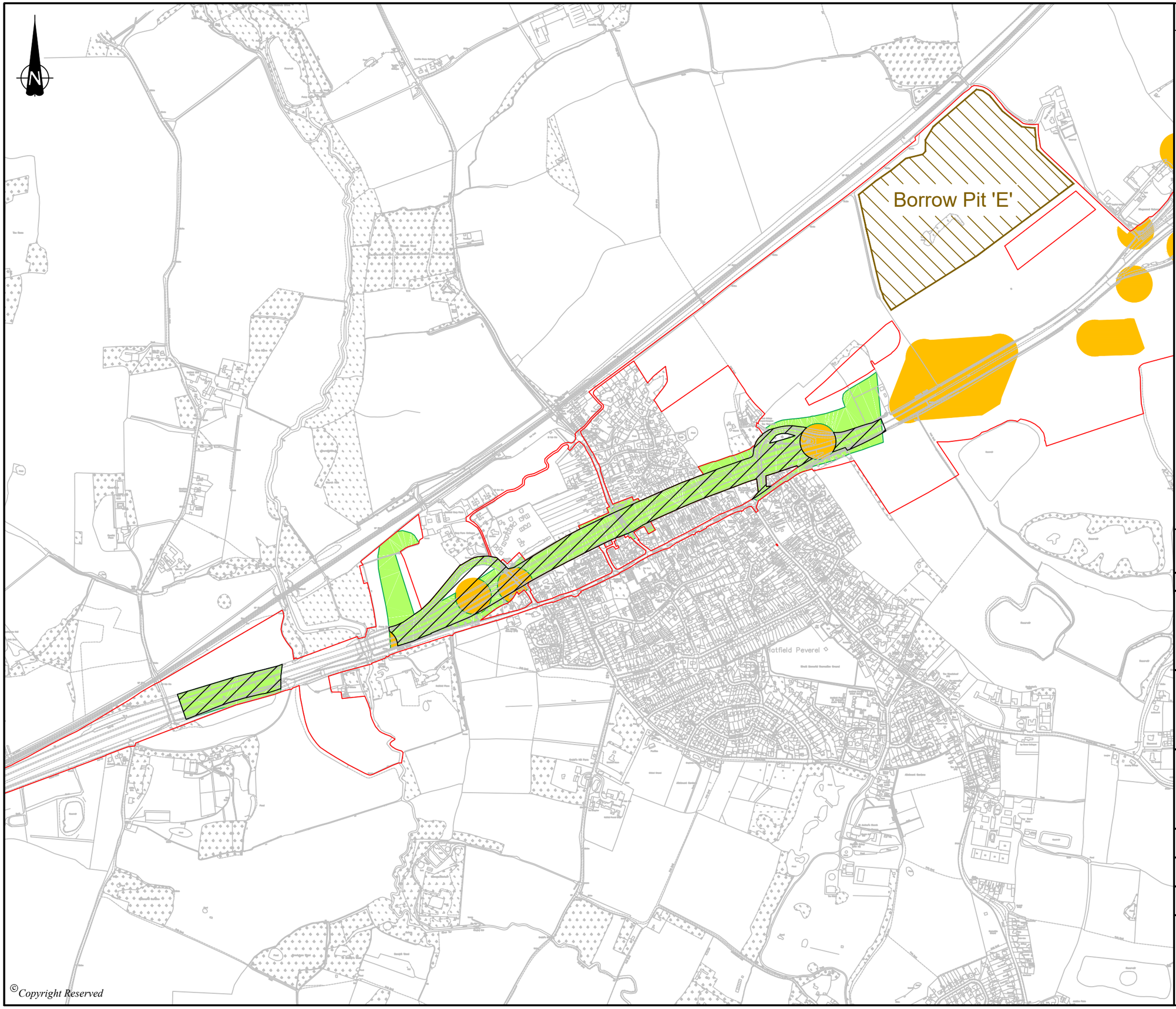
SHEFFIELD
STOKE ON TRENT



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LEGEND

Order limits

Sterilised safeguarded sand and gravel (within permanent acquisition land) (excluding borrow pit areas)

Sterilised safeguarded sand & gravel (beneath existing A12)

Areas where sand and gravel is absent or where a high overburden to mineral ratio is present.

Borrow Pit for proposed scheme

REVISION	DETAILS	DATE	DR'N	CHK'D	APP'D

CLIENT

NATIONAL HIGHWAYS

PROJECT

A12 CHELMSFORD TO A120 WIDENING SCHEME
MINERAL RESOURCE ASSESSMENT

DRAWING TITLE

DESIGN SECTION 1
(Chainage 15090 - 17200)
SAND AND GRAVEL RESOURCES

DRG No.		REV
CA12096-002		P0
DRG SIZE	SCALE	DATE
A3	1:10,000	MAY 2022
DRAWN BY	CHECKED BY	APPROVED BY
DNH	DL	CH

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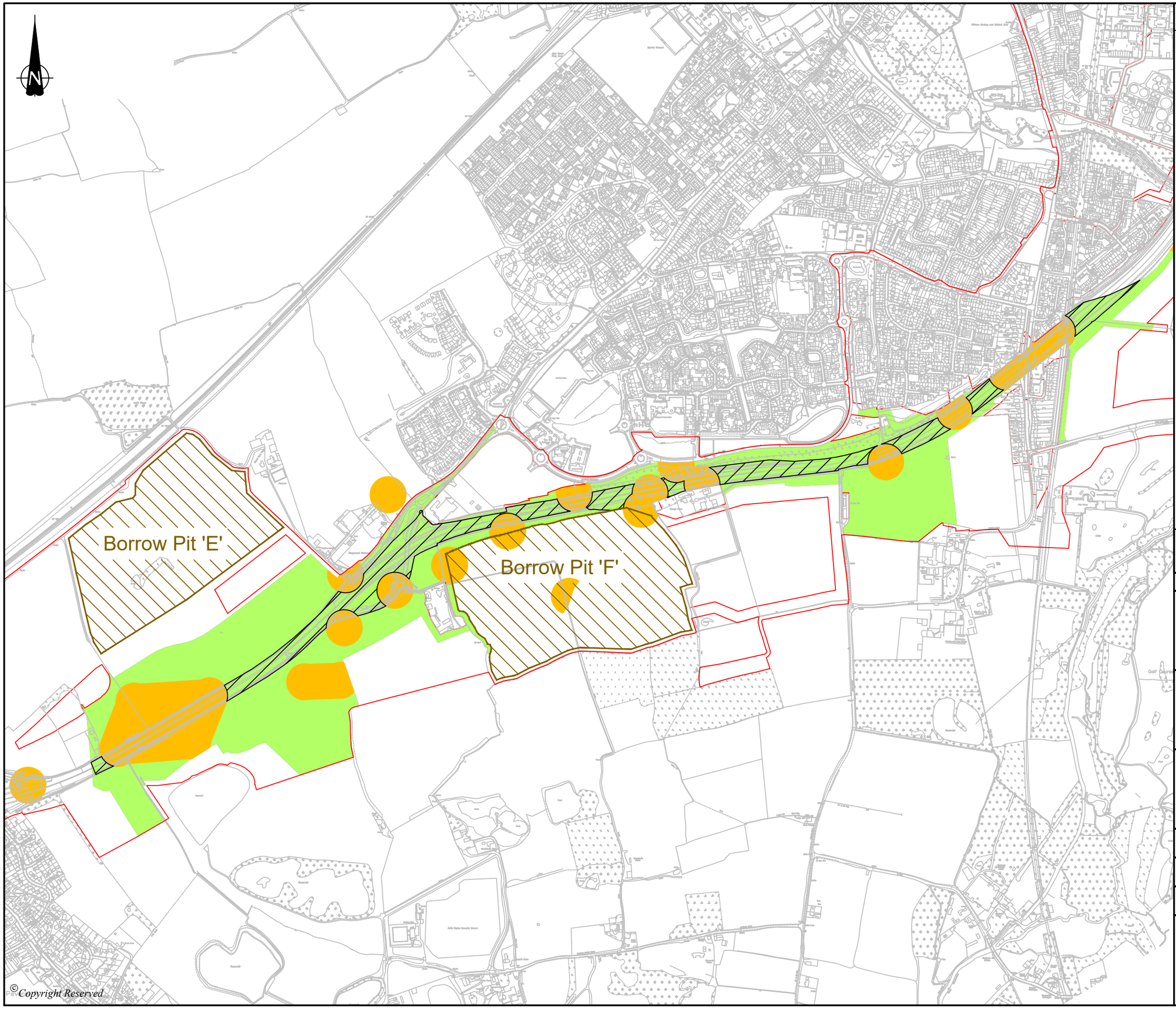

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LEGEND

Order Limits

Sterilised safeguarded sand and gravel (within permanent acquisition land) (excluding borrow pit areas)

Sterilised safeguarded sand & gravel (beneath existing A12)

Areas where sand and gravel is absent or where a high overburden to mineral ratio is present.

Borrow Pit for proposed scheme

REVISION	DETAILS	DATE	DR'N	CHK'D	APP'D

CLIENT

NATIONAL HIGHWAYS

PROJECT

A12 CHELMSFORD TO A120 WIDENING SCHEME
MINERAL RESOURCE ASSESSMENT

DRAWING TITLE

DESIGN SECTION 2
(Chainage 17200 - 21030)
SAND AND GRAVEL RESOURCES

DRG No.		REV
CA12096-003		P0
DRG SIZE	SCALE	DATE
A3	1:10,000	MAY 2022
DRAWN BY	CHECKED BY	APPROVED BY
DNH	DL	CH

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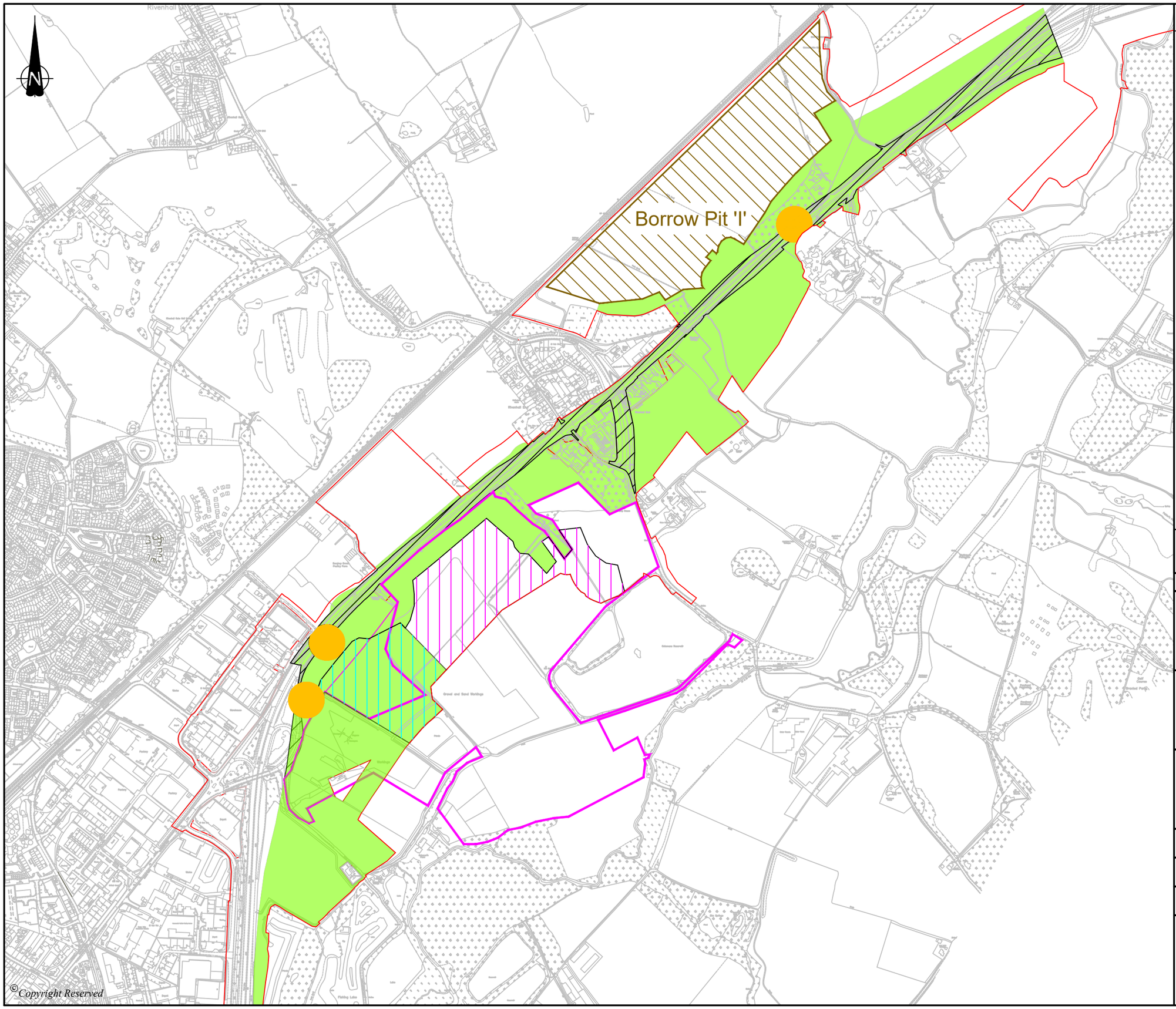

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LEGEND

Order Limits

Sterilised safeguarded sand and gravel (within permanent acquisition land) (excluding borrow pit areas)

Sterilised safeguarded sand & gravel (beneath existing A12)

Areas where sand and gravel is absent or where a high overburden to mineral ratio is present.

Safeguarded mineral site Colemans Farm (Sand and gravel)

Potentially sterilised safeguarded mineral resources beneath proposed scheme if not removed by Brice Aggregates (Phases 5 -7)
Subject to PA Ref. ESS/51/21/BTE
Refer to Annex 4 - Colemans Farm Revised Working Plan

Sand and gravel reserves extracted by Brice Aggregates Ltd under planning permission Ref. ESS/40/18/BTE

Borrow Pit for proposed scheme

REVISION	DETAILS	DATE	DR'N	CHK'D	APP'D

CLIENT

NATIONAL HIGHWAYS

PROJECT

A12 CHELMSFORD TO A120 WIDENING SCHEME
MINERAL RESOURCE ASSESSMENT

DRAWING TITLE

DESIGN SECTION 2
(Chainage 22270 - 25900)
SAND AND GRAVEL RESOURCES

DRG No.		REV
CA12096-004A		P0
DRG SIZE	SCALE	DATE
A3	1:10,000	MAY 2022
DRAWN BY	CHECKED BY	APPROVED BY
DNH	DL	KH

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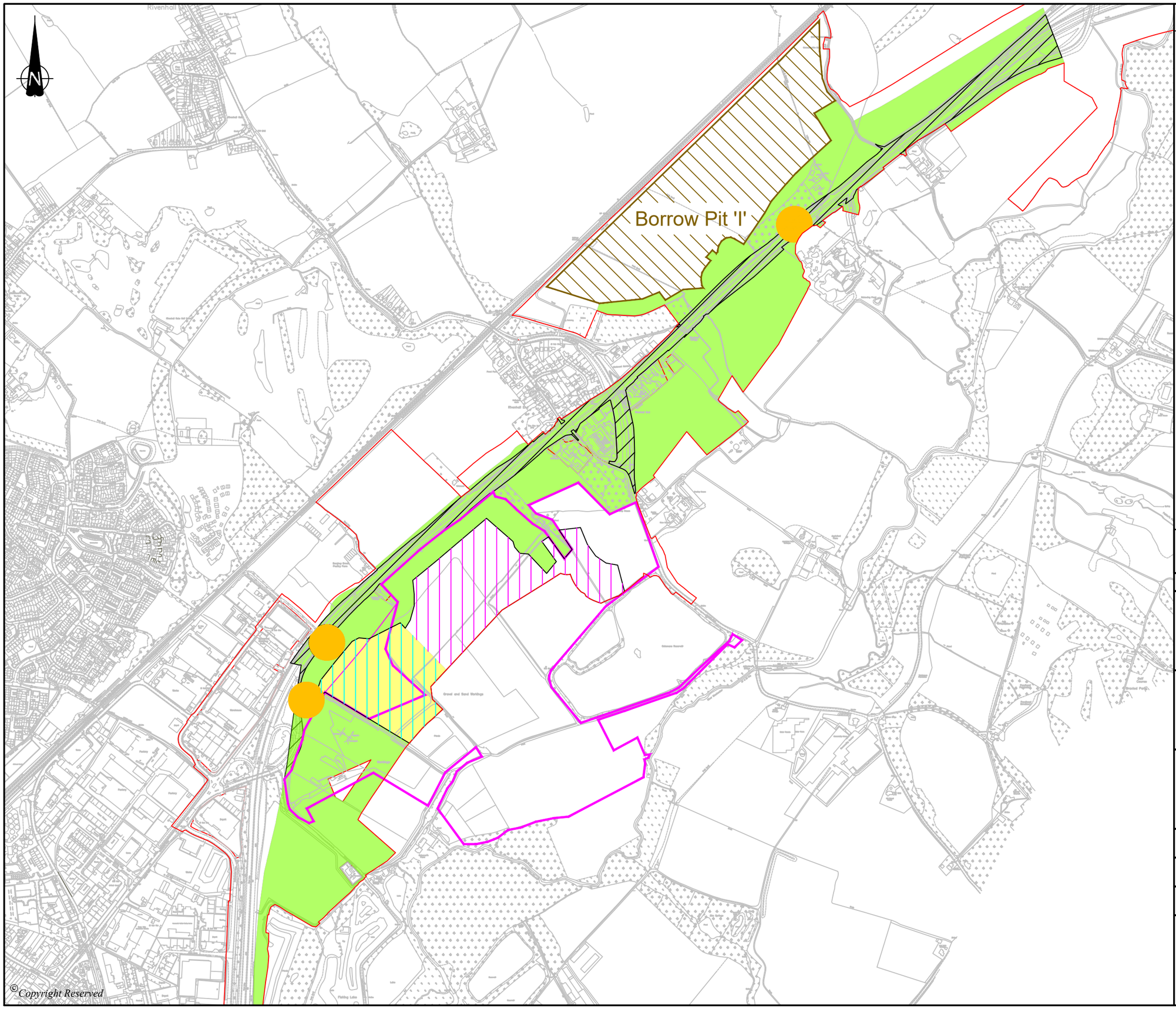

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LEGEND

Order Limits

Sterilised safeguarded sand and gravel (within permanent acquisition land) (excluding borrow pit areas)

Sterilised safeguarded sand & gravel (beneath existing A12)

Areas where sand and gravel is absent or where a high overburden to mineral ratio is present.

Safeguarded mineral site Colemans Farm (Sand and gravel)

Safeguarded mineral resources beneath proposed scheme to be worked by Brice Aggregates (Phases 5 - 7)
Subject to planning application ESS/51/21/BTE
Refer to Annex 4 - Colemans Farm Revised Working Plan

Sand and gravel reserves extracted by Brice Aggregates Ltd under planning permission Ref. ESS/40/18/BTE

Borrow Pit for proposed scheme

REVISION	DETAILS	DATE	DR'N	CHK'D	APP'D

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A12 CHELMSFORD TO A120 WIDENING SCHEME
MINERAL RESOURCE ASSESSMENT

DRAWING TITLE

DESIGN SECTION 2
(Chainage 22270 - 25900)
SAND AND GRAVEL RESOURCES

DRG No.		REV
CA12096-004B		P0
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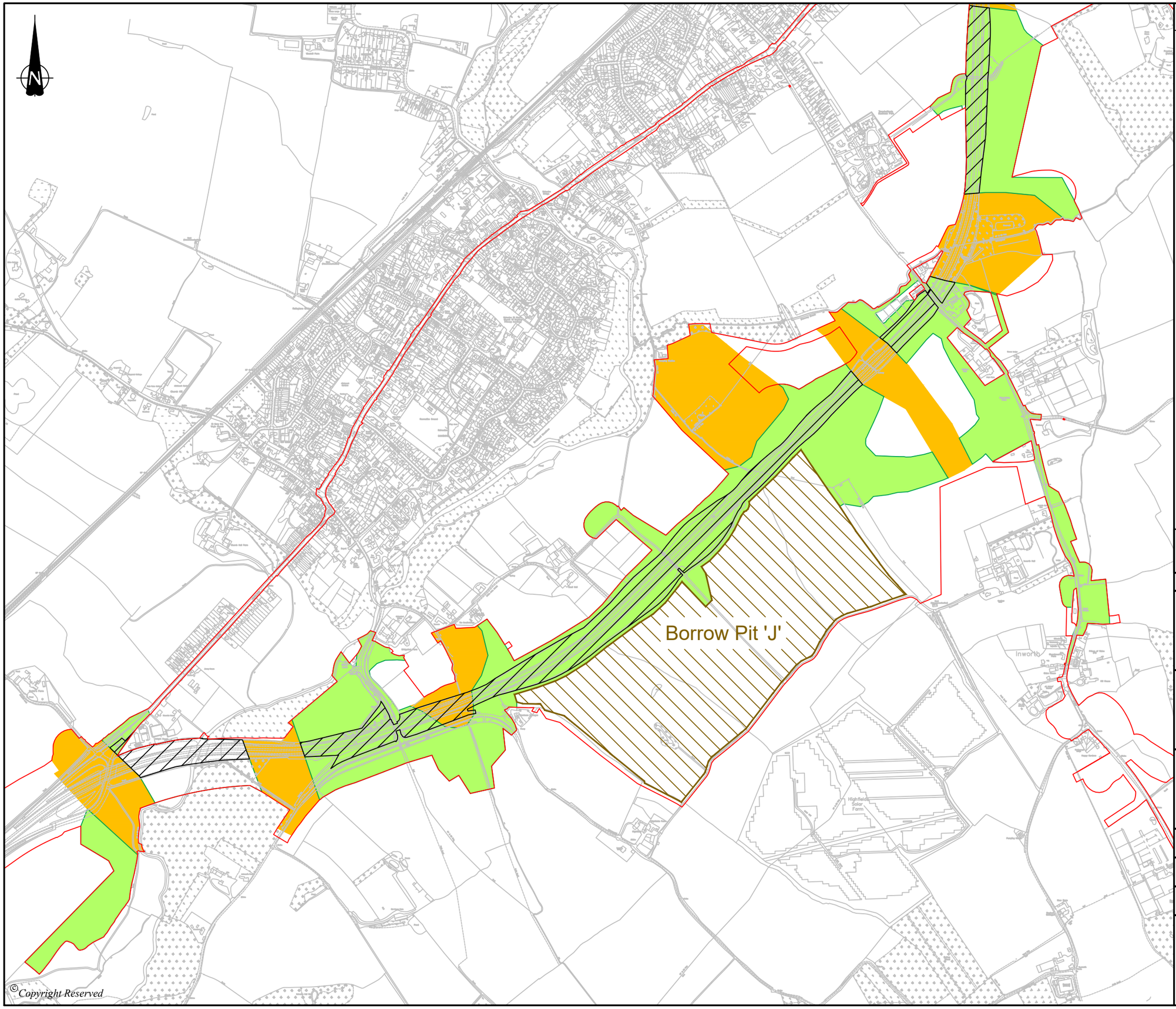

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LEGEND

Order Limits

Sterilised safeguarded sand and gravel (within permanent acquisition land) (excluding borrow pit areas)

Sterilised safeguarded sand & gravel (beneath existing A12)

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Borrow Pit for proposed scheme

REVISION	DETAILS	DATE	DR'N	CHK'D	APP'D

CLIENT

NATIONAL HIGHWAYS

PROJECT

A12 CHELMSFORD TO A120 WIDENING SCHEME
MINERAL RESOURCE ASSESSMENT

DRAWING TITLE

DESIGN SECTION 3
(Chainage 25900 - 32600)
SAND AND GRAVEL RESOURCES

DRG No.		REV
CA12096-005		P0
DRG SIZE	SCALE	DATE
A3	1:10,000	MAY 2022
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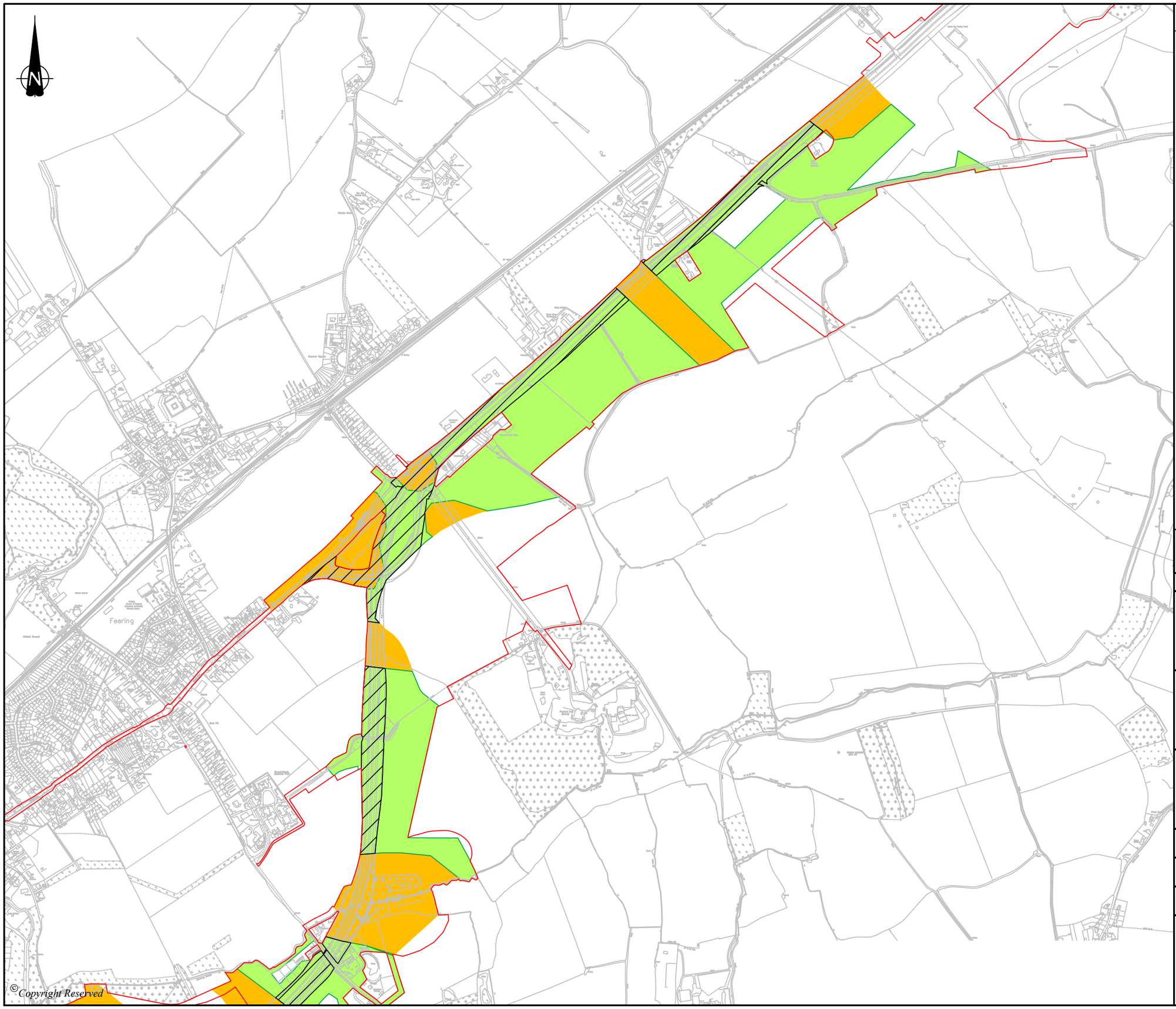

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LEGEND

Order limits

Sterilised safeguarded sand and gravel (within permanent acquisition land) (excluding borrow pit areas)

Sterilised safeguarded sand & gravel (beneath existing A12)

Areas where sand and gravel is absent or where a high overburden to mineral ratio is present.

REVISION	DETAILS	DATE	DR'N	CHK'D	APP'D

CLIENT

NATIONAL HIGHWAYS

PROJECT

A12 CHELMSFORD TO A120 WIDENING SCHEME
MINERAL RESOURCE ASSESSMENT

DRAWING TITLE

DESIGN SECTION 3
(Chainage 31600 - 34700)
SAND AND GRAVEL RESOURCES

DRG No.		REV
CA12096-006		P0
DRG SIZE	SCALE	DATE
A3	1:10,000	MAY 2022
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DNH	DL	CH

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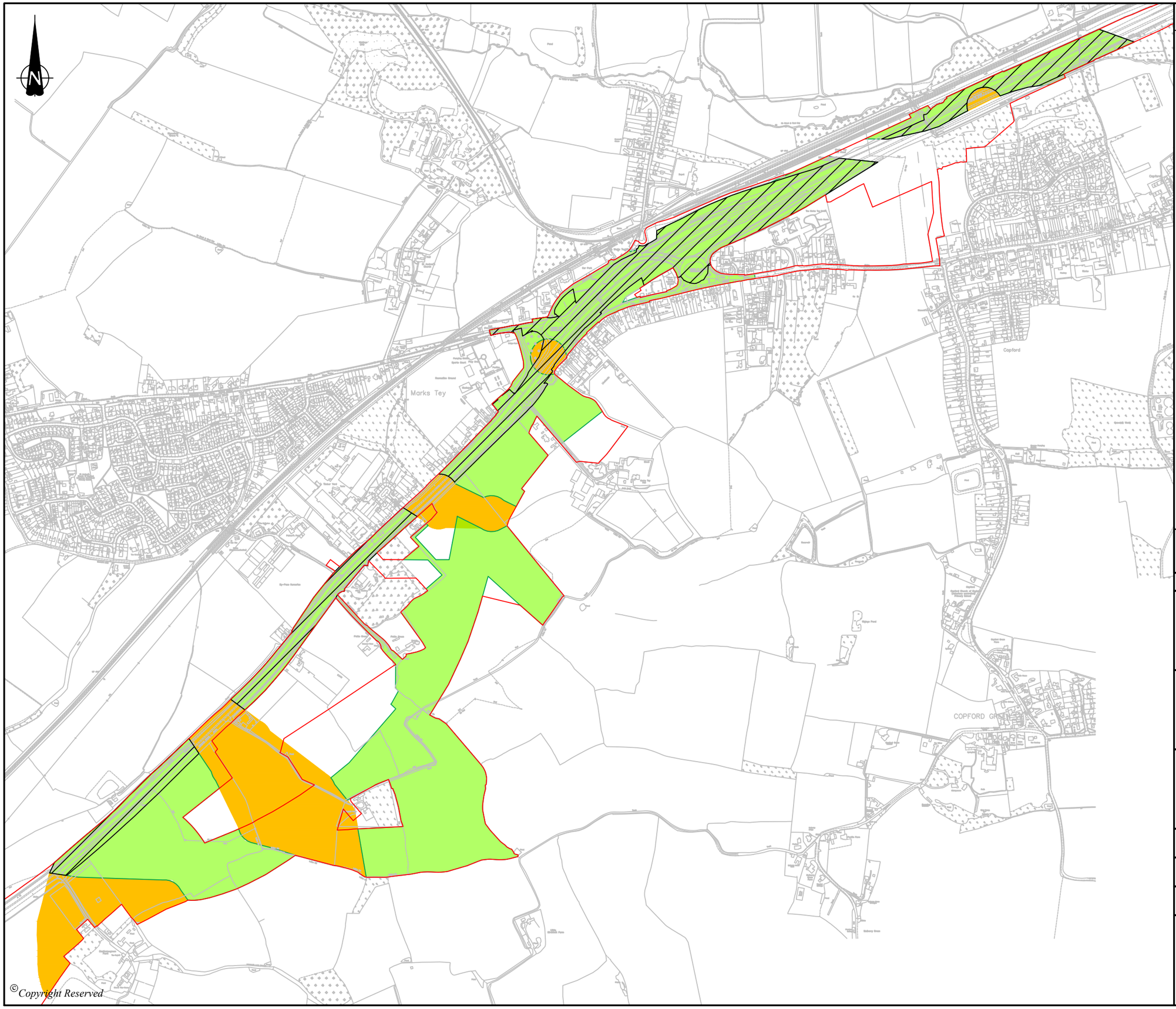

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LEGEND

Order Limits

Sterilised safeguarded sand and gravel (within permanent acquisition land) (excluding borrow pit areas)

Sterilised safeguarded sand & gravel (beneath existing A12)

Areas where sand and gravel is absent or where a high overburden to mineral ratio is present.

REVISION	DETAILS	DATE	DR'N	CHK'D	APP'D

CLIENT

NATIONAL HIGHWAYS

PROJECT

A12 CHELMSFORD TO A120 WIDENING SCHEME
MINERAL RESOURCE ASSESSMENT

DRAWING TITLE

DESIGN SECTION 3
(Chainage 35900 - 39900)
SAND AND GRAVEL RESOURCES

DRG No.		REV
CA12096-007		P0
DRG SIZE	SCALE	DATE
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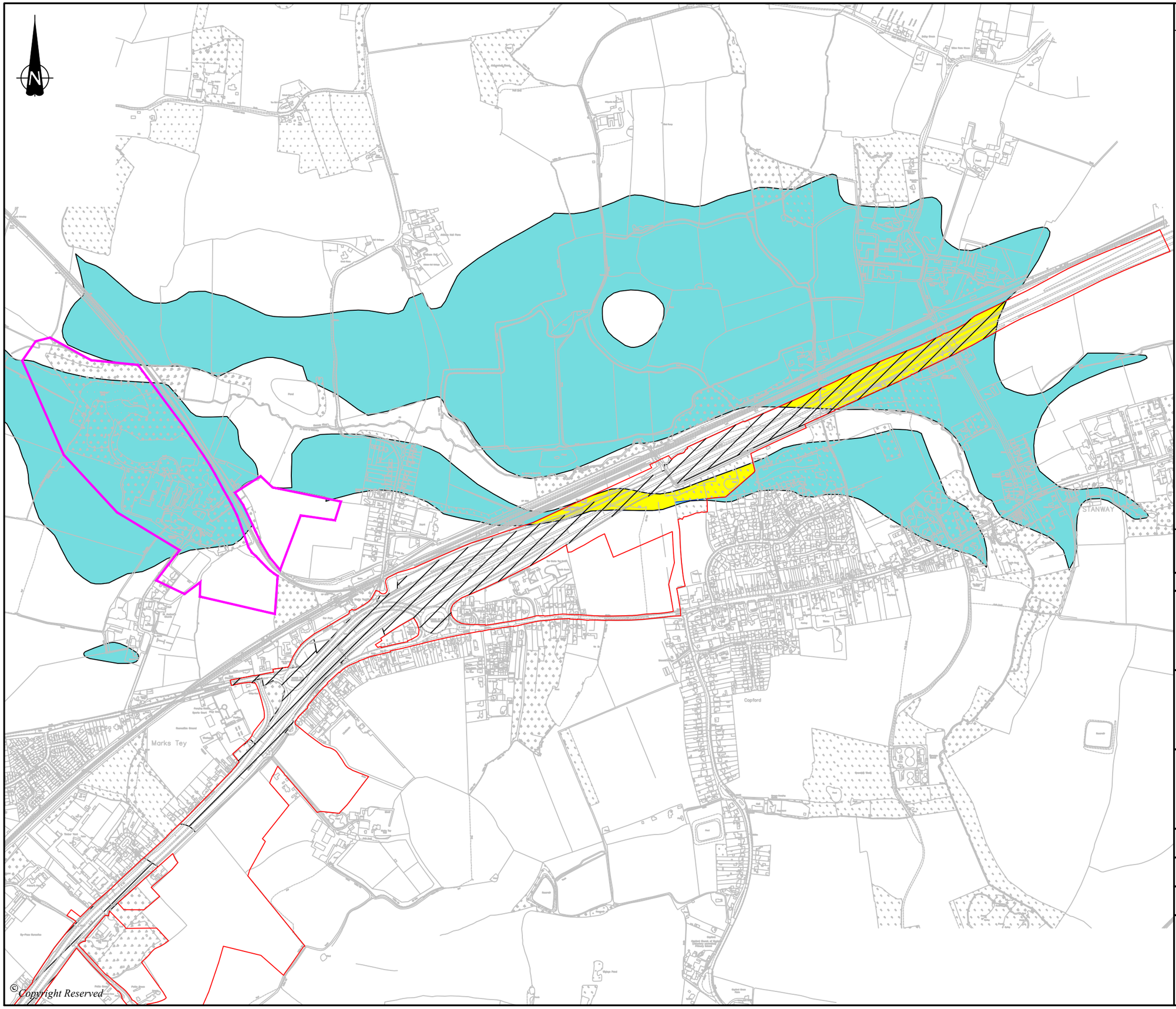

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LEGEND

Order Limits

Sterilised safeguarded Brick clay (within permanent land take)

Safeguarded Brick Clay mineral resource

Sterilised safeguarded Brick clay (beneath existing A12)

Safeguarded mineral site (Brick clay)

REVISION	DETAILS	DATE	DR'N	CHK'D	APP'D

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PROJECT

A12 CHELMSFORD TO A120 WIDENING SCHEME
MINERAL RESOURCE ASSESSMENT

DRAWING TITLE

DESIGN SECTION 3
(Chainage 38800 - 40900)
BRICK CLAY RESOURCES

DRG No.		REV
CA12096-008		P0
DRG SIZE	SCALE	DATE
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STOKE-ON-TRENT
Sir Henry Doulton House
Forge Lane
Etruria
Stoke-on-Trent
ST1 5BD
Tel: +44 (0)1782 276 700

BIRMINGHAM
Two Devon Way
Longbridge Technology Park
Longbridge
Birmingham
B31 2TS
Tel: +44 (0)121 580 0909

BOLTON
41-50 Futura Park
Aspinall Way
Middlebrook
Bolton
BL6 6SU
Tel: +44 (0)1204 227 227

BRISTOL
Desklodge
2 Redcliffe Way
Bristol
BS1 6NL

BURY ST EDMUNDS
9 Lamdin Road
Bury St Edmunds
Suffolk
IP32 6NU
Tel: +44 (0)1284 765 210

CARDIFF
Tudor House
16 Cathedral Road
Cardiff
CF11 9LJ
Tel: +44 (0)292 072 9191

CARLISLE
Marconi Road
Burgh Road Industrial
Estate Carlisle
Cumbria
CA2 7NA
Tel: +44 (0)1228 550 575

EDINBURGH
Great Michael House
14 Links Place
Edinburgh
EH6 7EZ
Tel: +44 (0)131 555 3311

GLASGOW
24 St Vincent Place
Glasgow
G1 2EU
Tel: +44 (0)141 428 449

LEEDS
36 Park Row
Leeds
LS1 5JL
Tel: +44 (0)113 831 5533

LONDON
Third Floor
46 Chancery Lane
London
WC2A 1JE
Tel: +44 (0)207 242 3243

NEWCASTLE UPON TYNE
City Quadrant
11 Waterloo Square
Newcastle upon Tyne
NE1 4DP
Tel: +44 (0)191 232 0943

TRURO
Baldhu House
Wheal Jane Earth Science Park
Baldhu
Truro
TR3 6EH
Tel: +44 (0)187 256 0738

International offices:

ALMATY
29/6 Satpaev Avenue
Hyatt Regency Hotel
Office Tower
Almaty
Kazakhstan
050040
Tel: +7(727) 334 1310

MOSCOW
21/5 Kuznetskiy Most St.
Moscow
Russia
Tel: +7(495) 626 07 67

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