



*Bicester Motion Innovation  
Centre*

Remediation Strategy  
and Verification Plan

*For Bicester Motion*

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*Date: 5 December 2023*

*Doc ref: 27280-HYD-XX-XX-RP-GE-3001*

# Document control sheet

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Client	Bicester Motion	
Project name	Bicester Motion Innovation Centre	
Project title	Remediation Strategy and Verification Plan	
BIM reference	27280-HYD-XX-XX-RP-GE-3001	
Project reference	27280	
Date	05/12/2023	

Document production record		
Issue Number	P02	Name
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Document revision record			
Issue Number	Status	Date	Revision Details
S2	P01	04/12/23	First Issue
S2	P02	05/12/23	Updated following Client comments

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# 1. Introduction

## 1.1 Terms of reference

In July 2023, Hydrock Consultants Limited (Hydrock) was commissioned by Bicester Motion (the Client) to prepare a Remediation Strategy and Verification Plan (RS&VP) for a proposed warehouse/commercial development, with associated external and landscaping works, car parking and access roads.

The site is located to the south of the existing Bicester Motion site approximately 2km north-east of Bicester town centre, in north-east Oxfordshire. The National Grid reference of the approximate centre of the site is 459624 and 223986, and the nearest postcode is OX26 5AF.

The site currently comprises a generally flat area of open fields, with some local undulations, covering approximately 10.3ha.

Preparation of this RS&VP follows completion of ground investigation works carried out by Ridge, as reported in its June 2021. 'Ground Condition Assessment. Bicester Motion – Innovation Quarter' report (Ref: 5016203<sup>1, 2</sup>) and Hydrock's supplementary ground investigation works reported in its November 2023 'Bicester Motion Innovation Centre. Desk Study Review & Ground Investigation' report (Ref: 27280-HYD-XX-XX-RP-GE-1001).

## 1.2 Objectives

The scope of this RS&VP is to present details of the remedial objectives and how remediation of the site will be undertaken to mitigate the risks posed by contaminated soils present as a result of the previous uses of the site.

This report (27280-HYD-XX-XX-RP-GE-3001) provides a 'Remediation Strategy and Verification Plan' (RS&VP) to be used as part of the development works. The objectives of this RS&VP are to:

- » present details of the geo-environmental risks that need to be mitigated;
- » describe how the remediation of the site will be undertaken;
- » outline how the works will be verified;
- » maximise the sustainability of the project by reducing off-site disposal and import requirements; and
- » explain how the works will be permitted under the current regulatory regime.

The remedial works are designed to ensure that on completion, the ground conditions at the site can be shown to be suitable for the proposed commercial end use and will not pose an unacceptable risk to human health or the environment during the enabling works to prepare the site.

Careful consideration of the ground conditions and the implementation of sound earthworks and materials management practices as part of the remediation works are critical to ensuring that the redevelopment complies with all regulatory requirements set out in the planning conditions.

This is a working document and, in agreement with the relevant regulatory bodies, it may need to be updated at any stage during development, dependent on the ground conditions encountered. This version therefore constitutes 27280-HYD-XX-XX-RP-GE-3001.

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<sup>1</sup> Does not cover the whole of the Innovation Centre site area.

<sup>2</sup> This report references a number of previous reports on the site by: Carl Bro, Grontmij Group, Geo-Integrity and Ridge and Partners, which should be referred to if additional information is required.



### 1.3 Scope

The scope of this RS&VP and Specification comprises:

- » a summary of previous reports undertaken at the site;
- » a Remediation Options Appraisal;
- » details of a Remediation Strategy implementation; and
- » details of the required remediation verification.

### 1.4 Reference Documents

The following documents, reports etc. have been provided to or undertaken by Hydrock by Bicester Motion for use in the preparation of this report:

- » Ridge. June 2021. 'Ground Condition Assessment. Bicester Motion – Innovation Quarter'. Report Ref: 5016203.<sup>1,2</sup>
- » Hydrock Consultants Ltd. September 2023. 'Bicester Motion. Cut and Fill Analysis'. Ref: 27280-HYD-00-ZZ-DR-C-7400.
- » Hydrock Consultants Ltd. November 2023. 'Bicester Motion Innovation Centre. Desk Study Review & Ground Investigation'. Ref: 27280-HYD-XX-XX-RP-GE-1001.
- » Hydrock Consultants Ltd. December 2023. 'Bicester Motion Innovation Centre. Geotechnical Design Report'. Ref: 27280-HYD-XX-XX-RP-GE-4001.

The contractor is to confirm with Hydrock the latest version of the above referenced documents before construction.

It is understood that the Client defined in Section 1.1 commissioned / has obtained assignment of, the above documents and Hydrock has assumed full reliance can be placed on their contents. Should this not be the case, Hydrock should be informed at the earliest opportunity.

### 1.5 Limitations

Hydrock has prepared this report in accordance with the instructions of the Client, by e-mail under the terms of appointment for Hydrock, for the sole and specific use of the Client and parties designated by them for the purpose of providing information on the remediation and validation works to be undertaken during the enabling and construction stages of the development. The report contents should only be used in that context. Furthermore, new information, changed practices or new legislation may necessitate revised interpretation of the report after the date of its submission.

Any third parties who use the information contained herein do so at their own risk. Hydrock shall not be responsible for any use of the report or its contents for any purpose other than that for which it was prepared or for use of the report by any parties not defined in Hydrock's appointment.

The report has been prepared by Hydrock on the basis of available information obtained during the study period. Although every reasonable effort has been made to gather all relevant information, not all potential environmental constraints or liabilities associated with the site may have been revealed.

Hydrock has used reasonable skill, care and diligence in the design of the remediation of the site. The inherent variation of ground conditions allows only definition of the actual conditions at the locations and depths of trial pits and boreholes at the time of the investigation. At intermediate locations, conditions can only be inferred. Groundwater data are only representative of the dates on which they were obtained and both levels and quality may vary.

Information provided by third parties has been used in good faith and is taken at face value. However, Hydrock cannot guarantee the accuracy or completeness of any information provided by others.

The work has been carried out in general accordance with recognised best practice as detailed in guidance documents such as in accordance with the principles of LCRM; BS 5930:2015+A1:2020 BS 8485:2015+A1:2019, BS 10175: 2011+A2:2017

## 1.6 Definitions

Bicester Motion is referred to as 'the Client'.

For the purposes of this report the remediation has been split into two distinct phases: the 'Enablement Stage' and the 'Construction Phase'. The same Contractor could undertake both phases of work.

The Enablement Contractor shall undertake remediation works during the Enablement Stage of works. The 'Ground Works Contractor' shall undertake remediation works during the Construction Stage. A single contractor, or separate contractors may undertake the role of the Enablement Contractor and the Ground Works Contractor.

As additional and supporting information is presented throughout this document the Contractor(s) shall read and understand the entirety of this report. If there is any doubt with regard to the works required, please contact the Client or Hydrock for clarification.

This document will be referred to as the 'Remediation Strategy and Verification Plan' or the 'RS&VP'.

The term 'MMP' refers to a Qualified Person declared Materials Management Plan in accordance with the Contaminated Land: Applications in Real Environments (CL:AIRE) document: 'The Definition of Waste: Development Industry Code of Practice' (Version 2) (DoWCoP), dated March 2011.

The term 'GDR' refers to the 'Geotechnical Design Report' (ref. 27280-HYD-XX-XX-RP-GE-4001), prepared by Hydrock.

The term 'EWS' refers to the Earthworks Specification, included as an appendix to the GDR.

GAC refers to Generic Assessment Criteria.

SSAC refers to Site Specific Assessment Criteria, derived using site-specific data.

RTVs refers to Remedial Target Values.

CoPC means Contaminant(s) of Potential Concern.

'Gross' contamination implies staining, significant odour vapours, or visible sheen / free product.

Where the phrase 'suitable for use' is used, the soils are to be suitable for use in accordance with this RS&VP, the MMP, the GDR and the EWS.

The works to be undertaken during the enablement and construction phases (as described in this document) are referred to as 'the Contract' or 'the Works'. The Works shall be undertaken in accordance with this RS&VP.

The 'Nominated Consultant' shall be the geo-environmental Consultant retained by the Client to undertake site watching briefs and audits. Hydrock Consultants Limited is the Nominated Consultant.

The Contractor may sub-contract packages of works. However, the Contractor shall retain the responsibility for the Works. If the Client (or the Nominated Consultant) gives notice that Sub-Contractors are unsuitable, the Contractor shall nominate details of supplementary Sub-Contractors for approval.

Please refer to Bicester Motion for guidance as to Principal Contractor responsibilities during the works

## 2. Conceptual Model

### 2.1 Context

This section presents a summary of the conceptual model for the site presented in the Hydrock 'Desk Study Review and Ground Investigation' report (reference 27280-HYD-XX-XX-RP-GE-1001, dated November 2023). For further details please refer to this report.

### 2.2 Site location & Description

The site is referenced in Table 2.1. A site location plan (Hydrock Drawing 27280-HYD-XX-XX-DR-GE-1001) is presented in Appendix A.

Table 2.1: Site referencing information

Item	Brief Description
Site Name	Bicester Motion Innovation Centre.
Site Address	Off Skimmingdish Lane, Bicester.
Site Location and grid reference	The site is located to the south of the existing Bicester Motion site approximately 2km north-east of Bicester town centre, in north-east Oxfordshire. The National Grid reference of the approximate centre of the site is 459624 and 223986, and the nearest postcode is OX26 5AF.

The site is a generally flat area of open land, with some local undulations, and a number of vegetation-covered mounds, covering an area of approximately 10.3ha.

It is bounded to the south west by Skimmingdish Lane, with off-site (third party) commercial units bounding it to the east. The southern airfield perimeter forms the northern boundary, while the western boundary is located approximately at one of the airfield's make-shift car parks.

### 2.3 Site history

A study of historical Ordnance Survey maps has been undertaken and is presented in Hydrock's 'Desk Study Review and Ground Investigation' report'. This indicates that the site was predominantly agricultural land from at least 1881, with the former Roman Way (now A4421) to the west, a small quarry to the south-east and evidence of quarrying in the far north of the site. Hungerford Farm is shown close to the northern quarry; within the site boundary.

A number of buildings are shown on the western site boundary on the 1923 map, although they are no longer shown from 1938.

Although not shown on the OS maps (1938 to 1952) the RAF Bicester airfield and buildings are known to have been present to the north of the site during this period. The airfield is shown from 1955, although the associated buildings are still not shown. Hungerford Farm is not shown on the 1955 map.

Maps from 1968 to the present day show the RAF Bicester buildings, infrastructure and airfield essentially as they currently are.

The report notes that it is known that part of the wider Bicester development site was first occupied by the Royal Flying Corps in 1920, then the RAF in 1928, and was used as a logistical centre and training facility by the RAF in World War II. After the war it was used for storage, maintenance, repair and salvage of aircraft and equipment until 1976, when it ceased being an active station. The United States Air Force used the site between 1978 and 1994, when it was used again by the RAF, until 2004.

## 2.4 Geology Hydrogeology and Hydrology

### 2.4.1 Geology

Based on the British Geological Survey (BGS) mapping the geology at the site consists of Cornbrash deposits (limestone, with thin sandstones and occasional interbeds of mudstone), overlying the Forest Marble (mudstone, possibly sandy, with some limestone and sandstone). Made Ground associated with the construction of the former buildings and infrastructure, including the temporary car park, should be anticipated.

No superficial deposits are recorded on site, or in the nearby area.

Both the Cornbrash and the Forest Marble are classified by the Environment Agency as Secondary A aquifers.

The Ridge report does not identify any groundwater abstractions on or close to the site, and the site is not within a Source Protection Zone.

The nearest surface water feature is Audley Brook approximately 150m to the north-west of the site, which drains into Langford Brook approximately 550m to the east.

## 2.5 Radon and ground gas

The site is not in a Radon Affected Area and no radon protection measures are required.

## 2.6 Unexploded Ordnance (UXO)

A specialist UXO assessment indicates a moderate bomb risk.

## 2.7 Physical Ground Model

### 2.7.1 Ground Conditions

The results of Ridge and Hydrock ground investigations indicate ground conditions at the site to be as summarised in Table 2.2.

Table 2.2: Ground Conditions

Stratum	Depth to top (m bgl)	Depth to base (m bgl)	Proven Thickness (m) (range)	Thickness (m) (average)
Made Ground Topsoil <sup>3</sup>	0.00	0.10 - 0.70	0.10 - 0.70	0.25
Made Ground <sup>4</sup>	0.00 - 0.15	0.10 - 1.00	0.05 - 1.00	0.30
Made Ground Landfill	0.00 - 0.15	0.25 - 2.20	0.25 - 2.20	0.97
Cornbrash <sup>5</sup>	0.10 - 1.00	>0.57 - >3.50	>0.10 - >1.80	-
Forest Marble (Hydrock TP103 and Ridge BH01, BH02 only)	2.00 - 2.80	>3.10 - >9.00	>1.10 - >6.20	-

<sup>3</sup> A number of boreholes and trial pits from the Ridge ground investigation record Topsoil, but this has been reinterpreted following the Hydrock ground investigation as Made Ground Topsoil.

<sup>4</sup> The Ridge GIR does not distinguish Made Ground Topsoil, general Made Ground and Made Ground Landfill, so this may include some of those 'strata'.

<sup>5</sup> Includes materials described by Ridge as "clay/silt", "silty clayey gravelly sand" or "silty clayey sandy gravel", but not identified as a particular stratum. Hydrock considers these materials to weathered Cornbrash.

## 2.7.2 Groundwater conditions

Shallow groundwater was encountered locally in the Cornbrash during the fieldwork, although many of the shallowest holes did not encounter groundwater at all during excavation. The Ridge boreholes BH01 to BH04 were drilled using rotary techniques, with water flush, which would have masked any groundwater entries.

Water levels post-fieldwork from both investigations indicate a shallow groundwater table generally at between approximately 0.50m and 1.50m bgl.

## 2.7.3 Summary of known areas of contamination

The central part of the site is identified as a former landfill, with Made Ground up to 2.20m deep in the centre, although generally between approximately 0.5m and 1.0m deep. The Made Ground is shown on Hydrock Drawing 27280-HYD-XX-XX-DR-GE-1010 and the Made Ground -Landfill is shown on Hydrock drawing 27280-HYD-XX-XX-DR-GE-1012, provided in Appendix A..

Ash, macadam, glass, concrete, tile and metal were identified by Ridge, in the Made Ground in a number of exploratory holes across the site.

The Ridge investigation report notes that the Grontmij and Carl Bro investigations identified: lead, nickel, arsenic, copper, cadmium and zinc above "*residential screening values*"; and cadmium, benzo(a)pyrene, dibenzo(a,h)anthracene and lead above "*industrial screening levels*", as well as chrysotile asbestos in soils in two locations.

The Ridge report also indicates "*Elevated PAH*" in one borehole from the Grontmij or Carl Bro investigations. However, no values are provided for either the recorded concentrations of contaminants or the "*screening values*" for either soil or water, so it is difficult to assess the degree of contamination. The Ridge report goes on to highlight the following contaminants identified as part of its investigation at concentrations in excess of published Suitable 4 Use Levels (S4ULs, Category 4 Screening Levels (C4SL) for lead, and the UK Soil Guideline Values (SGVs) for selected metals, BTEX and phenols:

- » lead;
- » benzo(b)fluoranthene;
- » benzo(a)pyrene; and
- » dibenz(a,h)anthracene.

Asbestos fibres and one fragment of asbestos cement were also recorded locally in the Made Ground encountered during the Investigations

The Ridge ground investigation report indicates no groundwater contamination in any of the samples analysed, although the GAC against which the results have been compared are not provided,

The Hydrock GIR identified the following contaminants at concentrations in excess of published Suitable 4 Use Levels (S4ULs, Category 4 Screening Levels (C4SL) for lead and the UK Soil Guideline Values (SGVs) for selected metals, BTEX and phenols:

- » lead;
- » benzo(b)fluoranthene;
- » benzo(a)pyrene; and
- » dibenz(a,h)anthracene.



Asbestos fibres, and one fragment of asbestos cement were also recorded locally in the Made Ground in the south and east of the site encountered during the investigations. No ACM was recorded in the former rifle range area and proposed landscaping areas in the north of the site.

### 3. Risk Assessment Review

#### 3.1 Introduction

Following the site investigation, risk assessment has been undertaken using all available data. The risk assessment, including a summary of the Source – Pathway – Receptor linkages following investigation, is summarised below for reference. Reference should also be made to the full assessment in Hydrock Report 27280-HYD-XX-XX-RP-GE-1001

#### 3.2 Human Health Risks

Contamination data were assessed against the Generic Assessment Criteria (GAC) applicable to the proposed commercial / industrial end use,

The screening exercise identified:

- » In the Made Ground – Topsoil:
  - » benzo(b)fluoranthene at a concentration of 64.4mg/kg compared to a GAC of 45mg/kg; and
  - » dibenz(a) anthracene at a concentration of 4.87mg/kg compared to a GAC of 3.6mg/kg.
- » In the Made Ground:
  - » benzo(b)fluoranthene at a concentration of 67.5mg/kg compared to a GAC of 45mg/kg; and
  - » dibenz(a,h)anthracene at a concentration of 3.93mg/kg compared to a GAC of 3.6mg/kg .
- » In the Made Ground – Landfill – lead at a concentration of 16,200mg/kg compared to a GAC of 2,300mg/kg.

Asbestos Containing Materials (asbestos cement - chrysotile) were only encountered in one location, asbestos fibres (between <0.001% v/v and 0.01% v/v of chrysotile and amosite) have been detected in Made Ground – Topsoil in three locations, and in the Made Ground – Landfill in two locations. However, Hydrock considers it plausible for asbestos to be present in any of the Made Ground soils.

#### 3.3 Plant life risk assessment

Recorded concentrations of copper in the Made Ground – Topsoil and Made Ground - Landfill are locally slightly elevated when compared to the relevant GAC.

The requirement for mitigation of risk to human health will also serve (in part) to mitigate risks to plant life. Notwithstanding the concentrations of contamination identified, there is little to no suitable Subsoil or Topsoil growing medium from areas that are to be excavated on the site and this will require import.

#### 3.4 Pollution of controlled waters risk assessment

Historical groundwater sampling as part of the Ridge ground investigation recorded no exceedances of the screening criteria with regards to tested determinants (heavy metals, PAH petroleum hydrocarbons, BTEX and MTBE). The risk to controlled water is considered to be low.

## 3.5 Ground gas risks

### 3.5.1 Radon

The site is an area where naturally occurring radon concentrations are recorded as 1% to 3%. As such no radon protection is required.

### 3.5.2 Methane and carbon dioxide (whole site)

The ground Investigation report indicates a maximum recorded concentration of methane of 0%, a maximum recorded concentration of carbon dioxide of 4.9% and a peak flow rate of 0.1L/hr (based on six visits). The computed GSV for both carbon dioxide and methane indicate CS1 conditions and methane and carbon dioxide concentrations are 'typically' below 1% and 5% respectively.

On this basis, subject to confirmation with the LPA; the site is classified as Characteristic Situation 1 (Situation A), for which no mitigation measures are required

### 3.5.3 Ground Workers and Ground Gas Risk

It is noted that concentrations of carbon dioxide (an asphyxiant) in the soil locally at least exceed HSE Workplace Exposure Limits for personnel in the working environment of 1.5% for short term (15 minutes) exposure and 0.5% for long term exposure.

All contractors and maintenance workers should be made aware of the possible presence of carbon dioxide and oxygen-deplete atmospheres, and should take all necessary health and safety precautions when working in trenches or confined spaces.

## 3.6 Water Pipelines

Made Ground is identified across the whole site and contains, locally at least, ash, bitumen, coal and macadam. Elevated concentrations of PAH are recorded in both the Ridge and Hydrock investigations. On this basis, unless the Made Ground is removed or pipework installed in natural ground / over-excavated trenches, it is anticipated that 'Protectaline' or similar barrier water supply pipework will be required.

Subject to agreement with the local water supply company, it may be possible for at least some parts of the site to be classified as non-contaminated from the perspective of the water supply pipe requirements, with standard pipework placed in natural soils

## 3.7 Other Construction Materials

Plastic pipes for drains and sewers are manufactured from unplasticized poly vinyl chloride (PVC-U), polypropylene (PP) or polyethylene (PE). These materials may be affected by the presence of organic compounds in the soil.

In accordance with the British Plastics Federation Guidance (August, 2018), as the concentrations of PAH and or BTEX are, at least locally, above 100mg/kg and the concentrations of petroleum hydrocarbons (TPH) are, at least locally, above 200 mg/kg, the pipework manufacturer should be consulted with regard the suitability of plastic pipework and the type of pipework to install.

If the plastic pipework is placed within natural ground, or surrounded by gravel, no further consultant is required.

## 3.8 Contamination Risk from Asbestos

Asbestos fibres, and one fragment of asbestos cement were recorded in the Made Ground encountered during the investigations. On this basis, it should be assumed that the Made Ground in areas in the south and east of the site may contain asbestos, and therefore that it could be encountered during redevelopment works.

All site staff should be made aware that there is a possibility of encountering further asbestos containing materials in the Made Ground at any stage of the development. It is advised that the Contractor should supply suitable and sufficient 'Asbestos Awareness' training (specific to asbestos in soils) to all site staff who could foreseeably encounter asbestos containing materials during the course of its work.

The Contractor for each stage of works must undertake a suitable and sufficient Risk Assessment in accordance with Regulation 6 of the Control of Asbestos Regulations 2012 (CAR2012). The results of the assessment should be used to compile a methodology in accordance with Regulation 7 of CAR2012, which limits potential exposure and spread of asbestos fibres. Appropriate training should be provided to all site staff identified within the risk assessment as having the potential to be exposed or encounter asbestos during their work in accordance with Regulation 10 of CAR2012.

It is the responsibility of the Contractor to ensure that mitigation measures are suitable and sufficient to prevent exposure to airborne asbestos so far as is reasonably practicable in accordance with Regulation 11 of CAR2012.

The Contractor(s) for each stage of works must manage the risks from asbestos in accordance with HSE Guidance and CAR 2012.

### 3.9 Summary

The plausible source-pathway-receptor linkages are summarised in Table 3.1 which require mitigation by the remediation works. (see Hydrock Report 27280-HYD-XX-XX-RP-GE-1001)

Table 3.1: Final conceptual model and residual risks following risk evaluation

Contaminant Linkage				Comments	
Pollutant Linkage	Sources	Pathways	Receptors	General	Mitigation
PL 1.	PAH in the Made Ground - Topsoil and Made Ground. Lead in the Made Ground - Landfill	Ingestion inhalation or direct contact	Human health	There is Made Ground below the entire site and Made Ground – Landfill in the north-west	Mitigation required in the form of an engineered cover system for soft landscaped areas in the south and east of the site.
PL 2.	Asbestos fibres and Asbestos-Containing Materials (ACM) in the Made Ground	Inhalation of fugitive dust.	Human health.	ACM recorded in Made Ground. Asbestos fibres recorded in soil samples.	Mitigation required in the form of an engineered cover system in the south and east of the site.  In addition, any ACM encountered during site development will need to be handpicked and removed from site.
PL 3	Copper and zinc in the Made Ground – Topsoil and Made Ground – Landfill.	Root uptake.	Plant life.	Significant (zinc) or slight (copper) exceedance of the GAC.	A 'clean' growing medium will be required as part of the engineered cover system where placed

Contaminant Linkage				Comments	
Pollutant Linkage	Sources	Pathways	Receptors	General	Mitigation
PL 4	Coal tar in tarmac track in east of the site.	Ingestion, inhalation or direct contact.	Human health.	Presence of coal tar indicated in one pavement core.	Mitigation required in the form of excavation and off-site disposal, with verification of removal
PL 5	PAH, BTEX and TPH in Made Ground – Topsoil.	Direct contact	Water supply pipes.	The Made Ground – Topsoil contains PAH, BTEX and petroleum hydrocarbons at concentrations in excess of the acceptable levels.	Installation of 'Protectaline' (or similar) pipework required where installed in made Ground (subject to discussion with the water authority).

## 4. Options Appraisal

### 4.1 Preliminary Assessment

Investigation and risk assessment have concluded that the site will require remediation in order to mitigate the risk to the identified receptors. The objective of the remediation is to sever one or more of the linkages in the source-pathway-receptor (S-P-R) model. Hydrock considers the primary specific objectives of the remediation works to be to removal or mitigation of the risks to human health receptors (future site users and construction workers) from asbestos and hydrocarbons, and the risks to building materials from PAH and petroleum hydrocarbons.

The initial screening process considers the available remedial techniques based on the following key criteria:

- » Effectiveness. The strategy must work within the context of the site and be effective in the removal of contaminant linkages.
- » Relative cost. The works covered in the strategy must not entail excessive cost.
- » Relative operational time. The works covered in the strategy should work in a feasible and realistic time scale.
- » Practicality. The strategy has to be demonstrably successful and readily available within the UK market. Novel solutions or those still in the research stage are not considered here.
- » Durability. The strategy needs to be durable and not reliant on ongoing maintenance to continue being effective.
- » Sustainability. Preference is given to remedial options which are more environmentally sustainable.

### 4.2 Remediation Options – Feasibility Assessment

Table 4.1 and Table 4.2 summarise the accepted remedial techniques readily available in the UK and assesses each against the six key parameters listed above for elevated concentrations of TPH/PAH and asbestos containing materials.

In the first instance, the feasibility of each of the listed remedial options is assessed in terms of effectiveness at treating the contamination, which is broken down into: effective (Y), partially effective (P) or ineffective (N).

The listed techniques are then assessed in terms of relative cost ranging from negligible cost (£) through moderately expensive (££) to prohibitively expensive (£££+).

Timescales over which the remediation technique is operational has been broadly assessed in units of weeks, months, years and decades. If for example a given technique is only effective over a period of years to decades then its overall feasibility is diminished.

Practicality, durability and sustainability are considered separately.

### 4.3 Remediation Options – Recommended Approach

The most feasible, or a combination of the feasible methods discussed in Table 4.2 is recommended. In this case, the recommended approach is excavation, processing, on-site retention of suitable material, off-site disposal of unsuitable materials and import of suitable material for filling and cover system soils, as required.

Any natural soils deemed surplus to requirements for reuse on site may be suitable for reuse at a receiver site following treatment/processing.



Table 4.1: Initial Feasibility Assessment of Remediation Options

Remedial Activity	Effective for Identified Contamination?	Relative Cost	Relative Operational Time	Comments (Practicality / Sustainability / Durability)	Feasibility (Y- Yes, N – No)
Cover system	Y	£	Weeks	Will remove the pathway between the source(s) and future site users, so is considered to be a feasible option. As some filling at least is proposed, where a suitable thickness of 'clean' fill is to be placed it will act as a suitable 'cover'. Clean cover material only required where there is a risk of contact.	Y
Excavation and reuse	Y	£	Weeks	Excavated geotechnically suitable soils (other than Made Ground – Landfill) that are chemically unsuitable should they be accessible to site users, could be reused below the cover system in areas of soft landscaping, below roads, or below buildings if fully penetrated by foundations. Excavated hardstanding and concrete obstructions can be processed for reuse as capping below roads. Works would need to be carried out under a MMP and placed to a suitable earthworks Specification. Made Ground – Landfill cannot be re-used under a MMP (as it is already waste).	Y
Excavation and disposal	Y	£/££	Weeks	Will effectively break the S-P-R linkage by removing the source of the contamination. Less sustainable than some other options (due to take up of landfill space, transport issues, need to replace with clean material to be sourced and imported to the site). Made Ground will need to be removed from below the footprint of the proposed buildings and some may also need to be removed from below external paved areas, and suitable material placed and compacted to a suitable specification to allow construction of a ground-bearing floor slab and pavements respectively.	Y
<i>In situ</i> soil remediation	N	££	Months	<i>In situ</i> remediation is considered not to be a practical approach to remove asbestos fibres, and at the recorded concentrations is unlikely to be particularly effective at reducing PAH concentrations. It is therefore considered not to be a feasible option.	N
<i>Ex situ</i> soil remediation	N	££	Months	<i>Ex situ</i> remediation is considered not to be a practical approach to remove asbestos fibres, and at the recorded concentrations is unlikely to be particularly effective at reducing PAH concentrations. It is therefore considered not to be a feasible option.	N
Use of 'Protectaline' or similar water supply pipework	Y	£	Days	Whilst not strictly a remedial process, the use of 'Protectaline' or similar barrier water supply pipework should suitably protect water supplies, without excessive costs and little or no increase in the development period.	Y

## 5. Remedial Strategy

### 5.1 Overview

The RS&VP included in the following sections is presented on the basis of a commercial / industrial development with associated infrastructure and areas of soft landscaping. In addition to this document, all works should be completed in accordance with Hydrock's GDR and EWS (December 2023) which specifies the requirements for any backfilling works, and a MMP, which will set out the requirements for materials management within the Waste Management regulatory framework.

### 5.2 General Compliance Issues

The implementation of the remediation strategy will be in accordance with documented quality assurance procedures. These will include the following:

- » Remediation Strategy and Verification Plan (this document) - which sets out the requirements for remediation and for gathering data to demonstrate that the remediation objectives detailed in this report are met.
- » Verification Report - this will provide a record of the remediation activities undertaken at the site and the data collected as part of the verification plan to support compliance with remediation objectives and criteria. It will also include descriptions of the works with associated 'as built' drawings and details of any unforeseen conditions encountered during the works and how they were dealt with.

### 5.3 General Comments

In addition to the above, the Contractor(s) must manage the risks in accordance with its legal requirements, will need to prepare appropriate health and safety documentation and obtain appropriate approvals, licences, consents and permits prior to commencement.

The Contractor(s) will need to have suitable experience working in a similar setting, with similar ground conditions and with the Contaminants of Concern at the site (ACM, asbestos fibres, metals and PAHs in soil). They must also be able to manage the risks in accordance with the legal requirements outlined in this document, and will need to prepare appropriate health and safety documentation and obtain appropriate approvals, licences, consents and permits prior to commencement.

The methodology for the remediation is detailed in the RS&VP (this document), which will need to be submitted to the regulatory authorities for approval.

All remediation works need to be undertaken in accordance with the RS&VP (this document) and overseen by suitably experienced site staff. A site watching brief or periodic visits shall also be made the Nominated Consultant (Hydrock) to undertake the necessary verification.

It should also be noted that as soils are to be reused on site and are to be imported from another (donor) site, works will need to be completed in accordance with a MMP prepared in accordance with the CL:AIRE DoWCoP. Prior to work starting, the MMP will have been checked and Declared by a Qualified Person (QP), with confirmation of acceptance by CL:AIRE. A MMP cannot be applied retrospectively. If processing of Made Ground is required, an appropriate Environmental Permit will also be required.

Finally, all earthworks should be undertaken in accordance with the requirements of Hydrock's 'Geotechnical Design Report' and Earthworks Specification.

## 5.4 Summary of Remediation Proposals

Subject to regulatory agreement, Hydrock considers the following remedial activities will be required to deliver the site Suitable for Use (SFU) for the defined end use. These mitigation works will be undertaken in two phases:

- » Enablement Phase; and
- » Construction Phase.

Each stage of remediation shall be undertaken (as required) and validated and verified as the works in that phase are completed. There will also be a requirement to undertake works to ensure any soils imported to the site, or to be reused in the Works, are both chemically and geotechnically suitable.

### 5.4.1 Enablement Phase

The Enablement Phase of works will comprise the following tasks:

- » E1 - Break out of all hardstanding and below ground obstructions and (where appropriate) processing for reuse in accordance with a suitable specification and a Materials Management Plan (MMP) (PL4).
- » E2 - Stockpiling for reuse or disposal of existing road surfacing materials containing coal tar (PL4).
- » E3 - Removal of Topsoil and Made Ground to at least 300mm below the final proposed level where an engineered cover system is required.
- » E4 - Appropriate materials handling (including hand picking of ACM) and stockpiling in accordance with the Materials Management Plan (MMP) to ensure soils that contain asbestos fibres or elevated concentrations of PAH are reused beneath buildings/hardstanding, a cover system or disposed of off-site. (PL1-3).
- » E5 – Sampling and chemical analysis of geotechnically suitable material for assessment for chemical suitability for reuse.
- » E6 – Placement to a suitable specification, of suitable excavated soils, and (if required) suitable imported soils as part of the earthworks.
- » E7 – Removal of unsuitable material (including any excavated landfill materials).
- » E8 - Validation of the Enablement Phase remedial works.

### 5.4.2 Construction Phase

The Construction Phase of works will comprise the following tasks:

- » C1 - Import of subsoil and topsoil in accordance with the Materials Management Plan (MMP) to create an engineered cover system/growing medium in areas of soft landscaping.
- » C2 - Installation of Protectaline pipework if required.
- » C3 - The installation of a 300mm engineered cover system in soft landscaped areas in the south and east of the site comprising a bonded geogrid/geotextile break layer (e.g. TX160G), overlain by subsoil, beneath a topsoil growing medium at least 100mm thick.
- » C4 - Validation of the Construction Phase remedial works.

## 5.5 Project Setup and Management

### 5.5.1 Background

Prior to appointment of the Contractor(s), this report, along with copies of supporting documents, will need to be issued to the Local Authority for comment. Any comments will be reviewed and this document may require updating to incorporate any comments.

Unless otherwise agreed with the Client in writing, the Contractor(s) is deemed to have included in the contract sum for all requirements set out in this document. Hydrock is to be notified in writing of any exclusions in the Contract.

Prior to commencement of site activities, detailed planning of the project shall be undertaken by the Contractor(s), including liaison (as necessary) with the key stakeholders and project team. Principal Contractors, Sub-Contractors etc. will be confirmed through appointment, in advance of commencement of relevant works, along with regulators from respective statutory bodies.

The project is to be operated under the Construction, Design and Management (CDM) Regulations, (2015). Under the CDM regulations, the Client should appoint a Principal Designer, who would provide the Pre-Construction Information Report (PCIR) and a Principal Contractor who would provide a site-specific Construction Phase Health and Safety Plan (CPHASP) prior to works commencing. If the Client does not appoint a Principal Designer, they will assume the role. The Principal Designer will review the CPHASP and notify the local office of the Health and Safety Executive (HSE) of the works prior to commencing (via form F10).

The Contractor shall provide to the Client details of all individuals who will be appointed in the key roles of management and supervisory responsibility, including *curricula vitae* demonstrating their experience, training and competency to undertake the defined roles.

All operatives must be appropriately skilled and experienced for the type of work, and hold relevant CITB Certificates of Competence or be training to obtain CITB Certificates of Competence, prior to commencement on site.

Site staff responsible for supervision and control of the work are to be trained Supervisors experienced in the assessment of the risks involved, and in the methods to be used. The Client shall retain the right to reject any personnel considered not to be suitably qualified or competent.

### 5.5.2 Appointment of Appropriate Contractor(s)

At the time of writing this report the Contractor(s) has not been appointed.

The Enablement Contractor will need to have suitable experience working in a similar setting, with similar ground conditions and with the CoPC identified at the site (ACM, asbestos fibres, metals and PAHs in soil). It must also have experience in the correct materials management of soils and the required earthworks.

The Contractors (Enablement and Groundworks), must also be able to manage the risks in accordance with the legal requirements outlined in this document and will need to prepare appropriate health and safety documentation and obtain appropriate approvals, licences, consents and permits prior to commencement.

It is the responsibility of the Contractor(s) to have read and understood the requirements of the RS&VP (including all cross-referenced documents) and associated designs and specifications. If there are any queries, please contact Hydrock or the Client for clarification.

### 5.5.3 Appointment of Appropriate Sub-Contractors

Details of all Sub-Contractors employed on the project shall be submitted to the Client for approval prior to the commencement of works, to demonstrate that they are suitably qualified/experienced to undertake the works and are not considered to pose a risk to the delivery of the project. The Contractor(s) will retain the responsibility for the Works.

The Client will retain the right to reject any Sub-Contractor that is not considered suitable.

If the Client (or the Nominated Consultant) gives notice that Sub-Contractors are unsuitable, the Contractor(s) shall provide details of alternative Sub-Contractors for approval.

### 5.5.4 Site supervision

All Works are to be undertaken with a site watching brief by the Client and its Nominated Consultant (Hydrock). The Nominated Consultant shall be on site on a watching brief and site audit basis (part time or full time as required) and undertake the following tasks:

- » Liaison with the Contractor(s) and the Client's Project Manager.
- » Reviewing of testing activities. It should be noted that this does not replace or absolve the Contractor(s) from the responsibilities set out in the Specifications.
- » Observing and commenting on the quality of the Works. It should be noted that this does not replace or absolve the Contractor(s) from the responsibilities set out in the Specifications.

The Contractor(s) is to provide supervision by an appropriate (competent), experienced person who has read and understands the requirements of the RS&VP.

### 5.5.5 Collection of samples and testing

For all stages of the Works, sampling and testing of soils shall be undertaken, using suitably trained staff, in accordance with BS 5930:2015+A1:2020 'Code of Practice for Site Investigations' and BS 10175:2011+A2:2017 'Investigation of Potentially Contaminated Sites – Code of Practice'.

Soils for inorganic analysis shall be sealed in air-tight polythene tubs. Soils for organic analysis shall be sealed in amber glass jars with the minimal practicable headspace.

Groundwater samples shall be collected in suitable containers with the correct preservatives, as provided by the laboratory.

All samples shall be scheduled on Chain of Custody forms prior to being dispatched to the UKAS accredited laboratory for analysis.

All testing shall be undertaken at a laboratory which holds UKAS and MCERTS accreditation for the specific tests. Where it is not possible to obtain the testing of a material for a specific property to a UKAS or MCERTS accredited method, the Contractors shall obtain permission from the Nominated Consultant for the test to be completed at the proposed laboratory, before the test is undertaken.

Testing is to be undertaken by a suitably qualified geo-environmental engineer on behalf of the Contractor(s), the results of all testing undertaken (and a copy of the test certificates), shall be submitted to the Nominated Consultant as soon as they are reported, and no more than one day after issue of the test certificate to the Contractor(s). It is recognised that different tests may take different time to complete. However, the Contractor(s) shall advise the Nominated Consultant of any delay that they are aware of regarding the completion of any tests (e.g. a sample is being retested and the report will be delayed). In addition, the Contractor(s) is to make available on site, at all times, a file containing all test certificates in addition to the testing summary, for inspection by the Nominated Consultant.



## 6. Remedial Strategy Implementation

During construction the Main Contractor shall be responsible for undertaking the following tasks.

- » Break out of all hardstanding and below ground obstructions and (where appropriate) processing for reuse in accordance with a suitable specification and a MMP.
- » Reuse or disposal of existing road surfacing materials containing coal tar.
- » Appropriate materials handling (including hand picking of ACM) and stockpiling in accordance with the MMP to ensure soils that contain asbestos fibres are reused beneath hardstanding, buildings or a cover system, or disposed of off-site.
- » Import of subsoil and topsoil in accordance with the MMP for use in the earthworks and to create an engineered cover system.
- » The installation of an engineered cover system in soft landscaped areas.
- » Installation of Protectaline pipework if required.
- » Off site disposal of unsuitable or excess materials.

### 6.1 Enablement Phase Works

#### 6.1.1 *Task E1: Break out of hardstanding, existing structures and below ground obstructions.*

All man-made hard obstructions encountered during construction (or as instructed by the Client) shall be removed to their full depth, as necessary to allow remediation and construction works to be undertaken.

The Contractor shall inform the Nominated Consultant before each area is exposed so that it may attend and witness the excavation of slabs etc. The Contractor and the Nominated Consultant will undertake additional visual investigation, following slab removal, with any additional plausible sources identified (hotspots/tanks/drainage runs etc.) to be added to the remedial requirements or tested to confirm suitability of use.

The Nominated Consultant may (at its discretion) request additional investigation by excavation, inspection and chemical testing. The Contractor shall supply any required plant at no additional charge to the Client. If additional investigation is required, sampling and testing (if, and as required) will be undertaken by the Contractor. If required, the area under investigation is to be quarantined until the Contractor is advised by the Nominated Consultant that excavation can continue.

The Contractor shall provide adequate protection against collapse of the excavations and suitable groundwater control measures shall be put in place until the voids are infilled.

Should the Contractor encounter any previously unidentified contamination during the removal of below ground structures, it shall contact the Nominated Consultant immediately, who will attend as soon as possible, to advise.

The Contractor shall survey to Ordnance Survey Grid (using Total Station survey equipment) the base and sides of all excavations (regardless of origin) to provide a composite base of excavation drawing for reference during the works, and 'as-built' records.

All materials removed from below ground excavations shall be segregated and stockpiled prior to processing or disposal off site.

All unsuitable materials (that cannot be treated to render them suitable) excavated during the removal of below ground structures are to be removed from site to a suitably licensed facility

## 6.1.2 Task E2: Reuse or disposal of existing road surfacing containing coal tar

Coal tar has been proven in the road surfacing in Sample A1, and should be assumed to be present in all road surfacing at the site.

The Environment Agency Regulatory Position Statement 075, guidance document RPS 157 and ADEPT 'Managing Reclaimed Asphalt' report provide guidance and requirements for managing coal tar containing materials. The reuse of asphalt waste flow chart (Appendix A of the ADEPT document) is included in Appendix G for reference.

Following the results of PAK testing and subsequent laboratory testing on any positive PAK indicators (carried out at the ground investigation stage) the road surfacing materials can either be reused (in accordance with EA requirements), temporarily stored or disposed of as hazardous waste. These options are detailed below (and summarised in the flowchart in Appendix G).

### 6.1.2.1 Reuse of coal tar containing materials

Environment Agency Regulatory Position Statement (RPS) 075 (included in Appendix E) states that providing encountered coal tar is treated by crushing, grinding and screening at the site of origin and controlled by means of suitable general rules (clause 958, ex-situ cold recycled bound material within the Specification for Highways Works Series 900), it can be reused.

If proposed for reuse, this material may only be used in bound sub-surface layers; its use in surface applications is prohibited. In addition, the reuse of material containing coal tar can only be undertaken if permitted by the Specification.

Requirements for the reuse of coal tar containing soils must also meet objectives of the Water Framework Directive to ensure that waste management is carried out without endangering human health and harming the environment including:

- » without risk to water, air, soil, plants or animals;
- » without causing a nuisance through noise and odours and;
- » without adversely affecting the countryside or places of special interest.

Assessment and risk assessment will be required by the Contractor to prove the objectives of the Water Framework Directive (as above), prior to reuse.

### 6.1.2.2 Storage of coal tar containing materials

If the intention is to store coal tar containing material at the site, it must be cold mix coated, and treatment must consist of crushing, grinding, screening, grading or mixing in accordance with Environment Agency Guidance: 'Storing and Treating Asphalt Waste': RPS 157.

If conditions stated in the RPS are met, an Environmental Permit is not required to store the material. However, if conditions in the RPS cannot be met, an environmental permit must be applied for.

Conditions that must be complied with, taken from EA RPS 157 include:

*"The maximum amount of waste that can be stored before treatment is:*

- » *500 tonnes of waste coded 17 03 01 at any one time, or 50,000 tonnes within 12 months;*
- » *50,000 tonnes of wastes coded 17 03 02 within 12 months.*

*You must make sure that:*

- » *crushing, grinding, screening or grading is undertaken by plant authorised by a local authority under Part B Section 3.5 (a) or (c)*

- » *subsequent cold mix coating at the same site is covered by a local authority Part B Section 3.5 (e) mobile plant authorisation*
- » *wastes coded 17 03 01 must be stored on an impermeable surface with a sealed drainage system."*

If the coated material remains as waste, its use is covered by the regulations mentioned in section 5.6.2. The same Water Framework Directive points must be considered, and records showing that the requirements of the RPS are met, must be kept for two years. These records must be made available to the Environment Agency if required.

#### *6.1.2.3 Disposal of coal tar containing materials*

If the coal tar containing materials cannot be reused, or the requirements of Sections 5.6.2 and 5.6.3 cannot be met, the coal tar containing materials will require off-site disposal.

The soils containing coal tar will need to be transferred off site as a waste (likely to be hazardous) to an appropriate waste disposal facility.

Waste consignment notes will be required and WAC tests will be required by the landfill operator

#### *6.1.3 Task E3 – Removal of Topsoil and Made Ground to at least 300mm below final levels*

Following removal of the hardstanding and buried obstructions, the Contractor shall remove all Topsoil and Made Ground from areas of soft landscaping, to a depth of at least 300mm below the final proposed levels to allow installation of the cover system where required.

Should suspected asbestos containing materials be encountered, work should stop and the mitigation measures required under Section 3.8 put in place immediately.

Excavated soils should be sorted and stockpiled in accordance with the requirements of Section 7.6

#### *6.1.4 Task E4 - Appropriate materials handling, stockpiling and import in accordance with the Materials Management Plan (MMP).*

##### *6.1.4.1 General*

The enablement works are to include cut and fill as necessary to leave the site at the required formation level (level to be determined as part of the engineering works). It is anticipated that the levels are to be planned such that the arisings from excavations during construction are accommodated on each proposed development plot.

Excavation and/or placement of soils during construction will be required as follows:

- » beneath areas of hardstanding (roads, pavements etc.), where excavation to the design depth (or over-excavation) will be required as per the road design, with replacement of soils with suitable construction thickness as per road design and capping requirements;
- » to construct foundations and floor slabs as per the structural design;
- » to create trenches to allow services to be installed; and
- » beneath soft landscaped areas as part of a cover system.

All excavation and filling is to include appropriate testing to ensure the excavated soils are suitable for use in accordance with this RS&VP, the MMP and the EWS, to ensure the fill has been placed appropriately.

The Contractor is to undertake a watching brief for materials that may be contaminated. If suspect materials are encountered, please contact Hydrock immediately.

Any imported materials are to be tested as per the import criteria set out in Section 7.4.3 and should conform to the import criteria or the RTVs (see Section 7.4.3).

Reuse of soils excavated by the Contractor will need to be undertaken in accordance with the CL:AIRE DoWCoP', i.e. in accordance with a QP declared MMP. The Landfill Made Ground cannot be re-used on site.

#### *6.1.4.2 Hand picking of ACM*

Prior to the commencement of works the Enablement Contractor is to undertake a surface pick to remove any observed ACM.

A watching brief is to then be maintained by the Contractor during all works, and any observed ACM is to be hand-picked prior to disposal off site

#### *6.1.5 Task E5 – Sampling and chemical analysis of geotechnically suitable material for reuse*

Excavated soils deemed to be geotechnically suitable for the works should be sampled and analysed for the suite of chemicals listed in Table 7.1, 7.2 and 7.3 (depending on where they are proposed for use) to ensure that they are also chemically suitable for reuse.

Suitable materials should be stockpiled separately from unsuitable materials, in accordance with the requirements of Section 7.6.

Made Ground – Landfill shall not be reused on site.

#### *6.1.6 Task E6 – Placement to a suitable specification of excavated soils and (if required) imported soils*

Where required as part of the earthworks, suitable materials shall be placed and compacted in accordance with the requirements of the Earthworks Specification (Appendix A of Hydrock report 27280-HYD-XX-XX-RP-GE-4001).

Voids created by the excavation of buried structures should be backfilled with suitable materials placed and compacted in accordance with the requirements of the Earthworks Specification.

#### *6.1.7 Task E7 – Removal of unsuitable materials.*

Any excavated Landfill Made Ground soils, surplus (i.e. soils which cannot be reused on site due to volumes), unsuitable soils (i.e. soils which fail the RTVs and cannot be reused in an appropriate location), or soils which are not geotechnically suitable (as defined by the Earthworks Specification) shall be disposed of to suitably licensed facilities by the Contractor, in accordance with the commercial arrangement with the Client.

Any material excavated on site may be classified as waste and it is the responsibility of the holder of a material (i.e. the Contractor) to form its own view on whether or not it is waste. This includes the use of a MMP, and determining when waste that has been treated in some way can cease to be classed as waste for a particular purpose. All arisings should be regarded as contaminated unless proven otherwise. Any soils to be removed from site are to be removed to a licensed waste management facility. The waste is to be taken by a registered waste carrier in accordance with applicable Waste Management Regulations.

All testing to allow disposal of waste is to be undertaken by the Contractor(s) at the Contractor's cost. Waste consignment/transfer notices will be required and are to be retained by the Contractor(s). Copies of all waste consignment/transfer notices are to be provided to the Client

### 6.1.8 Task E8 – Validation of the Enablement Phase remedial works.

The Principal Contractor shall maintain a daily written and photographic record of the works undertaken.

On completion of the Enablement Phase of the works an 'Enablement Phase Remediation Validation Report' shall be prepared, including, but not be limited to, the following:

- » Details of site stripping and clearance activities undertaken during Enablement Phase remediation works.
- » Records of excavations, including:
  - » Ordnance Datum survey of extents and depth (including a final composite base of excavation drawing);
  - » Ordnance Datum survey of extents and depth of any residual features (e.g. sections of the 'catapult pit' and/or cable trenches, not removed, because they are not below new structures);
  - » record of decisions for over-excavation;
  - » photographic record of each excavation; and
  - » records of inspection and final extents of validation.
- » Records of any ACM encountered during the works (type location and action).
- » Results of asbestos air monitoring (including reassurance monitoring) and other environmental monitoring (noise/dust) undertaken as required.
- » Records of laboratory analytical results for off-site disposal, including:
  - » laboratory measurements of accuracy and precision;
  - » Chain of Custody forms; and
  - » copies of the certificates for chemical testing.
- » Approximate quantities of all materials removed from the site.
- » Waste classification and management documentation, including:
  - » copies of all consignment notes, in particular, those relating to the hazardous waste regulations; and
  - » details of waste facilities at which materials were disposed.
- » Final as-built survey of the site following completion of the Enablement Phase remediation works, including the stockpiles.
- » Summary and conclusions, including:
  - » final status of remediation and achievement of remedial objectives to satisfy the planning conditions; and
  - » additional risk assessments/non-scheduled reactive works undertaken.

Information associated with regulatory health and safety, control of noise, nuisance, dust, and waste shall be excluded from the technical validation reporting and shall be submitted to the Client as separate documentation. This separation is made to differentiate between technical remediation requirements stated herein and operational controls of work.

It should be noted that any reuse of soils during the Enablement Phase will need to be undertaken in accordance with the CL:AIRE 'Definition of Waste: Development Industry Code of Practice', i.e. in accordance with a Qualified Person declared Materials Management Plan (MMP). The Contractor is responsible for providing a MMP declared by a Qualified Person.



## 6.2 Construction Phase Works

### 6.2.1 *Task C1: Import or re-use of soils in accordance with a Materials Management Plan (MMP)*

Clean Subsoil: for use in the cover system, as a growing medium, or as clean backfill to service trenches, may be won from site, but some may also need to be imported, dependant on site levels.

Clean Topsoil for use in the cover system and as a growing medium will need to be imported to site

Any soils 'won' from the site and proposed for reuse as part of the cover system or as clean backfill, shall be uncontaminated and meet both physical and chemical criteria, as detailed below.

Any imported earthworks fill will also need to meet the requirements for geotechnical suitability as detailed in the Earthworks Specification.

All landscape works are to be undertaken in accordance with the Landscape Architect's designs.

All soils shall be imported in accordance with the requirements detailed in Section 7.

### 6.2.2 *Task C2: Installation of Protectaline (or similar) pipework (where necessary)*

To mitigate against the permeation of CoPc into potable water pipelines, Protectaline (or similar) pipework may be required where pipes are placed in Made Ground soils.

The validation of the installation of services (over-excavation, installation of Protectaline (or similar) pipework, by the Contractor, comprises:

- » photographic proof of over-excavation of service trenches;
- » provision of delivery tickets showing barrier pipework have been delivered to site;
- » photographic proof that barrier pipework has been installed;
- » testing to prove the soils used as backfill are in accordance with the reuse criteria (Section 8.4.3) and
- » photographic proof of backfilling with validated 'clean' soils.

If the Contractor is unable to provide the requested information proving that it has installed the appropriate barrier pipework, then it shall excavate at its own cost in those locations where barrier pipe is required, to demonstrate that it is present.

### 6.2.3 *Task C3: Installation of an engineered cover system*

Mitigation is required in landscape areas across the site in order to break the source pathway receptor linkage between the contaminants in the Made Ground and the end users of the site.

Hydrock proposes the following barriers and cover system:

- » Beneath building footprints: install the ground floor slab as per the structural design. The floor slab will break the link between the underlying soils and potential receptors.
- » Beneath areas of hard standing (roads, pavements etc): excavate as required by the road design and replace with suitable construction thickness as per road design and capping requirements. The hard standing will break the link between the soils and potential receptors.
- » A cover system is to be placed in the south and east of the site as shown on Hydrock Drawing 27280-HYD-XX-XX-DR-GE-1013.

### 6.2.3.1 Stockpiling of Materials for the Cover System

Stripped Subsoil shall be stockpiled separately from, and away from areas designated for storing, other materials or potential sources of contamination. Separate stockpiles shall be created for each different material source.

Stockpiles shall be kept below 2m in height at all times (to prevent the build-up of heat in the stockpile, which will reduce the amount of soil bacteria), and traffic on the stockpile shall be minimised to prevent compaction.

All stockpiles shall be identified with clear signs, and each stockpile of imported material shall be given a clear reference number and designated sheet recording the following:

- » identification reference (e.g. Stockpile A, B, C etc.);
- » material type (e.g. Topsoil);
- » source area;
- » approximate volume; and
- » which areas the material is to be used on.

These sheets shall be available for inspection by the Client, the Consultant, Local Authority staff and others involved with this development. A copy shall also be given to the Nominated Consultant when verification visits are made.

### 6.2.3.2 Installation of the Cover System

The cover system in soft landscaped areas as detailed on Hydrock Drawing 27280-HYD-XX-XX-RP-GE-1013 is to comprise, from the base up:

- » A bonded geogrid/geotextile layer (e.g. TX160G), to act as a 'no-dig' and high visibility marker layer.
- » A minimum thickness of 300mm of Subsoil and Topsoil (of which at least the upper 100mm shall be Topsoil). Deepening of the cover system will be required to accommodate the root-ball of trees or shrubs.

The cover system installation shall be undertaken in the following steps:

1. Establish the finished ground levels over the area and from this determine the required level of the underside of the cover system.
2. Undertake appropriate materials management to reuse site-won fill below the cover system.
3. Install drainage and other services in trenches that have been over-excavated, and backfill with clean soils as detailed in Section 7.
4. Confirm the level of the ground surface to ensure that it is at the correct level for the underside of the cover system.
5. Install a bonded geogrid/geotextile.
6. Place the Subsoil and Topsoil and verify the thickness. The Nominated Consultant is to be called to verify – minimum 72 working hours' notice required.

Where trees or shrubs are proposed, where a cover system is required, tree pits will need to be excavated, lined with the bonded geogrid and geotextile filled with Subsoil and Topsoil, as required by the landscape designer. The dimensions of the tree pit(s) are to be specified by a qualified arboriculturalist in conjunction with the landscape architect.

Refer to Section 8 for the verification requirements.

#### *6.2.4 Task C4: Validation of the Construction Phase Remedial works.*

The Ground Works Contractor shall maintain records of the works undertaken and shall note the information presented below, which is required to validate its works. The Ground Works Contractor shall provide the following remediation validation elements:

- » protection of services;
- » cover system; and
- » materials management.

## 7. Reuse Of Soils on Site and Material Management

### 7.1 Waste Management Background

The site is a brownfield site; as such any material excavated on site will be classified as waste as soon as it is excavated, unless there is a clear plan in place for the reuse of soils at the site. One of the ways this can be achieved is set out in the Contaminated Land: Applications In Real Environments (CL:AIRE) document: 'The Definition of Waste: Development Industry Code of Practice' (Version 2) (CoP), dated March 2011.

Landfill – Made Ground should not be reused on site and should be disposed of off-site to a suitably licensed facility.

The handling, reuse or disposal of waste is regulated by the Environment Agency. The Agency will take into account the use of the CoP in deciding whether to regulate materials as waste.

If materials are dealt with in accordance with the CoP, the Environment Agency considers that those materials are unlikely to be waste at the point when they are to be used for the purpose of land development. This is because the materials were never discarded in the first place, or because they have been submitted to a recovery operation and have been completely recovered so that they have ceased to be waste.

The party Nominated to write the MMP (or MMPs) is Hydrock, who will also be responsible for preparing and issuing the MMP Verification Report to CL:AIRE..

As the soils to be managed at the site will comprise both the reuse of soils from the site and the import of soils (Topsoil) to the site, the procedures to be followed for the production of the MMP will need to follow the protocols outlined for:

- » Site of Origin - Route A: Land affected by contamination or suspected of being affected by contamination (ref CL:AIRE DoWCoP, Appendix 1); and
- » Direct Transfer - Route B: Direct use of clean naturally occurring soils on another development site (ref CL:AIRE DoWCoP, Appendix 2).

In addition, there may be a requirement to import aggregate (6F2 and Type 1) to the site for use in construction. These aggregates will either comprise primary aggregates or recycled materials produced in accordance with the WRAP protocol. As such, whilst the volumes will need to be accounted for, these sources of material would not need to be included within the MMP.

### 7.2 Materials Movement

The proposed general sequence of materials movement at the site will comprise:

- 1) Undertake breaking out of all hardstanding, removal of below ground obstruction, processing and reuse in accordance with the Earthworks Specification and MMP.
- 2) Excavate the roads containing coal tar and either stockpile for reuse or dispose of off-site.
- 3) Excavate the Landfill Made Ground that needs excavation to accommodate construction and dispose of off-site.
- 4) Undertake general cut to fill works to leave the site at appropriate 'enablement levels' below the final ground level (in accordance with the civil engineering design and EWS).
- 5) Excavate service trenches, drainage and road boxes, in accordance with the civil engineering design. Suitable excavated soils can be reused as part of the general cut to fill in accordance with this RS&VP.
- 6) Backfill service trenches with clean naturally occurring soil from the site-won stockpile or imported soil as available (if required).

- 7) Place the clean cover system across the site using imported topsoil and either imported or site-Subsoil.
- 8) Construct the roads using imported (primary or recycled aggregate and / or asphalt containing coal tar in subsurface layers as per the RS&VP).
- 9) Dispose of excess soils.

### 7.3 Stockpiling of materials.

Topsoil and Subsoil for use in the cover system shall be stockpiled separately and away from Made Ground stockpiles and areas designated for storing other materials (e.g. processed aggregate), or potential sources of contamination. Separate stockpiles shall be created for each different source.

Topsoil and Subsoil stockpiles need to be managed in accordance with the MMP in both the Enablement and Construction Stages. If stockpiles are to remain for more than 12 months (which they will be), a bespoke agreement will be required in agreement with the local Environment Agency waste team.

Topsoil stockpiles shall be kept below 2m in height at all times (to prevent the build-up of heat in the stockpile, which will reduce the amount of soil bacteria) and traffic on the stockpile shall be minimised (to prevent compaction).

All stockpiles shall be identified with clear signs, and each stockpile of imported material shall be given a clear reference number and designated sheet recording the following:

- » identification reference (e.g. Stockpile A, B, C etc.);
- » material type (e.g. Topsoil);
- » source site;
- » the carrier's consignment note reference numbers;
- » the approximate volume (number of loads); and
- » which areas the material is to be used on.

Each entry shall be signed and dated by the Ground Works Contractor. A template form is provided in Appendix B. Other approved templates or documentation may be used.

These sheets shall be available for inspection by the Client, the Nominated Consultant, Local Authority staff and others involved with this development at any time. A copy shall also be given to the Nominated Consultant when verification visits are made.

The Ground Works Contractor is responsible for ensuing materials handling and materials management are undertaken in accordance with the MMP. If materials are mismanaged, the Ground Works Contractor is responsible for correcting the mismanagement at its cost.

## 7.4 Material Suitability

### 7.4.1 Enablement works

It is envisaged that the soils excavated during the Enablement Works will be a combination of Made Ground and natural soils, which will be used to create the final development platform.

It is anticipated that, with the exception of the Made Ground – Landfill materials, the majority of soils excavated and proposed for reuse during the Enablement phase will be suitable for use on the site (subject to confirmation during excavation and placement).

The site will be left at 'enablement levels' below the final ground level to allow for the reuse of soils during construction.

## 7.4.2 Construction works

The soil excavated during the Construction Stage of the works will comprise natural soils and Made Ground. These soils will be excavated as part of the general cut and fill, service trenches, roads and foundation construction. These excavated soils are likely to be suitable for use below the cover system, or with careful management, above the cover system. However, the ability to reuse them will be subject to space constraints during construction and some may require disposal off site.

All excavated Landfill – Made Ground material will need to be disposed of offsite.

Careful stockpile management by both the Enablement Contractor and the Ground Works Contractors will be required to allow reuse of materials at the site.

## 7.4.3 Chemical Suitability

The following section is a summary of chemical suitability based on the site investigation works undertaken at the site, and the proposed remediation works. In addition, the requirement to prove soils are chemically suitable for use are set out.

During the development of the site, soil will be required for the following reasons:

- » Subsoil for placement as clean backfill in service trenches (envisaged to be won from the site).
- » Subsoil to backfill remediation excavations, adjust site levels (general cut and fill) to allow design levels to be met and construct any screening, landscaping or ecological bunds. It is envisaged that these works will utilise site-won soils and the general cut and fill will leave the site at a level to allow the installation of roads, infrastructure and the cover system in soft landscaped areas, with localised future cut or fill being undertaken during the Construction works.

It is envisaged that these works will generally utilise site-won soils.

- » Topsoil, to be placed as a growing medium in landscaped areas.

Any soil not suitable for use, or not required, will need to be disposed of to an appropriate waste disposal facility in accordance with this RS&VP.

In addition to the required geotechnical testing (as per the GDR and EWS) the Enablement Contractor shall inspect arisings and test these with regards to geo-environmental criteria as discussed below.

### 7.4.3.1 Imported Aggregate

Primary source aggregate will be suitable for use if imported, and does not require testing.

Secondary source (i.e. recycled) aggregate will be suitable for use if produced in accordance with the WRAP protocol, but requires the following inspection and chemical testing to be undertaken by the Contractor to prove it is suitable for use:

- » no visual contamination (oil staining etc.) as confirmed by watching brief and site audits;
- » limited deleterious material (organics, wood, metal etc.), in accordance with the Specification for Highway Works;
- » no coal tar (based on PAK spray test and PAH double ratio test);
- » inspection to confirm no visible ACM as confirmed by watching brief and site audits; and
- » asbestos laboratory testing, with the quantification analysis showing no asbestos concentrations.

Testing is to be undertaken at a rate of 1 test per 500m<sup>3</sup>.

#### 7.4.3.2 *Topsoil for use in the Cover System and Subsoil for use in Service Trenches and the Cover System*

In addition to the geotechnical testing required by the EWS, all site-won and imported soils proposed for use as part of the cover system or to fill service trenches will require testing to confirm they are suitable for use.

Soils imported to site or to be used as part of the cover system, shall be tested at a UKAS accredited laboratory for the following general suite of contaminants, at a rate of 1 test per 100m<sup>3</sup>:

- » As, B (water soluble), Be, Cd, Cr (total), Cr (VI), Cu, Hg, Ni, Pb, S (elemental), Se, V, Zn, cyanide (total), sulphide, pH, asbestos fibres, speciated polycyclic aromatic hydrocarbons (PAH, by GC-FID), total phenols and fraction of organic carbon;
- » total TPH and (if required) speciated TPH (TPHCWG).

The test data are to be compared to the RTVs in Tables 8.1 and 8.2.

Soils imported to site or to be used as part of the cover system shall also conform to the following guidelines:

- » no gross visual contamination (oil staining etc.);
- » limited deleterious material (organics, wood, metal etc.), in accordance with the geotechnical Specification;
- » no visible ACM; and
- » no asbestos as proven by laboratory testing.

The use of clay soils is not recommended for Subsoil or Topsoil as they are likely to become waterlogged during handling and placement. If soils with a high clay content are proposed, their use is to be agreed by the Client.

Prior to importation of Topsoil from a commercial supplier, certification shall be obtained from the supplier detailing the source site, the previous land use and relevant test results. A copy of this information shall be forwarded to Hydrock for review and comparison against the import criteria. If the Topsoil is sourced from a recognised commercial supplier of natural Topsoil (e.g. British Sugar, Freeland Horticultural, etc.), no further testing (prior to import) is required.

If the proposed Topsoil or Subsoil import source is not a commercial supplier, the Ground Works Contractor is to provide Hydrock with copies of the site investigation, confirming the soils are naturally occurring and uncontaminated. Hydrock recommend that the soils are tested at source to confirm they are appropriate for use, prior to import. If any of the RTVs are exceeded, the material shall be considered to be unsuitable and is not to be imported.

Following import, soils are to be stockpiled on a Terram separator layer and additional chemical testing is to be undertaken and assessed in accordance with the criteria set out above (to ensure the imported material is the same as that for which chemical analysis has been provided). If suitable, the imported soils are to remain stockpiled for later use during construction. If unsuitable, or excess to the quantity requirements, they are to be disposed of off-site.

If soils are imported and placed directly, without stockpiling and testing, these works will be deemed to be undertaken at the Ground Works Contractor's risk, and if the soils are later proven not to be suitable for use, the Ground Works Contractor is to meet all associated excavation, disposal and replacement costs (including additional costs from the Nominated Consultant).

#### 7.4.3.3 *Import and reuse chemical criteria (as part of the cover system)*

The Import RTVs have been developed based on Hydrock's in-house GAC, with reference to the proposed end use and in consideration of the CL:AIRE DoWCoP, specifically Watch Point 15, which states that the following general restrictions are applied to materials imported to a site:



- » The hazards to human health and the environment must not be increased beyond those which already exist at the Receiver site, by importing materials with elevated concentrations of potentially harmful substances. A project may be regarded as "sham recovery" if it involves importation of soils with levels of contamination significantly above those already present i.e. to a degree that would require intervention should the site be redeveloped in the future; and
- » The importation of material at receiver sites must not introduce new hazards beyond those that already exist at the Receiver site, by importing materials containing new contaminants present at problematic levels. In any case this includes the importation and use of materials containing new contaminants present above hazardous waste thresholds.

The Import RTVs are therefore based on the most conservative value of:

- » Human Health GAC (details of the derivation of the Hydrock GAC are presented in Hydrock Report 24856-HYD-XX-XX-RP-GE-1002);
- » Phytotoxicity GAC (for materials to be placed within the upper 300mm of the final site levels in landscaped areas)
- » Soil Saturation Limit (to prevent soils containing non-aqueous phase liquids (NAPL) being used, except where site concentrations have been detected above this value and were not associated with NAPL); and
- » Geometric mean site concentration multiplied by 2.

For Reuse Criteria RTVs, the above applies except for the geometric mean site concentrations as the soils are already on site and therefore Watchpoint 15 does not apply.

Regarding protection of Controlled Waters, the following applies:

- » Importation of material will be limited to Topsoil for use in landscaping areas. Topsoil will either be sourced and used in accordance with BS 3882:2015 such that the provenance of the soil will indicate a non-contaminative source, and/or be sourced using the DoWCoP Direct Transfer option for "clean naturally occurring materials" - material defined as "devoid of anthropogenic contamination to a degree or level that is considered harmful to living organisms". On the basis that the combination of the human health GAC, phytotoxic GAC and consideration of existing site concentrations meets this definition it is not considered necessary to consider specific Controlled Waters criteria further.
- » Based on groundwater data, soils from within the vehicle's inspection pits should not be re-used on site.

Although there is no definition of 'clean' within the DoWCoP, Hydrock has taken the mean and maximum of the rural soils data for England from the UK Soil and Herbage Pollutant Survey as a range of concentrations representing 'clean and naturally occurring' soils. All RTVs are below these concentrations.

The import and reuse criteria are set out in Table 7.1 and Table 7.2 respectively for the site along with re-use criteria below the cover system for asbestos in Table 7.3

Table 7.1: Import Criteria

Contaminant	Human Health GAC <sup>1</sup>	Soil Saturation Limit	Mean Site Concentration x <sup>2</sup>	RTV
Arsenic	640	N/A	43	43
Beryllium	12	N/A	2.0	2.0
Boron	240,000	N/A	1.2	1.2
Cadmium	410	N/A	4.6	4.6
Chromium (III)	8400	N/A	45	45

Contaminant	Human Health GAC <sup>1</sup>	Soil Saturation Limit	Mean Site Concentration x <sup>2</sup>	RTV
Chromium (VI)	49 / 25	N/A	3.8	3.8
Copper	68,000	N/A	144	144
Lead	2300	N/A	1066	1066
Mercury, inorganic	1100	N/A	1.5	1.5
Nickel	980	N/A	45	45
Selenium	12,000	N/A	4.5	4.5
Vanadium	9,000	N/A	102	102
Zinc	730,000	N/A	433	433
Cyanide (free)	24	N/A	4	4
Phenol (total)	440	24,237	4	4
Acenaphthene	110,000	57	0.6	0.6
Acenaphthylene	110,000	86	0.2	0.2
Anthracene	540,000	1.17	2 <sup>2</sup>	2
Benz(a)anthracene	170	1.71	8.6 <sup>2</sup>	8.6
Benzo(a)pyrene	77	0.91	8.6 <sup>2</sup>	8.6
Benzo(b)fluoranthene	44	1.21	10.5 <sup>2</sup>	10.5
Benzo(g,h,i)perylene	3,900	0.15	3.98 <sup>2</sup>	3.98
Benzo(k)fluoranthene	1,200	0.69	3.48 <sup>2</sup>	3.48
Chrysene	350	0.44	7.86 <sup>2</sup>	7.86
Dibenz(a,h)anthracene	3.5	0.004	0.84 <sup>2</sup>	0.84
Fluoranthene	23,000	19	16.28	19
Fluorene	71,000	31	0.54	31
Indeno(1,2,3-c,d)pyrene	500	0.06	4.30 <sup>2</sup>	4.30
Naphthalene	1,800	76	0.22	0.22
Phenanthrene	23,000	36	6.88	6.88
Pyrene	654,000	2.12	14.26 <sup>2</sup>	14.26
Total TPH	N/A	N/A	255	1000 <sup>3</sup>
Asbestos w/w (%)	Detect	N/A	Not Detected	<LoD <sup>4</sup>

Notes:

All values in mg/kg

<sup>1</sup> Commercial;/Industrial based on 1% SOM.

<sup>2</sup> Mean site concentration x 2 exceeds soil saturation limit, but is not associated with visual evidence of contamination or presence of free phase.

<sup>3</sup> A limit of 1,000mg/kg has been applied to represent 'clean' soils and to prevent odorous or visually oily materials.

<sup>4</sup> Below the quantifiable limit of detection (<0.001%).

Table 7.2: Reuse Criteria as part of cover system.

Contaminant	Human Health GAC <sup>1</sup> /	Soil Saturation Limit	RTV
Arsenic	640	N/A	640
Beryllium	12	N/A	12
Boron	240,000 / 5	N/A	240,000 / 5 <sup>2</sup>
Cadmium	410	N/A	410
Chromium (III)	8400	N/A	8400
Chromium (VI)	49	N/A	49
Copper	68,000	N/A	68,000

Contaminant	Human Health GAC <sup>1</sup> /	Soil Saturation Limit	RTV
Lead	2300	N/A	2300
Mercury, inorganic	1100	N/A	1100
Nickel	980	N/A	980
Selenium	12,000	N/A	12,000
Vanadium	9,000	N/A	9,000
Zinc	730,000	N/A	730,000
Cyanide (free)	24	N/A	24
Phenol (total)	440	24,237	24,237 / 440 <sup>3</sup>
Acenaphthene	110,000	57	57 / 110,000 <sup>3</sup>
Acenaphthylene	110,000	86	86 / 110,000 <sup>3</sup>
Anthracene	540,000	1.17	1.17 / 540,000 <sup>3</sup>
Benz(a)anthracene	170	1.71	1.71 / 170 <sup>3</sup>
Benzo(a)pyrene	77	0.91	0.91 / 77 <sup>3</sup>
Benzo(b)fluoranthene	44	1.21	1.21 / 44 <sup>3</sup>
Benzo(g,h,i)perylene	3,900	0.15	0.15 / 3,900 <sup>3</sup>
Benzo(k)fluoranthene	1,200	0.69	0.69 / 1200 <sup>3</sup>
Chrysene	350	0.44	0.44 / 350 <sup>3</sup>
Dibenz(a,h)anthracene	3.5	0.004	3.50 <sup>4</sup>
Fluoranthene	23,000	19	19 / 23,000 <sup>3</sup>
Fluorene	71,000	31	31 / 71,000 <sup>3</sup>
Indeno(1,2,3-c,d)pyrene	500	0.06	500 <sup>4</sup>
Naphthalene	1,800	76	76 - 1800 <sup>3</sup>
Phenanthrene	23,000	36	36 / 23,000 <sup>3</sup>
Pyrene	654,000	2.12	2.12 / 654,000 <sup>3</sup>
Total TPH	N/A	N/A	1000 <sup>5</sup>
Asbestos w/w (%)	Detect	N/A	<LoD <sup>6</sup>

Notes:  
All values in mg/kg  
<sup>1</sup> Commercial/Industrial, conservatively based on 1% SOM.  
<sup>3</sup> If lower RTV exceeded this may indicate the presence of free phase. If following visual inspection, no visual or olfactory evidence of contamination is noted, the higher RTV should be adopted.  
<sup>4</sup> Saturation limit not adopted based on laboratory limit of reporting levels.  
<sup>5</sup> A limit of 1000mg/kg has been applied to represent 'clean' soils and to prevent odorous or visually oily materials.  
<sup>6</sup> Below the quantifiable limit of detection (<0.001%).

Table 7.3: Reuse Criteria below the cover system.

Contaminant	RTV
Asbestos	No visible ACM.

#### 7.4.3.4 Material for Off-Site Disposal

Materials found to be out of specification are to remain on site in segregated stockpiles until they can be disposed of to a suitably licenced waste disposal facility. Any material requiring disposal shall be disposed of in accordance with Section 7.7.

It is the responsibility of the Contractor to ensure adequate and appropriate disposal, including testing to satisfy the proposed waste facility. Records of the removal of material off site shall be maintained by the Contractor, including details of the disposal or treatment site to which they have been taken.

#### 7.4.4 Physical requirements of soils

Soil used in general earthworks, are to conform to the requirements of the GDR and EWS.

Imported Topsoil should conform to the requirements of BS 3882:2015 'Specification for Topsoil and requirements for use', unless otherwise agreed with the Client. Imported Subsoil should conform to the requirements of BS 8601:2013 'Specification for Subsoil and requirements for use', unless agreed with the Client. If the Client agrees that Topsoil and Subsoil do not need to conform to BS 3882:2015 or BS 8601:2013 respectively, they shall comprise chalk, clay or sand with a maximum of 60% of fragments in excess of 2mm, a maximum of 30% in excess of 20mm and a maximum of 10% in excess of 50mm, with nothing in excess of 75mm.

Clay soils may be used as Subsoil and Topsoil (growing media), although is not recommended as they are likely to become waterlogged during handling and placement. If soils with a high clay content are proposed, their use is to be agreed by the Client.

Topsoil and Subsoil used as part of the cover system, growing medium or to backfill service trenches shall be free of asbestos, metal, plastic, wood, glass, tarmac, brick, paper, concrete or other potentially hazardous foreign material which could cause injury. In addition, all materials must be free from aggressive/invasive weeds and bulk vegetative growth, in order to ensure negligible risk of subsequent weed problems.

#### 7.4.5 Geotechnical suitability

An assessment of the potential to reuse site-won materials has been completed. This indicates that subject to appropriate segregation and processing, in accordance with the Specification for Highway Works (SHW):

- » The Made Ground – Topsoil and Made Ground should be suitable for reuse as Class 4 Landscape Fill and may be able to be screened and processed to be suitable for re-use as a Class 1 / 2 General Fill .
- » The Cornbrash should be suitable for reuse as Class 1 General Fill or Class 6 Structural Fill.
- » The Forest Marble should be suitable for reuse as Class 2 General Fill or Class 7 Structural Fill.
- » Made Ground – Landfill is unsuitable for reuse on site and should be disposed of at a suitable off-site facility.

The Enablement Contractor shall be responsible for undertaking the required processing, geotechnical testing and placing the material in accordance with the GDR and EWS.

#### 7.5 Certainty of use and quantity of material

The following excavation, treatment and placement is proposed:

- » excavate Made Ground as necessary and process as necessary as part of the general cut and fill before placement below a cover system / hardstanding.
- » excavate natural soils as necessary and process as necessary as part of the general cut and fill;
- » excavate for construction of services, drainage, roads and foundations;
- » excavate Made Ground soils (as necessary) to allow the installation of the cover system and to install services;
- » finalise levels to the formation level (as per the design) so that construction can be undertaken, or the cover system can be placed; and
- » place the cover system using either site-won or imported Subsoil, and imported Topsoil.

Only materials deemed suitable for use by an appropriately qualified person shall be utilised on site. Material reused on site shall be subject to the necessary testing/review and comparison to the requirements of the RS&VP, GDR and EWS prior to reuse.

Any out of specification material which is deemed unsuitable for use shall, if appropriate, be classified as waste and shall be disposed of in accordance with waste legislation.

Only sufficient material required on site for the purposes of changing levels in accordance with the pre-determined proposals (planning conditions, design levels and drainage strategy) shall be imported or reused on site. Any surplus material or material which does not meet the required specification shall be disposed of off-site. It is the responsibility of the Contractor at each stage of the works to have checked all volume calculations and have allowed for disposal of unsuitable or excess materials.

## 7.6 On-site material management and processing

Any excavated soils proposed for reuse shall be reused in accordance with the QP declared MMP and the Contractors shall segregate materials having due regard for their subsequent reuse. The MMP shall be managed by the Contractor.

Assessment and testing are to be undertaken by the Contractor (as required) in accordance with this RS&VP, the GDR and the EWS.

Soils are to be processed as required. For the avoidance of doubt, processing includes crushing, sorting, screening, separating, addition of additives (e.g. lime or cement during modification (if necessary)), treatment, stockpiling, inspection and testing to ensure the excavated soils are suitable for use. It should be noted that not all of the above may be required, and it is up to the Contractor to allow for appropriate processing as required.

The processed soils are to be stockpiled for reuse in the earthworks and the different soil types are to be stockpiled in different clearly marked stockpiles. A record of the excavated quantities and reuse locations shall also be maintained on site. An example tracking system and example forms are provided in Appendix B (other tracking forms and systems may be utilised). A copy of all tracking forms shall be held at the site office.

Stockpiles of soil shall be stored on site in stockpiles managed by the Enablement Contractor and the Ground Works Contractor and shall be subject to operational constraints at the time of stockpiling.

Stockpiles of crushed and processed aggregate materials for use in the permanent works shall be stockpiled at locations to be agreed with the Client. Stockpile locations (permanent and temporary) shall be clearly marked and documented on working drawings maintained in the site office. At the end of the enablement works the stockpiles shall be surveyed to provide an accurate volume of material in each.

Appropriate precautions shall be taken by the Contractor to ensure that the stockpiled material does not result in risks to neighbouring land users, and the Enablement Contractor is to take appropriate mitigation measures and environmental precautions as considered necessary at storage locations. However, as a minimum, stockpiles shall be compacted, and kept wet in periods of dry weather, to prevent dust.

## 7.7 Off-site disposal of unsuitable or excess material

Any material excavated on site may be classified as waste and it is the responsibility of the holder of a material (i.e. the Enablement Contractor) to form their own view on whether or not it is waste. This includes determining when waste that has been treated in some way can cease to be classed as waste for a particular purpose. All arisings should be regarded as contaminated unless proven otherwise.

Any soils to be removed from site are to be removed to a licensed waste management facility and the waste is to be transported by a registered waste carrier in accordance with applicable Transport and Waste Management and Carrier Regulations.

Materials for off site disposal shall be sampled and analysed by the Contractor at its cost, at rates sufficient to allow the material to be adequately categorised.

Material exported from site to landfill, or other appropriately licensed facility, shall be hauled by a registered waste carrier in accordance with the requirements of 'The Environment Protection Act 1990 (including Duty of Care regulations)' and where appropriate 'The Controlled Waste (England and Wales) Regulations 2012', 'The Hazardous Waste Directive', and 'The Hazardous Waste Regulations and The Hazardous Waste (Northern Ireland) Regulations 2005'

Consignment notes (as required) shall be completed, signed and retained by all parties involved. The transfer note shall state the volume of waste, the nature of the material and statement of the chemical composition. Consignment notes shall be kept by the Contractor for the time period required by legislation.

Waste consignment/transfer notices will be required and are to be retained by the Enablement Contractor. Copies of all waste consignment/transfer notices are to be provided to Hydrock for inclusion in a verification report

## 7.8 Materials Management Validation

The Contractor shall undertake all works as set out in the Construction Phase RS&VP and the GDR and EWS and shall track materials at the site, including source, and placement location.

The Contractor shall provide a monthly stockpile plan to the Nominated MMP verification consultant.

In addition, the Contractor is referred to the requirements set out above and in Section 8.

## 8. Supervision, Verification and Reporting

### 8.1 Introduction

Necessary changes to the agreed Implementation Plan, arising during the course of the works, are to be agreed by Hydrock in writing with the Local Authority and Environment Agency prior to being undertaken on site.

### 8.2 Site Supervision

All remediation works are to be undertaken via a visiting (call out basis) site watching brief by the Nominated Consultant.

The Ground Works Contractor is to provide supervision by an appropriate, experienced person who has read and understood the requirements of the RS&VP.

### 8.3 Cover System Verification

On completion of the cover system by the Ground Works Contractor, verification pits will be excavated by the Nominated Consultant in order to measure the thickness of Topsoil and Subsoil and confirm the presence of the bonded geogrid and geotextile marker layer. These pits will be excavated at a rate of one per 50m<sup>2</sup>.

If the cover system is deemed to be insufficient, the Ground Works Contractor will be informed and advised on what is required to make it adequate. In instances where the cover system is deemed to be inadequate following the addition of further soil, further verification pits will be excavated to confirm that a sufficient thickness of soil is present.

### 8.4 Materials Management Plan (MMP) verification

During the construction works, all material movement must be undertaken in accordance with the Earthworks Specification and the MMP.

A 'Materials Management Verification Report' in accordance with the requirements of the Materials Management Plan will be prepared for submission by the Principal Contractor (not the Nominated Consultant). This will be prepared for submission to CL:AIRE and will include:

- » Background information, summary and a general description of the works.
- » Comment on volumes of materials excavated, imported and placed.
- » Comment on the processing and treatment undertaken.
- » Confirmation of material suitability.
- » Comment on the records of placement and *in situ* testing to prove compliance with the geotechnical design and Specification.
- » Comment on off-site disposal.
- » A summary of any problems experienced and resultant design changes.
- » Comment on final levels.
- » Comment with regard to stockpiled soils and future reuse.



## 9. Contingency Plan and Areas of Unexpected Contamination

There is the potential for unexpected contamination, due to the former use of the site. Any significant quantities of suspected oily or odorous material, significant ashy soils, unusual brightly coloured, or asbestos containing materials shall be considered as possibly contaminated.

The Discovery Strategy, included in Appendix B, must remain on site at all times during the Enablement Phase of works and demonstrates a clear allocation of responsibility for reporting and dealing with contamination.

A copy of the Discovery Strategy must be placed on the Health & Safety Notice Board and/or displayed in a prominent area where all site staff are able to take note of and consult the document at any time. Any member of the workforce entering the site to undertake any excavation must be made aware of the potential to discover contamination and the requirement to follow the Discovery Strategy.

A report shall be prepared by the geo-environmental Consultant and submitted to the Local Authority and the Environment Agency where groundwater may potentially have been impacted.

If additional materials are identified these materials shall be subject to the procedures stated in this RS&VP.

## 10. References

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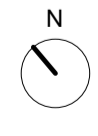
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# *Appendix A Drawings*





**Notes**  
 Do not scale from this drawing.  
 All dimensions are to be checked prior to construction and any discrepancies are to be identified to the Architect.  
 Copyright reserved.



Area schedule	SQM	SQFT
B1 GROUND FLOOR & 1ST FLOOR	2,800	30,138
B2 GROUND FLOOR & 1ST FLOOR	2,800	30,138
B3 GROUND FLOOR & 1ST FLOOR	2,800	30,138
B4 GROUND FLOOR & 1ST FLOOR	2,800	30,138
B5 GROUND FLOOR & 1ST FLOOR	2,800	30,138
B6 GROUND FLOOR & 1ST FLOOR	2,800	30,138
B7 GROUND FLOOR & 1ST FLOOR	2,800	30,138
B8 GROUND FLOOR & 1ST FLOOR	2,800	30,138
B9 GROUND FLOOR & 1ST FLOOR	5,600	60,277
<b>Total</b>	<b>28,000</b>	<b>301,381</b>
<b>Total park spaces</b>	<b>359</b>	

Revisions				
Scale	Size	Date	Drawn	Checked
1 : 1000	A1	25/04/23	TF	SB

Client  
**Bicester Motion Limited**

Project  
**Bicester Motion Innovation Quarter**

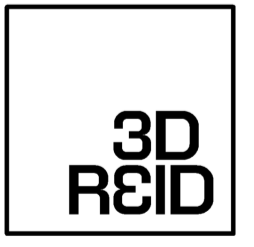
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**Proposed site plan phase 2**

Purpose  
**For Information**

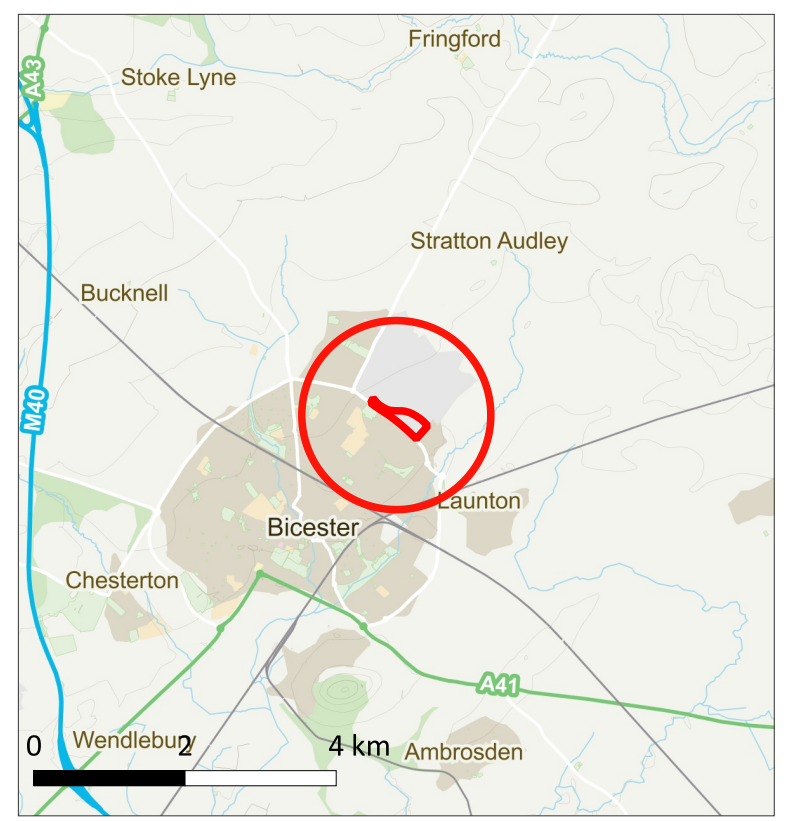
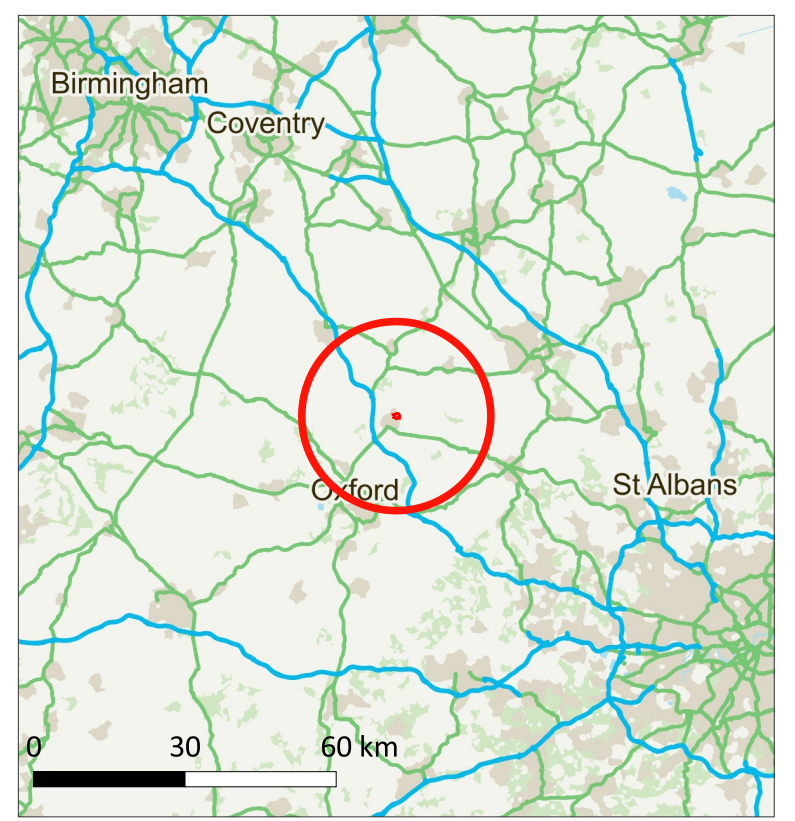
Status Code  
**S1**

3DReid  
 www.3DReid.com  
 Architecture Interiors Masterplanning


Drawing No.  
 220127-3DR-ZZ-00-DR-A-07008








Contains Ordnance Survey data © Crown copyright and database right (2020)

<b>KEY PLAN</b>	
	Site Boundary

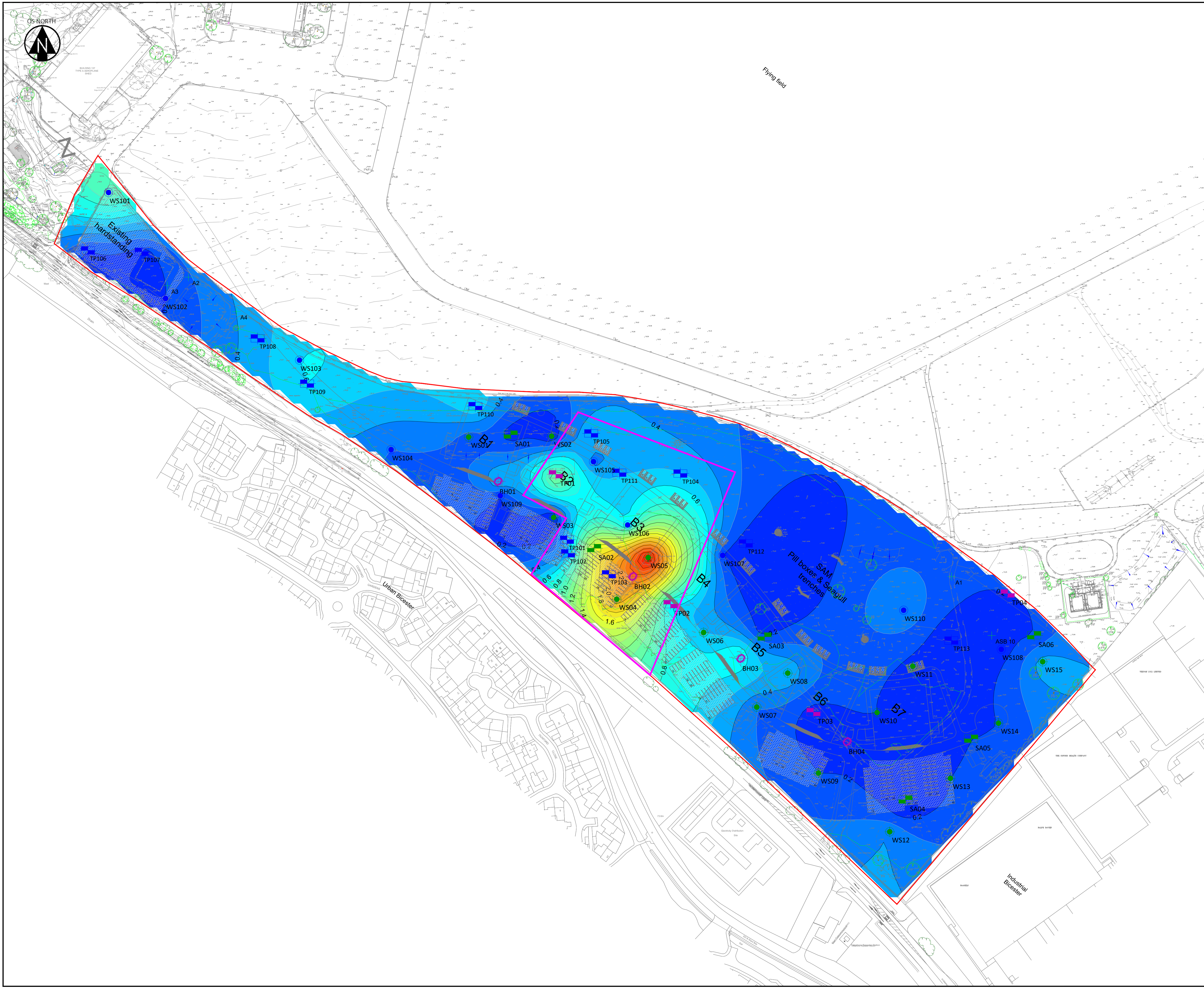
<b>NOTES</b>
1. Contains OS data © Crown copyright and database right (2022)

<b>REVISIONS</b>				
REV.	DRAWN BY INITIALS	CHECKED BY INITIALS	DATE	REVISION NOTES/COMMENTS
P01	AT	NT	20/11/23	First issue

	
<b>CLIENT</b>	Bicester Motion
<b>PROJECT</b>	Bicester Motion Innovation Quarter

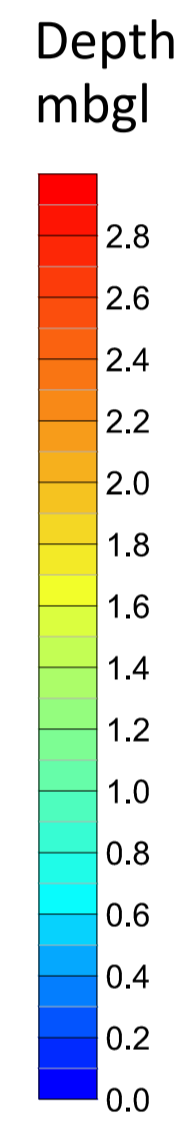
<b>TITLE</b>		
SITE LOCATION PLAN		
<b>HYDROCK PROJECT NO.</b>	<b>SCALE @ A3</b>	
27280	1:5,000	
<b>PURPOSE OF ISSUE</b>	<b>STATUS</b>	
SUITABLE FOR INFORMATION	S2	
<b>DRAWING NO.</b>	<b>REVISION</b>	
27280-HYD-XX-XX-DR-GE-1000	P01	





- KEY**
- Site Boundary (approximate)
  - Hydrock Interpreted Landfill Boundary
  - Hydrock Dynamic Sampler Borehole
  - Hydrock Trial Pit
  - Superficial Samples
  - ## Previous SI: Ridge Property & Construction Consultants (2021)
  - Rotary Borehole
  - Dynamic Sampler Borehole
  - Trial Pit
  - Soakaway Pit

- NOTES**
1. All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing.
  2. This drawing is to be read in conjunction with all relevant Engineers' and Service Engineers' drawings and specifications.
  3. This drawing has been based on the following drawings and information: Ridge Property & Construction Consultants Topographical Survey No: 2555702-1 Dated: August 2021. Indicative Layout Plan. Number: 220127-3DR-22-00-DR-A-08003. Dated: 01/06/23.
  4. Based on Ridge Ground Condition Assessment report - Reference 5015203-RDG-XX-ST-DOC-C-00GAD1.
  5. Subject to confirmation following Hydrock Site Investigation.
  6. Supersedes drawing 27280-HYD-XX-XX-DR-GE-1009.



UPDATED LANDFILL BOUNDARY						
P03	RT	05/12/23	NT	05/12/23	AB	05/12/23
SECOND ISSUE						
P02	RT	07/11/23	NT	07/11/23	AB	07/11/23
FIRST ISSUE						
P01	RT	31/10/23	NT	31/10/23	AB	31/10/23
REVISION NOTES/COMMENTS						
REV.	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE

**Hydrock**

Hawthorn Park  
Holdenby Road  
Spratton  
Northampton NN6 8LD  
TEL: 01604 842 888  
E-Mail: northampton@hydrock.com  
or visit www.hydrock.com

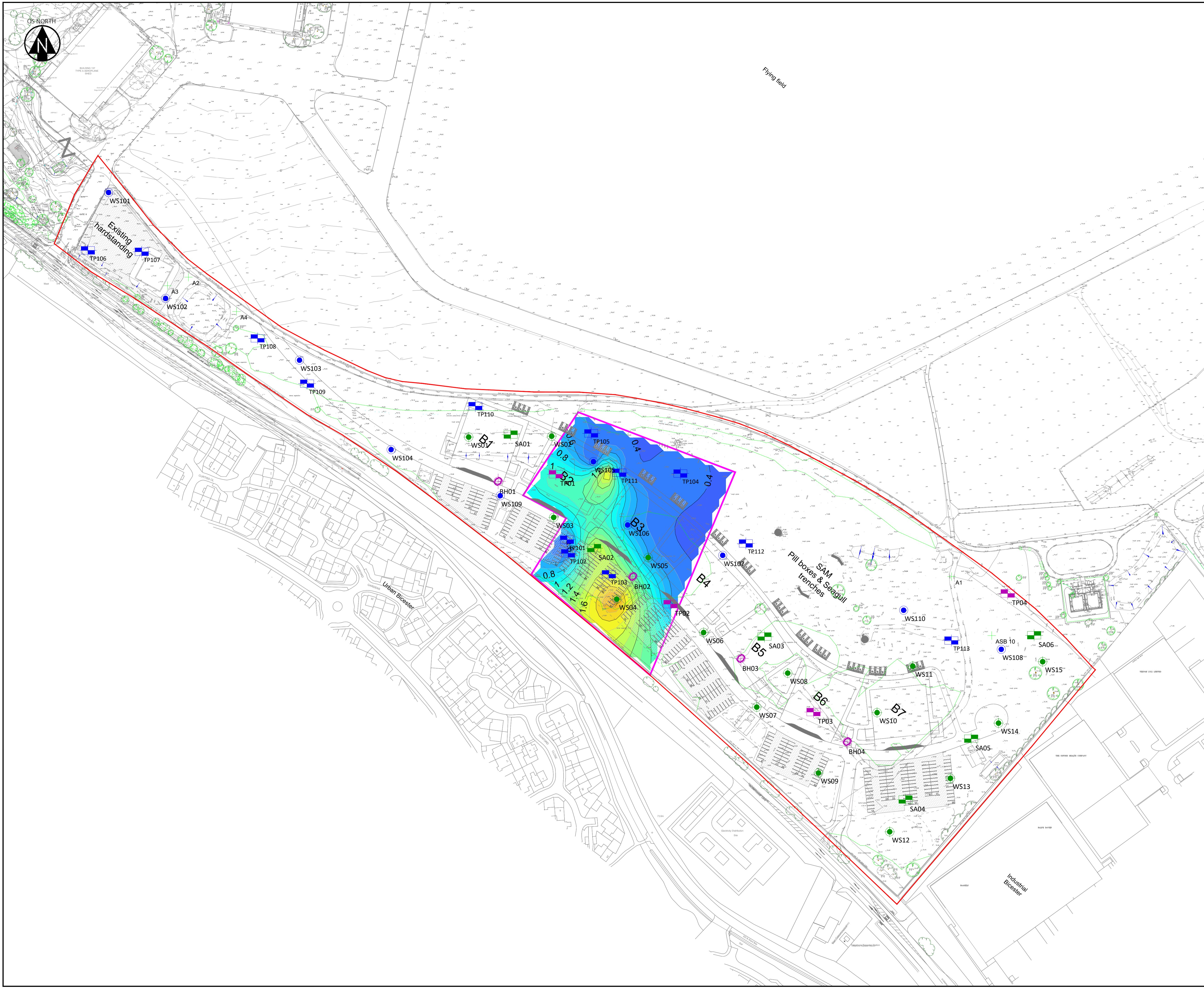
CLIENT  
**Bicester Motion Ltd**

PROJECT  
**Bicester Motion Innovation Quarter**

TITLE  
**Depth to Base of Made Ground (mbgl)**

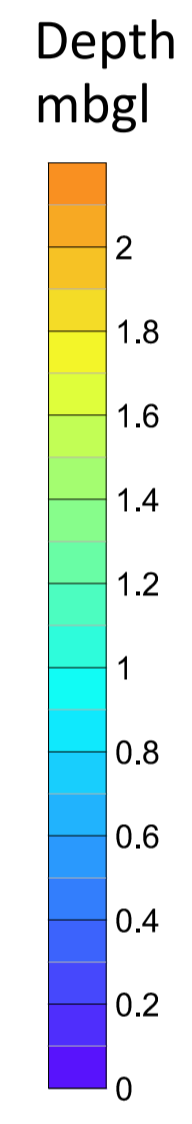
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PURPOSE OF ISSUE <b>SUITABLE FOR INFORMATION</b>	STATUS <b>S2</b>
DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER) <b>27280-HYD-XX-XX-DR-GE-1010</b>	REVISION <b>P03</b>





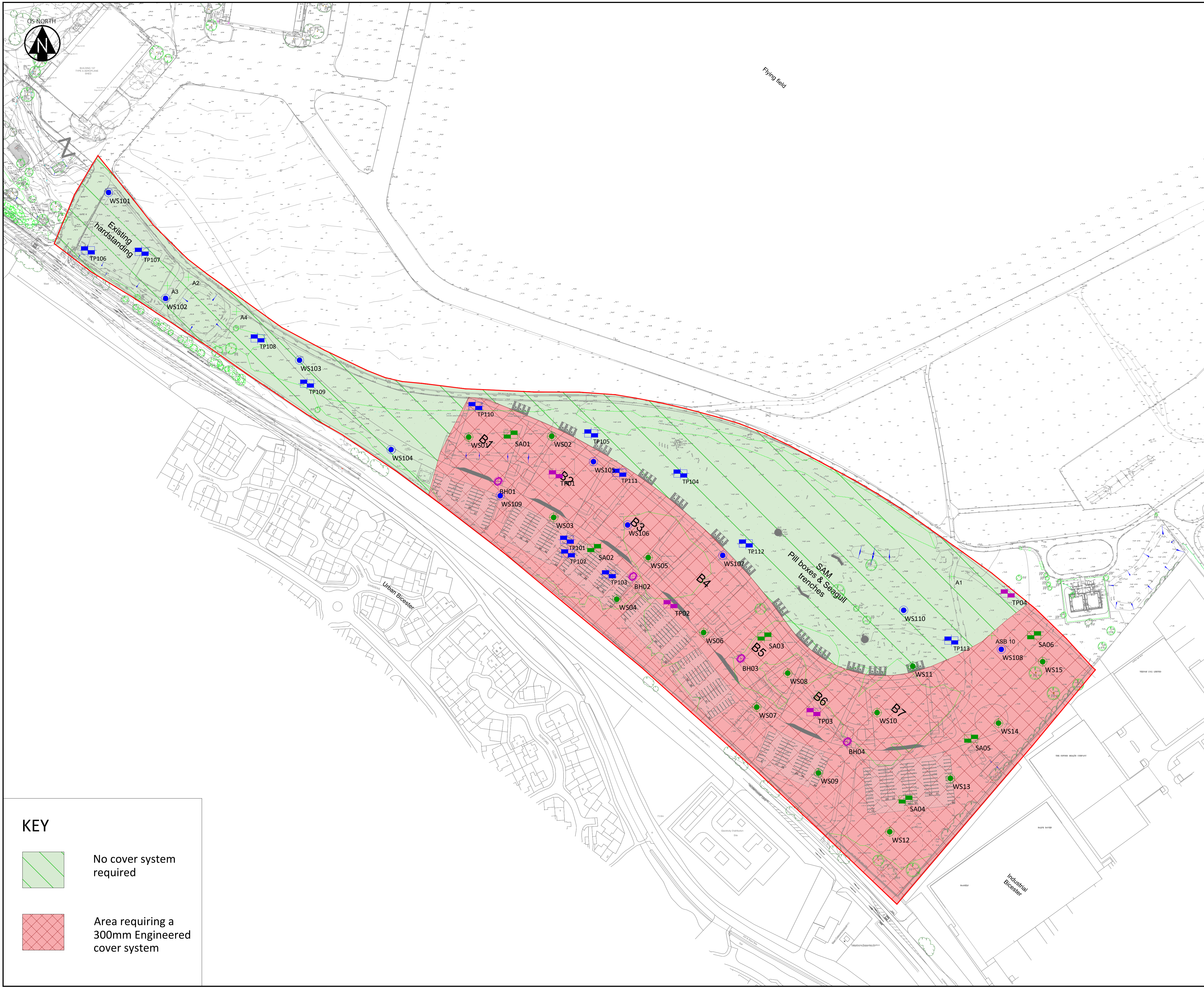
- KEY**
- Site Boundary (approximate)
  - Hydrock Interpreted Landfill Boundary
  - WS### Hydrock Dynamic Sampler Borehole
  - TP### Hydrock Trial Pit
  - Superficial Samples
  - ## Previous SI: Ridge Property & Construction Consultants (2021)
  - BH### Rotary Borehole
  - WS### Dynamic Sampler Borehole
  - TP### Trial Pit
  - SA### Soakaway Pit

- NOTES**
1. All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing.
  2. This drawing is to be read in conjunction with all relevant Engineers' and Service Engineers' drawings and specifications.
  3. This drawing has been based on the following drawings and information: Ridge Property & Construction Consultants Topographical Survey No: 2555702-1 Dated: August 2021. Indicative Layout Plan. Number: 220127-3DR-22-00-DR-A-08003. Dated: 01/06/23.
  4. Based on Ridge Ground Condition Assessment report - Reference 5015203-RDG-XX-ST-DOC-C-00GAD01.
  5. Subject to confirmation following Hydrock Site Investigation.
  6. Supersedes drawing 27280-HYD-XX-XX-DR-GE-1009.



FIRST ISSUE					
PO1	RT	05/12/23	NT	05/12/23	AB
REVISION NOTES/COMMENTS					
REV.	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY
 Hawthorn Park Holdenby Road Spratton Northampton NN6 8LD TEL: 01604 842 888 E-Mail: northampton@hydrock.com or visit www.hydrock.com					
CLIENT					
Bicester Motion Ltd					
PROJECT					
Bicester Motion Innovation Quarter					
TITLE					
Depth to Base of Landfill Made Ground (mbgl)					
HYDROCK PROJECT NO.		SCALE @ A1			
27280		1:1250			
PURPOSE OF ISSUE					STATUS
SUITABLE FOR INFORMATION					S2
DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)					REVISION
27280-HYD-XX-XX-DR-GE-1012					P01





**KEY**

- Site Boundary (approximate)
- Hydroc Interpreted Landfill Boundary
- WS### Hydroc Dynamic Sampler Borehole
- TP### Hydroc Trial Pit
- Superficial Samples
- ## Previous SI: Ridge Property & Construction Consultants (2021)
- BH### Rotary Borehole
- WS### Dynamic Sampler Borehole
- TP### Trial Pit
- SA### Soakaway Pit

- NOTES**
- All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing.
  - This drawing is to be read in conjunction with all relevant Engineers' and Service Engineers' drawings and specifications.
  - This drawing has been based on the following drawings and information: Ridge Property & Construction Consultants Topographical Survey No: 2555702-1 Dated: August 2021. Indicative Layout Plan. Number: 220127-3DR-22-00-DR-A-08003. Dated: 01/06/23.
  - Based on Ridge Ground Condition Assessment report - Reference 5015203-RDG-XX-ST-DOC-C-006CAD1.
  - Subject to confirmation following Hydroc Site Investigation.
  - Supersedes drawing 27280-HYD-XX-XX-DR-GE-1009.
  - The installation of a 300mm engineered cover system in soft landscaped areas comprising a bonded geogrid/geotextile [SC1] break layer (e.g. 'X1160G), overlain by subsoil, beneath a topsoil growing medium at least 100mm thick (PL1 - PL3), with deepening of the cover system where to account for trees and shrub planting.

**KEY**

- No cover system required
- Area requiring a 300mm Engineered cover system

FIRST ISSUE					
RF	05/12/23	NT	05/12/23	AB	05/12/23
REVISION NOTES/COMMENTS					
REV.	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY
Hawthorn Park Holdenby Road Spratton Northampton NN6 8LD TEL: 01604 842 888 E-Mail: northampton@hydrock.com or visit www.hydrock.com					
CLIENT					
Bicester Motion Ltd					
PROJECT					
Bicester Motion Innovation Quarter					
TITLE					
Engineered cover system					
HYDROCK PROJECT NO.			SCALE @ A1		
27280			1:1250		
PURPOSE OF ISSUE					STATUS
SUITABLE FOR INFORMATION					S2
DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)					REVISION
27280-HYD-XX-XX-DR-GE-1013					P01



## *Appendix B Form Templates*

# Bicester Motion Innovation Quarter Imported Soil Documentation Form

Stockpile Identification Reference	
<b>Material Type</b>	
<b>Source Site</b>	
<b>Consignment Note Reference Numbers</b>	
<b>Volume of Stockpile (or number of loads)</b>	
<b>Plots Material to be used in</b>	
<b>Stockpile Identification Reference</b>	

Sketch Plan of Stockpile Location and Sample Points

Signed \_\_\_\_\_

Position \_\_\_\_\_

Date \_\_\_\_\_

## *Appendix C Appendix C Discovery Strategy*

# DISCOVERY STRATEGY

## CONTAMINATED MATERIALS

### DISPLAY AND AWARENESS

#### **SITE: Bicester Motion Innovation Quarter**

The Discovery Strategy must be placed on the Health & Safety Notice Board and/or displayed in a prominent area where all site staff are able to consult it at any time.

Any member of the workforce entering the site to undertake any excavation must be made aware of the potential to discover contamination, and the Discovery Strategy.

#### **HOW TO IDENTIFY POTENTIALLY CONTAMINATED MATERIAL**

- » Looks oily and has an oily odour.
- » Solvent / fuel type of odour.
- » Bright colours / staining.
- » Man-made materials in fill such as paint cans, car parts, glass fragments.
- » Contains fragments of coal/coke cinder.
- » Sandbags, and/or sub-surface concrete structures.
- » Asbestos cement.
- » Fibrous material.
- » Asbestos lagging or asbestos insulation board.

#### **PROCEDURE**

If evidence of unexpected contamination is found the following procedures shall be adhered to:

1. All site works at the position of the suspected contamination should stop.
2. Site personnel to inform the Site Manager/Agent.
3. Visual and olfactory observations of the condition of the ground and the extent of contamination should be made and notification shall be immediately given to the geo-environmental Consultant, which will inform the Local Authority within 24 hours after discovery. Should the contamination be likely to affect controlled waters the Environment Agency shall also be informed.
4. In the presence of a suitably qualified geo-environmental Consultant, investigation works shall commence to recover samples for testing and, using visual and olfactory observations of the condition of the ground, delineate the area over which contaminated materials are present.
5. Should the geo-environmental Consultant deem it appropriate, the affected material may be excavated and placed in a stockpile on a suitable impermeable surface. This should be suitably quarantined with no addition to, removal from, or removal of, the stockpile while chemical analysis is being undertaken. Alternatively, the material should remain *in situ* until laboratory test results have been obtained.
6. A photographic record should also be made of relevant observations.
7. The geo-environmental Consultant will determine the testing suite based on visual and olfactory observations.
7. Test results will be compared against current assessment criteria suitable for the future use of the area of the site affected.

8. If after testing the ground is found to be contaminated, the Local Authority and Warranty Provider shall be informed. After consultation with the Local Authority, NHBC and if necessary, the Environment Agency, materials should either be removed for disposal to a licensed waste management facility or remediated to agreed clean-up criteria.

## **UNEXPECTED TANKS**

It is possible that underground tanks, which have not been identified by the investigations to date, may be present. The following procedures are to be adhered to if tanks are identified:

1. All site works at the position of the tank(s) should stop.
2. Notification shall be given to the geo-environmental Consultant who will inform the Local Authority within 24 hours.
3. The tank's position and depth should be determined and marked on a plan of the site.
4. In the presence of a suitably qualified geo-environmental Consultant, investigation works should be undertaken to obtain samples of any liquid or sludge contents and to establish the dimensions of the tank(s).
5. A description of the tank(s) should be made by the geo-environmental Consultant including; condition and surroundings, along with visual and olfactory observations should any contents be apparent in the tank. A photographic record should also be made of relevant observations.
6. Laboratory testing will be determined by the geo-environmental Consultant based on visual and olfactory observations of the materials sampled.
7. Test results will be compared against current assessment criteria and proposals for disposal of any contents determined in agreement with the appropriate Regulatory Parties.
8. Emptying the tank and disposal of contents to a suitable licenced disposal facility.
9. Once the tank has been emptied in accordance with the above proposals, it is to be removed for disposal to a licensed waste management facility. Copies of the relevant waste consignment notes are to be forwarded to the Geo-environmental Consultant for verification.
10. Excavation and remediation of any contaminated soils in accordance with Section 4.
11. Samples of the base and sides of the resultant hole will be sampled as per the geo-environmental Consultant's instructions and an assessment as to whether this may have been a source of groundwater contamination made.
12. A report shall be prepared by the geo-environmental Consultant and submitted to the Regulatory Parties including the Local Authority and, where groundwater may potentially have been impacted, the Environment Agency.



## *Appendix D General Requirements*

## D.1 Introduction

The Contractor (or sub-Contractor) undertaking the demolition works must be a valid member of the National Federation of Demolition Contractors (NFDC), certification of said association is to be provided with the tender submission and the membership is to be maintained throughout the duration of the contract.

Unless superseded by the Client's requirements, the Contractor(s) shall carry the following insurance:

- » Employer's Liability to a minimum level of £10,000,000.00 for any single occurrence;
- » Public Liability to a minimum level of £5,000,000.00 for any single occurrence.

Both policies must include Indemnity to Principal Extension.

Once the Contractor(s) has been appointed (whether verbally or in writing), the Contractor(s) is responsible (until practical completion) for insuring the whole of the premises against damage or loss by fire, including potential third-party claims and/or other consequential losses until formal handover to the Client. Said insurance shall include all retained structures/properties and the like within the confines of the site.

Any coins and antiquities found on the site will remain the property of the Client.

The Contractor(s) is also referred to the separate, Client's specification for the works and tender information.

In addition to the specific requirements detailed in the text above, the following general requirements will also apply to the remediation works.

## D.2 Compliance with Legislation and Standards

The works are to be undertaken in compliance with all relevant British Standards, codes of practice, regulations, guidance and legislation including, but not be limited to, the following:

- » The Health and Safety at Work etc. Act, 1974;
- » Electricity at Work Regulations, 1989;
- » The Environment Protection Act (including Duty of Care regulations), 1990;
- » Health and Safety Executive 'Protection of Workers and the General Public during Redevelopment of Contaminated Land' HS (G) 66, HMSO, 1991;
- » Party Wall etc. Act, 1996;
- » Provision and Use of Work Equipment Regulations, 1998;
- » The Lifting Operations and Lifting Equipment Regulations, 1998;
- » The Management of Health & Safety at Work Regulations, 1999;
- » The Control of Substances Hazardous to Health (Amendment) Regulations, 2004 (COSHH 2004);
- » Control of Vibration at Work Regulations, 2005;
- » The Noise at Work Regulations, 2005;
- » The Hazardous Waste Directive;
- » The Hazardous Waste Regulations and The Hazardous Waste (Northern Ireland) Regulations, 2005;
- » Health and Safety Executive Guidance Note EH40/98 relating to Occupational Exposure limits;
- » The Work at Height (Amendment) Regulations, 2007;
- » The Controlled Waste (England and Wales) Regulations, 2012;

- » The Control of Asbestos Regulations, 2012 (CAR 2012); and
- » The Construction, Design and Management Regulations, 2015.

### D.3 Licences, Permits and Consents

The Contractor(s) shall obtain all necessary approvals, licences, consents and permits from regulatory bodies and third parties prior to commencement. These are to be provided to Hydrock for review and comment a minimum of one week prior to commencement of the Works.

The Contractor(s) should only conclude that approvals have been sought by others where such approval has been provided to the Contractor(s), or where the Contractor(s) has been advised in writing that others are obtaining approvals.

If treatment of the soils is to be undertaken (e.g. bioremediation of contamination), it will need to be undertaken in accordance with an appropriate Environmental Permit, which is likely to be a Standard Rules Permit (SR2008 Number 27).

If crushing of recycled aggregate is to be undertaken, it will need to be undertaken in accordance with an appropriate Environmental Permit (Mobile Plant), likely a SR2010 Number 11 or Number 12.

Any reuse of soils or below ground materials will need to be undertaken in accordance with the 'Definition of Waste: Development Industry Code of Practice - Definition of Waste. Development Industry Code of Practice', Version 2 2011 i.e. in accordance with an approved Materials Management Plan and Qualified Person Declaration.

All recycled materials (6F2 etc.) must be produced under the 2013 Aggregates Protocol. If they are not, they will be deemed a waste and can only be used on site under a permit. More information can be found at <https://www.gov.uk/government/publications/quality-protocol-production-of-aggregates-from-inert-waste>.

## D4. General responsibility and management of the works

### D4.1 *Project Setup and Management*

Prior to appointment of the Enablement Contractor, this report, along with copies of supporting documents, will be issued to the Local Planning Authority (LPA) (and if deemed necessary by the LPA, the Environment Agency) for comment. Any comments will be reviewed, and this document may require updating to incorporate the comments.

The Contractor is to review any updates and confirm if the proposed works or Contract value changes. If no updated Contract value is provided, it shall be deemed the revised supporting documents have no impact on the Contract value.

### D4.2 *Health & Safety*

The project is to be operated under the Construction, Design and Management (CDM) Regulations, (2015).

Under the CDM regulations, the Client should appoint a Principal Designer, who would provide the Pre-construction Information Report (PCIR) and a Principal Contractor who would provide a site-specific Construction Phase Health and Safety Plan (CPHASP) prior to works commencing. If the Client does not appoint a Principal Designer, they will assume the role.

The Principal Designer will review the CPHASP, and the CPHASP shall meet with the approval of the Principal Designer prior to the works commencing. The CPHASP will be kept as a live document and will be adapted as required to during the project.

The Enablement Contractor must notify the local office of the Health and Safety Executive (HSE) of the works prior to commencing (via form F10).

Prior to commencement of site activities, detailed planning of the project shall be undertaken by the Enablement Contractor, including liaison (as necessary) with the key stakeholders and project team as required.

The Contractor(s) shall give written notice to the Client if features are encountered which might affect the progress or performance of the permanent or temporary works and might have safety implications.

The Contractor(s) shall give written notice to the Client if problems are encountered which might affect the progress or performance of the permanent or temporary works or might have safety implications.

### D4.3 *Site Supervision*

The Contractor is to provide suitably qualified and experienced full-time, non-working supervision for all aspects of the works. This supervisor is to have read and understand the requirements of the supporting documents.

The Contractor shall provide to the Client, details of all individuals who will be appointed in the key roles of management and supervisory responsibility, including curricula vitae demonstrating their experience, training and competency to undertake the defined roles.

All operatives must be appropriately skilled and experienced for the type of work and hold relevant CITB Certificates of Competence or be training to obtain CITB Certificates of Competence prior to commencement on site.

Site staff responsible for supervision and control of the work are to be trained Supervisors, experienced in the assessment of the risks involved and, in the methods, to be used. The Client shall retain the right to reject (at no cost to the Client) any personnel that are not considered suitably qualified or competent.

The Enablement Contractor is to provide suitably experienced and qualified geo-environmental and geotechnical supervision during the enablement works.

All Enablement Works are to be undertaken with a visiting site watching brief by the Client, and their nominated Consultant (Hydrock Consultants). The nominated Consultant shall be on site on a visiting watching brief and site audit basis and undertake the following role:

- » Liaison with the Contractor(s) and the Client Project Manager.
- » Reviewing of testing activities. It should be noted that this does not replace or absolve the Contractor (s) from the responsibilities set out in the Specification.
- » Observing and commenting on the quality of the Works. It should be noted that this does not replace or absolve the Enablement Contractor from the responsibilities set out in the Specification.

The nominated Consultant has the authority to request additional information from the Contractor site staff and/or management team as required. If the nominated Consultant is not satisfied by the responses to any requests for information, or the timescales for information are not met, clarification will be requested from the Client.

If the nominated Consultant observes works being undertaken not in accordance with this Specification, the nominated Consultant has the authority to suspend operations (at no cost to the nominated Consultant or the Client).

A site watching brief may be required by other consultants (for example, but not exclusively archaeologists, ecologists, arboriculturalists, etc) during the Works. Unless specifically excluded in the Contract and the Works Information the Contractor is deemed to have included for this in their tender and is to appoint third parties ensure the works are undertaken in accordance with the planning requirements.

A photographic log is to be provided by the Contractor to the nominated Consultant and the client on a weekly basis

## D6. Temporary Works

The Contractor is responsible for all temporary works (both above and below ground).

This is particularly relevant on the site boundaries, where collapse or instability of excavation faces could affect nearby property on and off site with associated health and safety implications.

A risk assessment of the stability of any open excavation should be undertaken by a competent person and appropriate measures adopted to ensure safe working practise in and around open excavations. Further guidance on responsibilities and requirements for working near, and in, excavations can be obtained from 'The Construction Design and Management Regulations' (2015); Construction Information Sheet 47: Inspections and Reports (2005); and HSG47: Avoiding Danger from Underground Services.

## D7. Traffic safety and management

The Contractor shall comply in all respects with Chapter 8 of the Traffic Signs Manual for works on, affected by, or affecting, the public highway and/or private roads forming the highway access to/from the site. The Contractor shall obtain all necessary consents from the Local Highway Authority for works on the public highway.

On-site access and haul routes should be provided and maintained by the Contractor in such a manner so as not to endanger either the user, those working in the vicinity of such accesses/haul routes or the Works.

Access to the site will be agreed with the Client prior to commencement.

The Contractor shall take all necessary measures to prevent the spread of mud and debris on the public highways or private roads. Regular inspections of the public highway/any private roads adjacent to the site shall be carried out. The Contractor shall ensure that the highway/private roads are swept regularly to remove any mud, slurry or dust deposited by vehicles entering or departing the site. If the Client considers that significant amounts of any detritus have been deposited on the public highway/private roads then operations shall be temporarily suspended until appropriate cleaning operations have been undertaken. The costs for all wheel washing facilities and cleaning of the public highways/private roads as required, or as requested by the Client, are deemed to have been included in the tender.

The Contractor(s) shall co-operate with other Contractors or site users on site during the works and shall co-ordinate its activities to minimise disruption.

Risks associated with the transport of hazardous/contaminated materials should be appropriately managed to keep the risk of spread of contamination as low as reasonably possible.

## D8. Welfare Facilities

Site cabins and welfare facilities will be established at a location to be agreed with the Client.

The Contractor is deemed to have made provision and arrangements for all temporary services associated with the welfare facilities.

A chair and desk (with a 240v power supply) is to be made available to the Nominated Consultant for use during their site visits.

## D9. Working Hours

All works are to be undertaken in accordance with the times stipulated in the Planning permission.

Noisy operations i.e. the use of hydraulic breakers shall be restricted to operating times as specified by the Client and by the Planning permission.

Prior to commencement the Contractor is to make contact with the Council to establish if any further restrictions apply.

## D10 Mobile Plant

Mobile plant shall be operated by suitably trained and qualified operators experienced for each item of plant. When not in use all plant shall be locked to prevent all plant shall be locked to prevent unauthorised operation.

All traffic entering or working on site shall obey the site set speed limit.

Fuelling of any plant shall be undertaken in a designated area and all above ground fuel storage tanks shall comply with the requirements of the Pollution Prevention Guidelines PPG2.

Specifically, any storage tanks used shall:

- » be sited within an oil-tight secondary containment system such as an impermeable bund;
- » the secondary containment must provide storage for at least 110% of the tanks maximum capacity;
- » be located within a secure area; and
- » all taps and valves shall be fitted with a lock and kept locked shut when not in use.

Maintenance of mobile plant should be undertaken in a designated area, unless absolutely necessary.

Waste oil, hydraulic fluid etc. should not be tipped directly or discharged on to site. Such materials shall be stored separately, in a secure bunded area, for off-site disposal. Waste oil may be a special waste and disposal shall be undertaken by a registered carrier in accordance with the Duty of Care Regulations.

A spill kit shall be kept on site in an accessible place adjacent to the designated refuelling area.

## D11 UXO Risk

A specialist UXO Desk Top Study has concluded there is a moderate risk of encountering UXO within the site.

## D12 Surveying

The Contractor shall provide full time surveying personnel and equipment to undertake the following activities and any other requirement for topographical information relating to the project that arises through the duration of the enabling works contract. The survey personnel and equipment should be capable of providing accurate levels and co-ordinates in relation to the national grid and topographical survey provided within 1 day of request.

The following key activities are covered by the requirements for surveying:

- » confirmation of topographical survey on possession of the site, and setting out of the site boundary;

- » confirmation of positions of existing services and site features;
- » all setting out and levelling relating to delivery of the enabling works;
- » surveying the base and extent of all excavations and remaining obstructions (to be undertaken prior to backfilling);
- » the location of sub-structures removed;
- » interim surveys to be undertaken during the infilling works to provide information on issues such as depth of excavation, progress of earthwork, quantities of materials etc.;
- » the location and elevation of test samples and locations; and
- » 'as-built' survey information.

A topographical survey of the site is provided in the Site Information. The Contractor is required to undertake all necessary topographical survey works to verify these levels before the commencement of the contract. Should the Contractor find any discrepancies on the drawings they are to refer the matter to the Client for verification before proceeding with the part of the works affected.

The Contractor shall undertake a topographical survey following completion of the enablement works. All topographical surveys shall include levels at maximum 10m spacing and details of any features, changes in slope, structures, services and any other features of interest. All of the above features shall be surveyed for line and level at the site boundary and marked on a plan. Levels shall be to Ordnance Datum and locations to National Grid. The survey shall be calibrated against existing site surveys and benchmarks in the vicinity of the site.

## D13 Collection of Samples and Testing

### D13.1 Sampling

All sampling shall be undertaken by the Contractor during the Enablement Works, using suitably trained staff in accordance with BS 5930:2015 +A1:2020 'Code of Practice for Site Investigations' and BS 10175:2011+A2:2017 'Investigation of Potentially Contaminated Sites – Code of Practice'.

All samples are to be taken in accordance with relevant guidance and laboratory guidance. Soils for inorganic analysis will be sealed in air-tight polythene tubs. Soils for organic analysis shall be sealed in amber glass jars with the minimal practicable headspace. Groundwater samples shall be collected in suitable containers and with the correct preservatives, as provided by the laboratory.

All samples shall be scheduled on Chain of Custody forms prior to being dispatched to the UKAS accredited laboratory for analysis.

### D13.2 Testing

The Contractor shall undertake all testing at a laboratory which holds UKAS and MCERTS accreditation for the specific tests. Where it is not possible to obtain the testing of a material for a specific property to a UKAS or MCERTS accredited method, the Contractor shall obtain permission from the Consultant for the test to be completed at the proposed laboratory, before the test is undertaken.

The results of all testing (geotechnical and geo-environmental) undertaken (and a copy of the test certificates), shall be submitted to the nominated Consultant as soon as they are reported, and no more than one day after issue of the test certificate to the Contractor. It is recognised that different tests may take different time to complete. However, the Contractor shall advise the nominated Consultant of any delay that they are aware of regarding the completion of any tests (e.g. a sample is being retested and the report will be delayed).



Test results are to be summarised in a single master spreadsheet (which contains all data) and is to be in a format agreed with the Consultant. This spreadsheet is to be updated each time samples are collected, scheduled, tested and reported.

Data that does not meet the validation requirements set out in the RS&VP shall be highlighted and include details of what works were undertaken to address the non-compliance. The master spreadsheet, results of chemical testing and drawings shall be maintained and kept up to date. An updated version of these documents is to be provided to the Consultant by 11:00am every Monday morning throughout the Contract.

In addition, the Enablement Contractor is to make available on site, at all times, a file containing all test certificates in addition to the testing summary, for inspection by the Consultant.

### D13 Off-Site Disposal

Materials for offsite disposal shall be sampled and analysed, by the Contractor(s) at their cost, at rates sufficient to allow the material to be adequately categorised.

Material exported from site to landfill, or other appropriately licensed facility, shall be hauled by a registered waste carrier in accordance with the requirements of 'The Environment Protection Act 1990 (including Duty of Care regulations)' and where appropriate 'The Controlled Waste (England and Wales) Regulations 2012', 'The Hazardous Waste Directive', and 'The Hazardous Waste Regulations and The Hazardous Waste (Northern Ireland) Regulations 2005'

Consignment notes (as required) shall be completed, signed and retained by all parties involved. The transfer note shall state the volume of waste, the nature of the material and statement to the chemical composition.

Consignment notes shall be kept by the Contractor(s) for the time period required by legislation.

The Contractor(s) is to undertake all testing required to classify the excavated soils and the costs for classification is to be included as part of rates.

### D13 Contamination

Contractor's staff shall be made aware of the possibility of encountering contaminants in soils at the site (including asbestos) through 'toolbox' talks.

Safe working procedures shall be implemented in accordance with CIRIA132 and good standards of personal hygiene should be observed and appropriate levels of PPE provided and utilised.

Eating, drinking and smoking shall be strictly prohibited in the development site other than in designated mess areas.

### D14 The Control of Noise, Vibration and Dust Nuisance

The Contractor(s) shall comply with the recommendations for practical measures to reduce noise and vibration set out in 5228-1:2009+A1:2014 and 5228-1:2009+A1:2014 and with any specific Client or Planning Conditions requirements.

The Contractor shall take all reasonable measures to prevent dust nuisance from being generated by construction traffic, etc.

If necessary, working methods will be altered in order to ensure that the level of noise generated from the works is within published tolerable limits.

The requirements of the LPA are to be sought and undertaken.

### D15.1 General

No fires shall be permitted on site.

### D15.2 Dust Mitigation

Any main temporary haul roads shall, where practical to do so, be constructed of crushed hardcore products. The haul roads shall be maintained for the duration of their use to minimise any build-up of loose spoil etc.

Traffic both entering and working on site shall obey the site speed limit.

Mobile water bowsers and sprayers shall be available on site at all times to water unpaved haul roads and working areas. The water spray may include chemical dust suppressants or wetting agents to improve dust control.

An adequate supply of water shall be maintained on site at all times to allow for dust suppression activities to be carried out at short notice. Contaminated water, or water that has been treated cannot be used for dust suppression.

Where mobile water bowsers are not effective in suppressing dust then vapour masts shall be used. Such vapour masts shall be deployed as required on the downwind side of haul roads or excavations giving rise to significant dust or emissions of odour.

Air quality, dust concentration and airborne asbestos monitoring stations will be set up and monitored on a regular basis (minimum monthly) as deemed necessary by the Contractor, or as instructed by the Client. Air quality and dust monitoring stations will be set up at locations agreed with the Client.

With regard to stockpiles:

- » stockpiles should be kept to a minimum to reduce 'wind whip' causing potentially hazardous material to be blown from the pile;
- » stockpiles should be placed on a suitable polythene membrane to prevent any cross contamination and care should be taken not to pierce the sheeting when placing the bulky elements of the material;
- » stockpiles should be dampened down or covered to prevent dust, whilst the final choice should be made by the Contractor based on site constraints, but the options include covering with plastic/polythene membrane, or by a layer of clean soil material; and
- » the drop distance from excavator bucket to stockpile will be kept as short as reasonably practicable to reduce dust.

### D15.3 Odour

The excavation works during the Enablement Phase works are considered likely to give rise to odours, although, the receptors to the odours are limited to the adjacent residential properties and site workers.

If highly odorous materials are encountered, which may give rise to nuisance to neighbouring properties, appropriate vapour masts shall be deployed to provide suitable odour control. Any odorous materials shall be covered at the end of each working day and any stockpiles will be located away from any sensitive areas.

Plant and machinery shall be serviced regularly to ensure that exhaust fumes are compliant with best practice and relevant regulations.

#### D15.4 Noise

The requirements of the Local Planning Authority and 5228-1:2009+A1:2014 'Noise and vibration control on construction sites' shall be adhered to at all times.

All machinery shall be fitted with effective silencers and shall be serviced at regular intervals. No items of plant shall be operated with engine covers raised.

The location of any crushing plant shall take into consideration the location of neighbouring properties and other noise sensitive receptors and shall be located away from these areas and located adjacent to proposed stockpile locations where possible.

The timing of noisy works should take into consideration neighbouring properties and other noise sensitive receptors.

#### D16. Services

Service records are provided by the Client for information purposes only.

It should be noted there is an existing electricity substation on site that serves the wider area and is to remain on-line throughout the remediation works. It should also be noted that where mains services need to remain during and following remediation, it is the Contractor's responsibility to ensure they understand which services are to remain and ensure the correct services remain following demolition.

The Contractor(s) is to report the location of any previously unidentified services.

Prior to site work commencing, the position of all services indicated as on site, or off site but close to the site boundary, shall be determined, and clearly identified where on site. The locations should be confirmed on site by appropriate inspection, investigation (vacuum excavation), observations and survey. Any discrepancies between the anticipated positions and confirmed locations are to be reported to the Client.

All services on site that are to be retained through the works are to be positively located on site; reliance shall not be placed on existing records. Services are to be visibly marked and protected for the duration of the works. Appropriate methods are to be put in place to ensure all site staff working in the vicinity of retained services are fully briefed.

#### D17. Drawings and supplied information

Whilst every effort has been made to ensure that the information provided to the Contractor is correct and current, the Contractor(s) is responsible for corroborating the existing information with the benefit of their site presence, and reporting any discrepancies encountered or anticipated, to the Supervising Engineer immediately.

Where cutting and filling operations are to be carried out the Contractor(s) is to undertake comparative assessments with the benefit of existing information, additional survey and their anticipated sequence of work to ensure sufficient and suitable material is available to undertake the works as proposed. Any anticipated shortfall or surplus is to be report immediately.

#### D18. Photographs and progress reports

The Contractor(s) is to provide on site a digital camera and e-mail facilities, to enable electronic transfer of site photographs and other information, for the full duration of the contract.

Progress photographs are to be taken at least weekly across all parts of the site for inclusion within the Contractor's progress reports.

A weekly photograph log is to be collated and submitted to the Client. The photograph log is to be collated as a document, with captions describing each photograph. The weekly photograph log / progress report, shall include: details of works undertaken; representative photographs (with captions explaining the works in each photograph); details of test locations and laboratory test certificates together with any other relevant information. The weekly photograph log, shall also include a plan showing where photographs were taken from and the direction photographs were taken.

A progress report is to be provided on a monthly basis (or more regularly, if meetings are more frequent), prior to the progress meeting. The progress report may include the weekly photograph logs as appendices, to show progress.

All completed excavations are to be photographically recorded and presented as a collated document for each excavation. Photographs are to include: the excavation during excavation; the excavation prior to backfilling, showing the trimmed surfaces; the filling operation and the completed backfilled excavation.

Photographs are to be made available to the Client in electronic format should they be requested during the contract. Record photographs should be provided as part of the validation information. The weekly photograph log can be used to assist in the validation report.

#### D19. Asbestos mitigation during earthworks

It should be noted that Asbestos Containing Materials (ACM) and asbestos fibres have been detected in soils at the site. However, the Contractor(s) should assume that asbestos may be found in all Made Ground soils and those formed during the demolition works.

As part of the proposed remediation works and earthworks, during excavation, processing and placement of Made Ground soils, there will be a requirement to remove any identifiable ACM encountered and to mitigate the risks of asbestos fibres from soil becoming airborne.

The Principal Contractor must manage the risks in accordance with their legal requirements and will need to prepare appropriate health and safety documentation and obtain appropriate approvals, licences, consents and permits prior to commencement.

All ACM encountered during works shall be hand-picked and disposed of off-site.

If ACM is encountered, the Contractor is required to have in place all appropriate licences and insurances specific to this project and the type of work required (or to employ a suitably licensed and insured Subcontractor). The Contractor is to provide evidence to the Client as to how the works are classified under the Control of Asbestos Regulations 2012 (CAR 2012).

Prior to commencing ground works, the Contractor shall ensure a detailed Method Statement and Risk Assessment, and any other necessary information, are written and submitted to the Client for approval. It will be the responsibility of the Contractor to ensure that the methods adopted for the removal of the asbestos is of a standard acceptable to the Health & Safety Executive (HSE) and in accordance with relevant guidance and legislation.

The remediation works are designed to break the source-pathway-receptor linkage with regard to contaminants in the soil (by the removal of identifiable ACM, hydrocarbon impacted soils (hotspots) and the installation of an engineered cover system).

The Ground Works Contractor shall have in place at the start of the contract, work procedures designed to ensure they are working in full compliance of all Health and Safety requirements (including, but not exclusively CAR 2012 and CAR Soils) and that control measures are sufficiently robust to prevent release of airborne asbestos fibres into the surrounding environment. Appropriate PPE, and if required RPE, shall be provided and utilised.



# *Appendix E Cover System Justification*

## F1 Cover System Justification

There are two broad categories of cover system available for use in the remediation of contaminated land<sup>6</sup>:

- » simple cover systems/growing medium: designed to provide a reduction of risk to human health and to provide a suitable medium for plant growth; and
- » engineered cover systems: designed to provide complete separation of the receptor from the source and to perform a number of functions including limiting upward migration of contaminants due to capillary rise and controlling the downward infiltration of water.

An assessment of the suitability of a 'simple' cover system as per Hollingsworth, 2004 (BRE 465) has been undertaken. This indicates that a simple cover system is not appropriate (due to the presence of asbestos fibres). As such an engineered cover system is proposed.

The engineered cover system beneath landscaped and garden areas is proposed to consist of (bottom up):

- » a bonded geogrid and geotextile (e.g. Tensar TX160G) marker layer; below
- » Subsoil (150mm landscaped areas); below
- » a minimum of 150mm Topsoil.

For trees planted as part of the wider landscaping, tree pits will need to be excavated in the underlying soils and the cover system deepened to allow these trees to have sufficient soil for the root ball. The depth of this deepening will need to be designed in conjunction with the Landscape Architects.

The engineered cover system will need to be verified by the Consultant once final installation has been undertaken.

An assessment of the design limitations and considerations regarding the proposed cover system has been undertaken and is detailed in Table E.1 in accordance with BRE 465.

Table E.1: Design Considerations for a Cover System

Factor affecting suitability of a cover system	Design limitation	Consideration
<b>Presence of soil gases and vapours</b>	A simple cover system will not inhibit the movement of soil gases or vapours.	Gas/vapour protection measures are not required.
<b>Location and mobility of water table and solubility of contaminants</b>	Liquid or soluble contaminants may be brought to the surface by a rising water table.	There is a perched water table at relatively shallow depths, but groundwater will be controlled by the installation of plot drainage and road drainage. As such, the risk from a rising water table is low.
<b>Risk to Controlled Waters</b>	If mobile elements are in continuity with the Controlled Waters a cover system would provide no additional increased protection to the groundwater.	There are no significant risks to Controlled Waters identified.

<sup>6</sup> BRE 465 'Cover Systems for Land Regeneration, Thickness of Cover Systems for Contaminated Land' 2004 is a useful discussion document, but as noted in the publication, the principle aim of the research is focussed on a *reduction in risk* rather than the *prevention* of exposure.



Factor affecting suitability of a cover system	Design limitation	Consideration
<b>Significant soil contamination</b>	If the concentrations of contaminants are significantly elevated the short-term exposure risk due to excavated soil is likely to be unacceptable, as are other risks associated with the cover system being compromised.	ACM is present, but will be removed by suitably licenced Contractors.
<b>Deep excavations</b>	Exposing the contaminated material below the cover.	Excavations are required as part of development.
<b>Excavations for buried services</b>	Exposing the contaminated material below the cover. Contamination of water services.	Over-excavation to minimise the risk of contact is required in some areas of the site. Barrier pipe is required in some areas of the site. Clean backfill to service trenches is required.
<b>Slopes</b>	The combined effects of gravity and seeping waters on a slope could lead to the failure of the cover system.	There are no significant slopes on site.
<b>Areas where mole, badger, rabbit and fox populations are significant.</b>	Contaminated material can be brought to the surface.	The site is a proposed commercial development with small areas of landscaping, unlikely to provide habitats for burrowing animals.

In addition to the factors covered in Table E.1 above, additional considerations with respect to the cover system are detailed below.

### Depth of Earthworm Activity

Worms can cause intermixing of the soils, including bringing soils from depth to the surface. However, the research also indicates that the main worm activity within the soil profile is within the upper 150mm, reducing rapidly with depth. The temporary shallow sub-horizontal burrows, which are more likely to lead to soil intermixing (due to their regular collapse) are generally to depths of 300mm to 350mm, with more permanent near vertical burrows to greater depths.

It can be concluded that the presence of a bonded geogrid and geotextile marker layer will limit burrowing activity and therefore soil mixing will not have a significant impact from worm activity.

### Depth of Burrows from Burrowing Animals

The main burrowing animals that are likely to affect soil cover in gardens are rats, mice moles, rabbits, badgers and foxes.

As the site is a proposed commercial / industrial area, the presence of moles, rabbits, badgers and foxes will not present an obstacle to the implementation of the cover system (as they will be actively discouraged by site users or prefer alternative locations in the fields surrounding the site).

Rats live in burrows often near a food source such as houses, farms or near rubbish bins. The burrows are generally to depths of around 500mm, and they frequently occupy disused rabbit burrows. As there are not going to be disused rabbit burrows in the engineering cover system, a depth of 300mm Topsoil/Subsoil will not have a significant impact on rats. In addition, rats will be actively discouraged by occupiers and site users as a pest.

The burrowing animals likely to be present on site that are likely to cause the greatest disturbance is rats which may dig to 500mm. However, rats are not seen as a desirable animal to encourage in a commercial area and will have many alternative locations. It is concluded that a depth of 300mm Topsoil/Subsoil will not have a significant impact on burrowing animal activity.

Wood mice also live in burrows to depths of 70mm to 180mm.

### **Effects from Plant/Tree Roots**

Plants tend to have a shallow root mat influenced by: soil density, availability of nutrients and availability of moisture. Ranges of the minimum soil layer thickness required for various plants include: 150mm for grass, 200mm to 300mm for garden crops and up to 500mm for shrubs. However, it is considered that significant root penetration can be reduced if shallow soils have suitable nutrients and moisture.

Deeper pits are required for trees. However, tree pits will be dug for trees planned for installation during construction.

It is concluded that a depth of 300mm Topsoil/Subsoil will be suitable for plants in landscaped areas, subject to the use of tree pits where necessary.

## *Appendix F Roles and Responsibilities*

Table F.1: Roles and Responsibilities

Work Activity	Responsibility
<b>Pre-Contract</b>	
Remediation Strategy and Verification Plan	Nominated Consultant
Regulatory discussion and agreement (yet to be undertaken)	Nominated Consultant
Geotechnical Design/Earthworks Specification	Nominated Consultant
<b>Pre-Commencement</b>	
H&S Risk assessments and working methods (including, but not exclusively soils containing asbestos. Asbestos is present in the soils and all appropriate measures will need to be undertaken by the Contractors with regard to CAR 2012. Working Methods and proposed monitoring to be provided to Hydrock for comment.	Ground Works Contractor
Materials Management Plan and Qualified Person sign off.	Nominated Consultant
Groundwater disposal licence/permit for water pumped from the site.	Ground Works Contractor
General H&S Documentation and a Construction Phase Plan (CPP)	Ground Works Contractor
<b>Construction works</b>	
Excavation and appropriate materials management and handling to ensure excavated soils are suitable for use.	Ground Works Contractor
Testing of soils as required.	Nominated Consultant
Any required groundwater control and discharge.	Ground Works Contractor
Installation of barrier pipework, and clean corridor, with provision of photographic proof of delivery and installation.	Ground Works Contractor
Materials management and tracking	Ground Works Contractor
Materials management verification	Nominated Consultant
Placement of the final cover system using imported soil.	Ground Works Contractor
Provision of all validation data / requirements as per the RS&VP	Ground Works Contractor
Verification of the cover system thickness.	Nominated Consultant

## Appendix G *Coal Tar Guidance Documents*

- » The Environment Agency Regulatory Position Statement 075
- » Environment Agency Guidance 157: Storing and Treating Asphalt Waste
- » ADEPT 'Managing Reclaimed Asphalt'