

EOS Inc Limited and Firethorn Trust

Gateway 36 Development Site – Phase 3

Ground Treatment Specification

325389-R04 (00)

RSK GEOSCIENCES

JULY 2021

RSK GENERAL NOTES

Project No.: 325389-R04 (00)

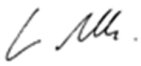
Title: Ground Treatment Specification: Gateway 36 Development Site – Phase 3

Client: EOS Inc Limited and Firethorn Trust

Date: 30 July 2021

Office: RSK Environment Limited, Spring Lodge, 172 Chester Road, Helsby, Cheshire, WA6 0AR. Contact: Siôn Roberts, Tel: 01928 726006.

Status: Rev 00

Author	Siôn Roberts	**Technical reviewer**	Gary McGuicken
Signature		Signature	
Date:	July 2021	Date:	July 2021
Project manager	Siôn Roberts	**Quality reviewer**	Ang Wallis
Signature		Signature	
Date:	July 2021	Date:	July 2021

Revision control sheet

Revision reference	Date	Reason for revision
Rev 00	July 2021	First issue

RSK Environment Limited (RSK) has prepared this report for the sole use of the client, showing reasonable skill and care, for the intended purposes as stated in the agreement under which this work was completed. The report may not be relied upon by any other party without the express agreement of the client and RSK. No other warranty, expressed or implied, is made as to the professional advice included in this report.

Where any data supplied by the client or from other sources have been used, it has been assumed that the information is correct. No responsibility can be accepted by RSK for inaccuracies in the data supplied by any other party. The conclusions and recommendations in this report are based on the assumption that all relevant information has been supplied by those bodies from whom it was requested.

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Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

This work has been undertaken in accordance with the quality management system of RSK Environment Ltd.

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1 INTRODUCTION

1.1 Commissioning

RSK Environment Limited (RSK) was commissioned by EOS Inc Limited (EOS site vendors) and Firethorn Trust (site purchasers and developers) to prepare this ground treatment specification for the Gateway 36 Phase 3 development site, near Barnsley. The project was carried out to an agreed brief as set out in RSK's proposal 325389TI02(00) dated 30 July 2021.

This report is subject to the RSK service constraints agreed within the appointment between EOS and RSK.

1.2 Objectives

This document (or any subsequent revision) provides detail on the ground treatment requirements for the Phase 3 building development platform.

This document forms part of the contract documents for the ground works, which will include a ground treatment specification for the Phase 3 development platform (this document). The ground works and subsequent building works will be designed and undertaken by the developer.

1.3 Definition of roles

EOS Inc Limited and Firethorn Trust are the Client for the ground treatment works.

Howard Civil Engineering Limited – is the Contractor responsible for the construction of the ground treatment works which will include cut operations and surcharge placement prior to handover of the site. The contractor will be required to place the surcharge mounds detailed in this document.

JPG Group Engineering Consultant – are the engineering consultant appointed by the Client and have produced the surcharge earthworks strategy drawings and an earthworks specification relating to these drawings.

Rex Proctor and Partners – will be the Employer's Agent and Quantity Surveyor for the ground treatment works.

RSK Environment Limited – are the geotechnical and environmental consultants and are responsible for the assessment of the site ground conditions and the production of the performance requirements for the ground treatment works. They will also be responsible for ground treatment design, supervision of ground treatment, and carrying out settlement monitoring and providing validation that all works are in compliance with this specification following completion.

1.4 Proposed development

The centre of the site is located at National Grid reference 435403 401141 and is shown in **Figure 1**. It is understood that the site is being considered for redevelopment for commercial end-use, including a large single warehouse building with supporting offices and external yard areas. The planned layout of the site is shown in **Figure 2**.

1.5 Site history

The site covers an area of approximately 10.5 hectares. It is generally occupied by grass land and woodland, with a public footpath crossing the site from the south west to the north east. An access estate road leading off the Dearne Valley Parkway is currently under construction, and a scheme of ground treatment (surcharging) of the building footprint was started in July 2021.

Historically, the site was subject to deep underground mining (Rockingham Colliery pre-1893 and 1980) and used for opencast coal mining (1991 to 1995), and subsequent backfilling and restoration, which was completed by 2002.

2 SITE INFORMATION

This section lists all Site information that is currently available.

2.1 RSK reports

RSK have completed site investigation and assessment work including borehole and trial pit investigation and a large-scale settlement load test. Details of work completed to date can be found in the latest versions of the reports referenced below:

- 325389-R01 (00) Gateway 36 – Phase 3 Development Summary Geo-environmental Report, April 2021
- 325389-R02 (00) Gateway 36 – Phase 3 Development Non-technical Ground Conditions Summary Report, April 2021
- 325389-R03 (00) Gateway 36 – Phase 3 Development Mineshaft Investigation Factual Report, July 2021

2.2 RSK drawings

The RSK drawings that accompany this specification are:

- 325389-R04 (00) Figure 1 Site location plan
- 325389-R04 (00) Figure 2 Proposed development layout
- 325389-R04 (00) Figure 3 Schematic of two-stage surcharge treatment
- 325389-R04 (00) Figure 4 Settlement monitoring infrastructure

2.3 JPG reports

The JPG documents that accompany this specification are:

- 4652-2-JPG-XX-XX-SP-G-0402-S1-P03-Phase_3_Earthworks_Specification

2.4 JPG drawings

The JPG drawings that accompany this specification are:

- 4652-2-JPG-P3-ZZ-DR-C-1202-S2-P03-Earthworks_Strategy_Stage_01
- 4652-2-JPG-P3-ZZ-DR-C-1203-S2-P03-Earthworks_Strategy_Stage_02

The JPG report and drawings are presented in **Appendix A**.

3 GROUND TREATMENT WORKS

Ground improvement works are required to improve the engineering properties of the opencast backfill and in particular the near surface materials in order that the performance requirements for the proposed development can be met.

The design for the ground treatment works are set out below and surcharge treatment shall be carried out in accordance with this specification.

3.1 Geotechnical modelling

In order to determine the potential ground settlement under the assumed design loads, the settlement data from the large scale load test completed in the Phase 3 site, has been back analysed to produce characteristic stiffness values for the non-engineered made ground. These have then been verified against the in-situ SPT results from site investigation works.

The resultant stiffness values have then been used to model the structural loads on pad foundations and ground bearing slab based on assumed foundation loads of 100kN/m^2**,** on pad foundations of nominal 1m dimensions and a ground bearing floor slab load of 50kN/m^2.

Details of this assessment is provided in **Appendix B**.

3.1.1 Load induced settlement

The previously reported large scale load test has confirmed that the opencast backfill is susceptible to significant settlement when loaded.

The proposed development will impose additional loading from (1) placement of engineered fill in part of the northern building to provide level development platforms, and (2) construction of the new building.

In order to assess the settlement which can be expected from these loads RSK have undertaken settlement modelling. This included back analysing the settlement data from the reported large scale load test and using SPT profile data from the drilling records at the site to form a ground model including a stiffness depth profile. This model was then modified to add surface loads and additional surface layers to mimic the proposed development loads and for these scenarios the induced settlement was calculated from computer modelling. This was carried out using the OASYS PDISP 20.0.0.2 software package. Full details of this modelling work is provided in **Appendix B**.

Based on the results of the large-scale loading test and the settlement modelling presented in **Appendix B**, significant settlements can be expected to be induced from future loading from the structural loads of the new buildings. In order to permit development, the anticipated settlements will have to be induced in advance of construction by ground treatment. This can only be practically achieved by placement of surcharge materials to effectively pre-load the development areas and induce settlements which are of a similar magnitude to those expected from the building loads and ensure that any residual settlements are of a tolerably low order and achieve the performance requirements set out below.

3.2 Performance requirements beneath building footprints

The performance requirements for the finished surface upon completion of the ground treatment works includes:

- allowable ground bearing pressure: 100kN/m^2 beneath building foundation
- anticipated floor slab load for settlement calculation purposes: Imposed Load up to 50kN/m^2. The imposed load will vary over time and across the footprint of the building depending on the amount of goods being stored within the building
- maximum Residual Ground Movement: 25mm
- maximum Differential Movement: 1 in 500.

3.3 Ground treatment required

The requirements for ground treatment by surcharging are detailed below. The following works will be carried out:

3.3.1 Vegetation clearance

In accordance with the JPG Earthworks Specification presented in **Appendix A**.

3.3.2 Surface strip

Strip of 'topsoil' and any organic subsoil in accordance with JPG Earthworks Specification presented in **Appendix A**.

3.3.3 Install monitoring infrastructure

The performance of the ground treatment works will be recorded by RSK using settlement monitoring equipment installed in advance of placing surcharge materials. Following vegetation removal and topsoil strip, the Contractor will install the required monitoring infrastructure as shown on **Figure 4**. The installation of settlement monitoring infrastructure will be supervised by RSK, and all monitoring will be undertaken by RSK.

The Contractor will allow safe access to RSK and any third-party staff to undertake monitoring and supervise installation, which may require the Contractor to cease working in particular areas during monitoring visits.

3.3.3.1 Hydrostatic profile gauge monitoring loops

The Contractor is required to provide plant and materials to install monitoring tubing in a number of shallow excavations and to subsequently protect monitoring infrastructure which is outlined below:

- excavation of a series of trenches each approximately 100m in length, 0.5m deep and 0.45m wide, for the installation of pipework outlined below. Indicative locations are provided on **Figure 4**. Access for monitoring will be required to the end positions of each loop and these areas should be made (by the Contractor) free draining and safely accessible
- the contractor shall provide pipework (MDPE water pipe, 50mm ID, such as Wavin MDPE Pipe Blue 50mm x 100m or similar, any joints internally flush coupled) and a

suitable pipe bedding material to sufficiently bed and protect the pipe as the trench is backfilled also ensuring that excess surface water ingress is prevented. The pipework installed in each backfilled excavation will form a settlement monitoring loop for subsequent monitoring

- the Contractor shall survey the top of the installed pipe and provide this to RSK.

3.3.3.2 Permanent ground markers

In advance of placement of any surcharge materials, the Contractor will install surface mounted ground anchors (permanent ground markers (PGMs)). These should be installed at a slightly reduced level in shallow hand dug pits and their precise elevation and co-ordinates recorded prior to covering with coloured sand (or similar to facilitate subsequent inspection and monitoring on removal of surcharge). The indicative number and positions of PGMs are presented on **Figure 4**.

The PGMs need to be robust as they will have to withstand the construction process required to place and subsequently remove the surcharge before completion monitoring can be carried out. The Contractor will agree with RSK practical positions for the PGMs and the measures necessary to protect them during the early stages of surcharge placement.

RSK will undertake precise levelling of the installed PGMs prior to protection with sand and commencement of the surcharging. The Contractor will allow safe access to RSK and any third-party staff to undertake monitoring and supervise installation, which may require the Contractor to cease working in particular areas during monitoring visits.

The contractor will install monitoring infrastructure under supervision from RSK as shown in **Figure 4**.

3.3.4 Materials for use as surcharge

Materials to be used as surcharge treatment can include the ‘topsoil’ and any subsoil material stripped from the Phase 3 site as well as the underlying opencast backfill materials. The opencast backfill materials will be subsequently used by the developer as engineered fill to create the final development landform.

As different materials are required to be used, they should be segregated. This includes segregation of ‘topsoil’ as well as opencast backfill in order to preserve both material types for future re-use. Where ‘topsoil’ is used within the same surcharge mound as other materials the ‘topsoil’ will need to be recorded and surveyed to facilitate separation when the surcharge is moved.

It is understood that the finished floor level for the development platform level beneath the new building is 127.4m AOD and given that existing ground levels are between 125m and 133m AOD, a significant volume of material required to form both stages of the surcharge treatment is already in situ.

The materials available on Phase 3 for use as surcharge include the existing former load test stockpile and materials which will be generated from a surface scrape of existing topsoil, proposed pond and car park area. Limited over-dig within the building footprint may also be required.

Available volumes for surcharge material are provided with JPG earthworks strategy drawings in **Appendix A**. The volume of material available for the works will require that the surcharging is carried out in two stages; initially over approximately half the building area to the west (stage or Mound 1) and then over the eastern area (stage or Mound 2).

3.3.5 Handling of materials for use as surcharge

Materials are to be handled in such a way that materials remain segregated and are suitable for future re-use either as engineered fill or landscaping purposes.

3.3.6 Surcharging methodology

As the existing load test stockpile and most of the in-situ materials are located over the western half of the building this should be the first loaded area before moving the surcharge treatment to the eastern half. These areas are indicated as Mound 1 and Mound 2 on **Figure 3**. The top of the surcharge mound would need to extend over the building footprint plus a perimeter area of 5m. As the opencast backfill material required to form the mound(s) will have to be used as engineered fill for the final development platform (at a later time by others) it is VERY important that, at all times, this material is segregated from the topsoil strip materials.

On the basis of the surcharge treatment being carried out in two stages (as Mound 1 and Mound 2 in **Figure 3**), the following sequence of works is anticipated:

- installation of monitoring equipment in western area (NB only limited installation and monitoring will be possible. Contractor to work with RSK to facilitate installation)
- preliminary earthworks in the Mound 1 treatment area should be carried out to segregate topsoil materials and the stockpiled materials (opencast backfill) – NB this is required to maximise re-use on completion
- site-wide strip of vegetation and generation of topsoil materials for surcharging
- placement of topsoil material in the Mound 1 treatment area to achieve accelerated surcharge mound level with segregation of materials
- excavation of opencast backfill materials over the surrounding areas including the Mound 2 treatment area, pond area and eastern borrow pit (if required) to be brought to the Mound 1 treatment area and placed to achieve accelerated surcharge mound level over the remainder of the Mound 1 treatment area (materials to be segregated)
- on completion of surcharge placement works for Mound 1, all necessary monitoring will be completed before the treatment is deemed successful (at this stage it is anticipated that Mound 1 will be in situ for only a few months post-completion, but longer-term monitoring might be recommended to demonstrate sufficient settlement has been induced)
- during the monitoring period for Mound 1 the Contractor will assist RSK to install more extensive settlement monitoring instrumentation across the Mound 2 treatment area.
- once the treatment of the Mound 1 area is approved then the materials from this area will be moved to the eastern Mound 2 treatment area. Again, topsoil and opencast backfill materials will be segregated and placed in separate areas

- during construction of the Mound 2 treatment area, monitoring will be carried out to confirm the effectiveness of the works and to measure induced settlement
- on completion of surcharge placement works for Mound 2, all necessary monitoring will be completed before approval for removal (at this stage it is anticipated that Mound 2 will be in-situ for only a few months post-completion, but longer-term monitoring might be recommended to demonstrate sufficient settlement has been induced)
- after approval of the treatment all materials can be removed from the Mound 2 treatment area and used as part of the site-wide earthworks.

3.4 Surface water inundation tests

As part of the agreed scope under the Phase 2 and 3 Contract, a surface water inundation test will be constructed and inundated by HCE prior to Mound 2 being constructed. RSK will undertake the installation and precise levelling of the PGMs.

4 SETTLEMENT MONITORING AND TESTING REQUIREMENTS

The performance of the ground treatment works will be recorded by RSK using settlement monitoring equipment installed by the Contractor under supervision in advance of placing surcharge materials.

4.1 Settlement monitoring

RSK will undertake weekly settlement monitoring of the HPG loops during surcharge construction. Weekly monitoring shall continue until the required settlement has been induced and approval is given by RSK that ground treatment has induced adequate settlement.

Monitoring of the HPG loops will also be carried out during the unloading stage for both Mound 1 and Mound 2.

Following removal of the Stage 1 surcharge (and at a later time for Mound 2), the Contractor shall give sufficient and timely notice to RSK so that the buried PGMs can be precise levelled once these are exposed.

4.2 Testing requirements

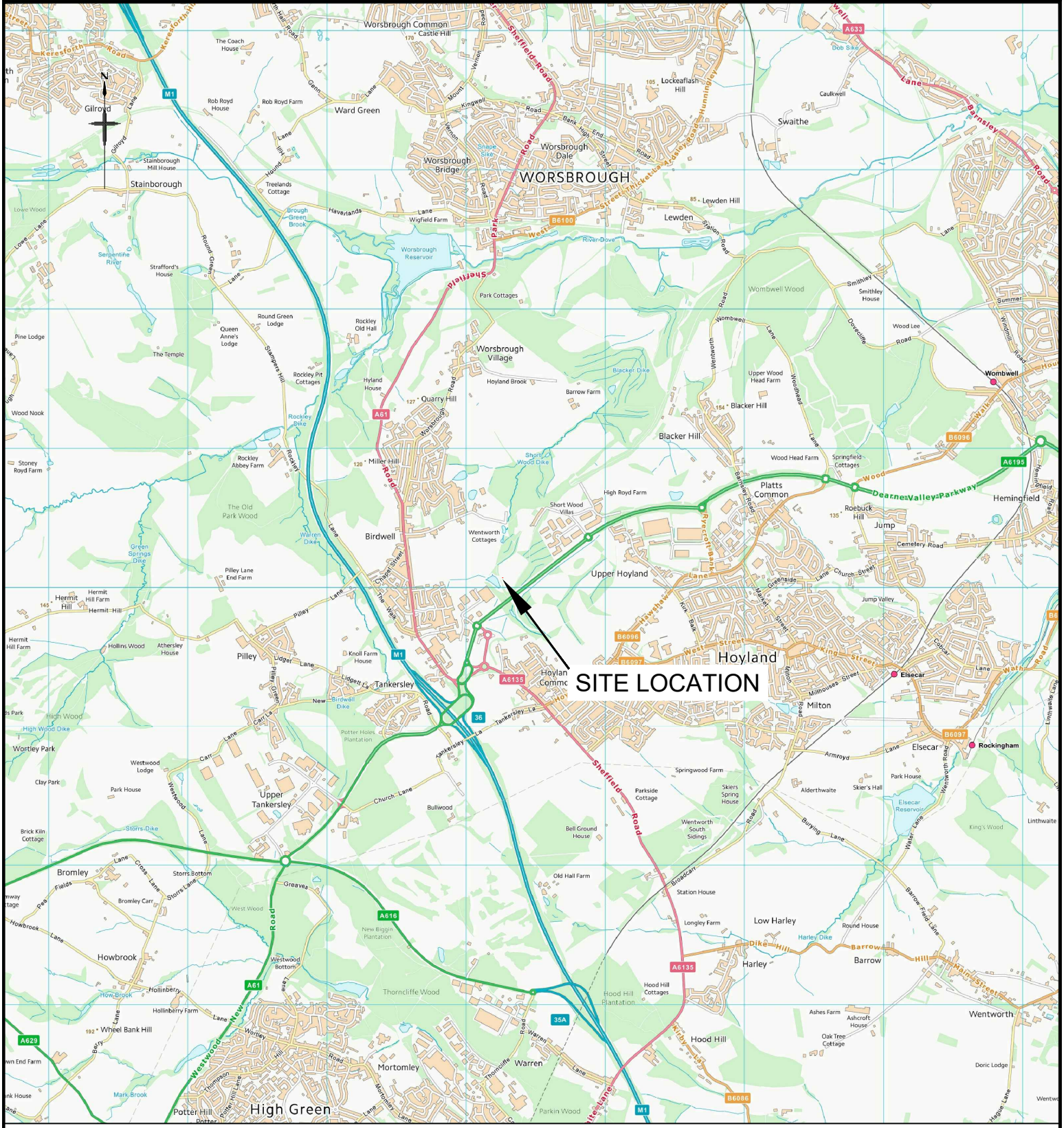
The Contractor will be required to carry out bulk sampling and testing of placed surcharge materials. These results will be made available to the plot developer as a record of the material classification and chemical status of the surcharge materials upon completion of ground treatment. The testing requirements and frequency are detailed in **Appendix C**.

5 REPORTING REQUIREMENTS

RSK will provide a ground treatment validation report following completion of the final stage of ground treatment (Mound 2) and subsequent monitoring.

The Contractor is to provide all testing and surveying data and as-built drawings of each completed surcharge mound, and reduced levels where this has taken place. Drawings shall be supplied in CAD and pdf format.

FIGURES



Contains Ordnance Survey data © Crown copyright and database right 2013

RSK GEOSCIENCES

Spring Lodge
172 Chester Road
Helsby
Cheshire
WA6 0AR

Tel: +44 1928 726006
Fax: +44 1928 725633
Web: www.rsk.co.uk

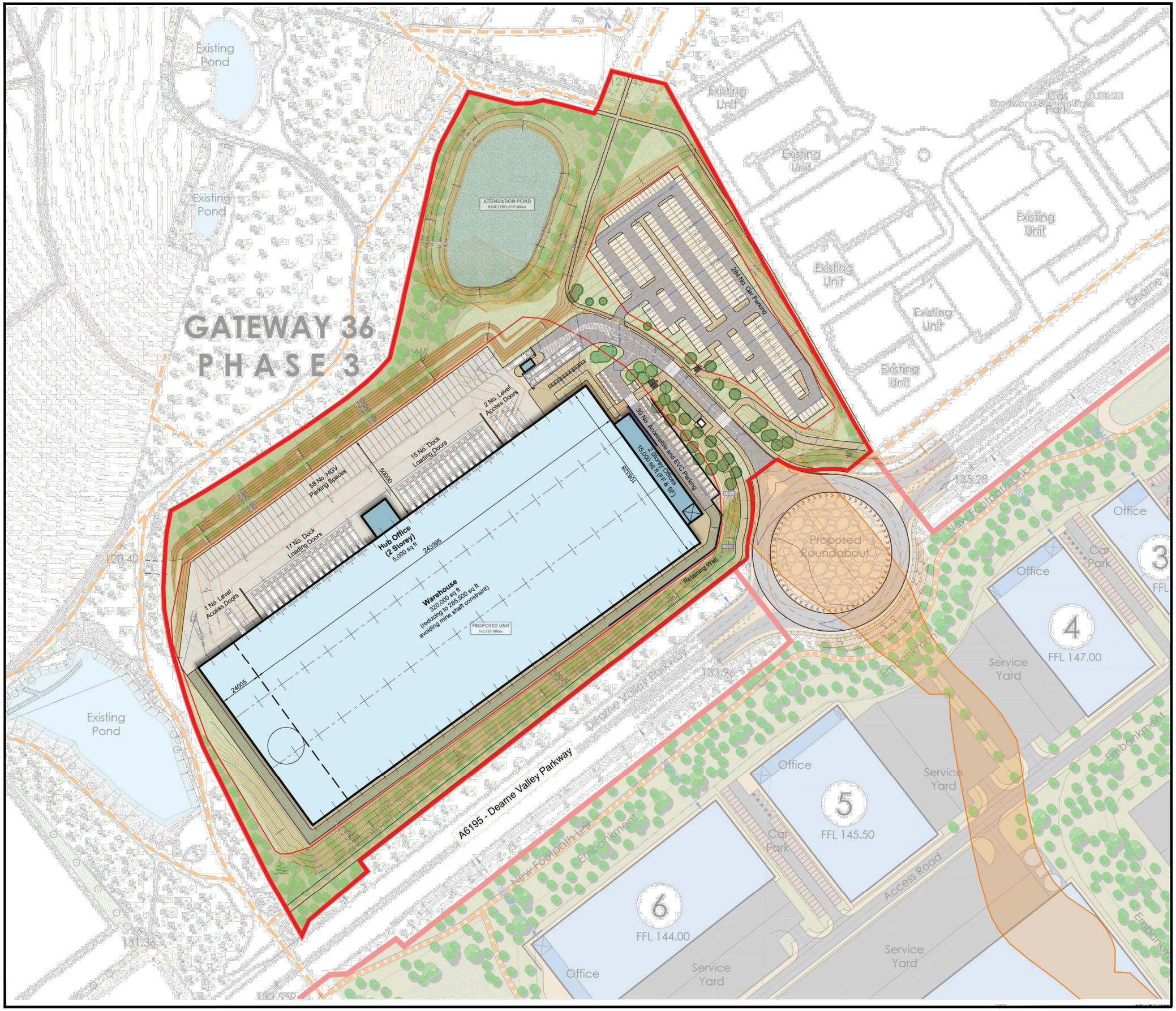
Client: EOS INC LIMITED

Project Title: GATEWAY 36 DEVELOPMENT SITE - PHASE 3

Drawing Title: SITE LOCATION PLAN

Drawn	Date	Checked	Date	Approved	Date	Project No.	Drawing File
HD	27.07.21	SR	27.07.21	SR	27.07.21	325389	325389-R04(00)D001A

Scale	Orig Size	Dimensions	Drawing No.	Rev.
NTS	A4	—	FIGURE 1	A



LEGEND:

Site boundary

N

NOTE:
Proposed layout '21049_F0004[C]_Site Layout - Option 3 Revision E, dated 27.01.2021

REV	DATE	DESCRIPTION	BY	CHD.	APR.
A	27.07.21	FIRST ISSUE	HD	SR	SR

Dimensions	Projection	Scale	Orig Size
m		1:2,000	A3

RSK GEOSCIENCES
Spring Lodge
172 Chester Road
Helsby
Cheshire
WA6 0AR
Tel: +44 1928 726006
Fax: +44 1928 725633
Web: www.rsk.co.uk

CLIENT: EOS INC LIMITED

PROJECT: GATEWAY 36 DEVELOPMENT SITE - PHASE 3

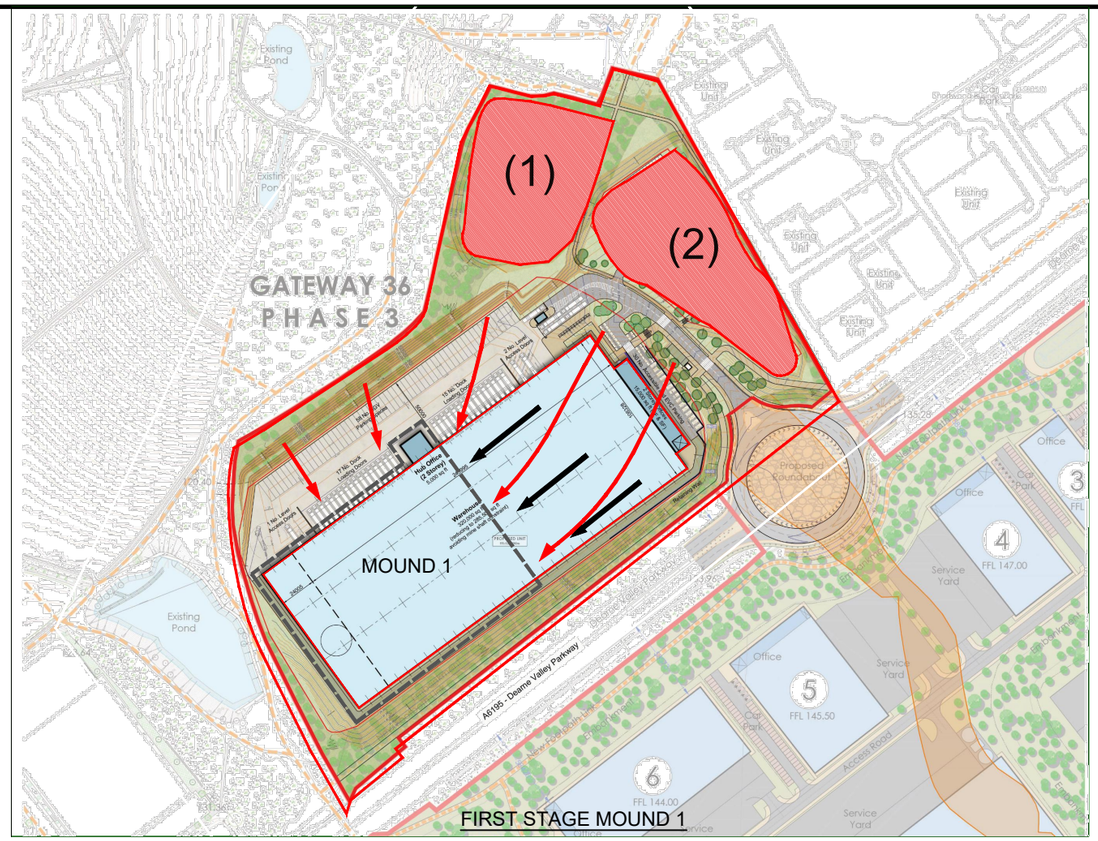
TITLE: PROPOSED DEVELOPMENT LAYOUT

JOB No.:	DRAWING FILE:
325389	325389-R04(00)D002A

BY:	DATE:	CONTRACT NO.		REV:
HD	27.07.21		FIGURE 2	A

Scale 1 : 2,000

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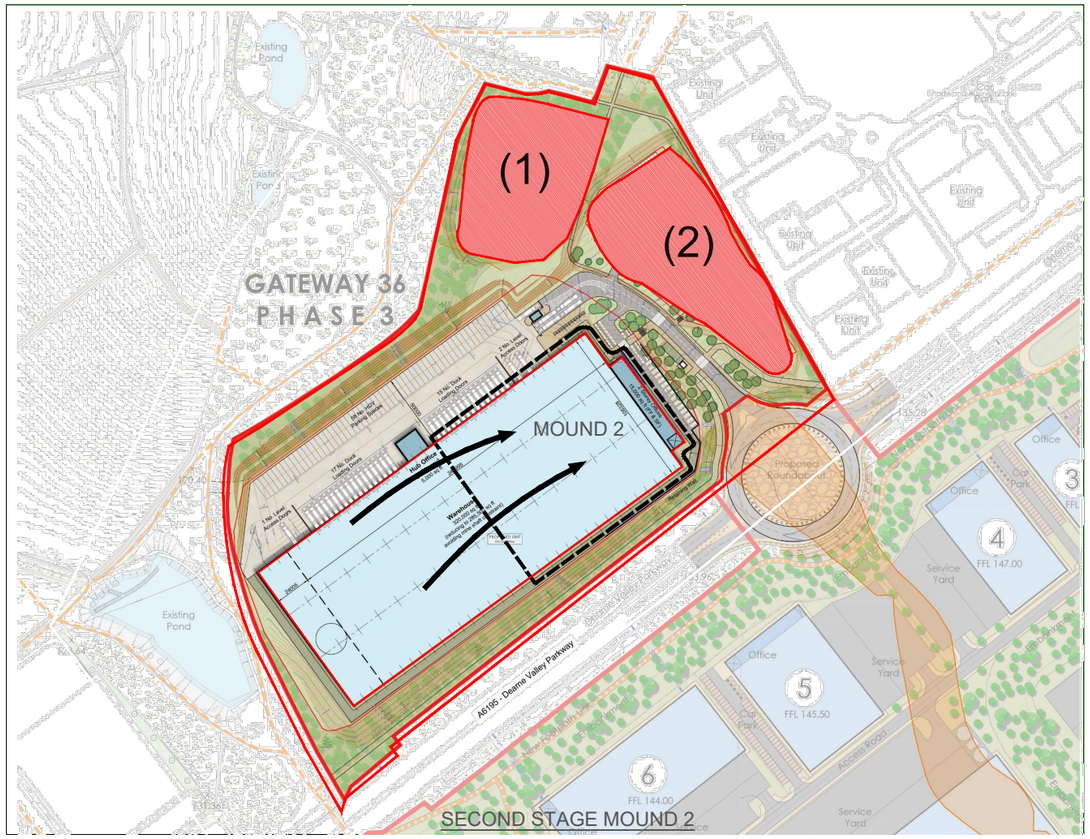
FIRST STAGE MOUND 1

KEY:

Topsoil strip (from full Phase 3 area)

Opencast backfill (from the area where it is to be cut)

NOTE:
Material from the topsoil strip and from the opencast backfill, including load test mound, to be SEGREGATED to permit future re-use)



SECOND STAGE MOUND 2

KEY:

Movement of materials from Mound 1 to Mound 2 (to include the segregated topsoil strip and opencast backfill materials (but also including the underlying opencast backfill where it is to be cut)

NOTE:
Materials to be be SEGREGATED to permit future re-use

LEGEND:

Site boundary

Outline of the top of the surcharge area (for Mound 1 and subsequently Mound 2

(1) Surcharge materials from proposed pond area

(2) Surcharge material from potential borrow - pit (if required)

N

NOTE:
Proposed layout '21049_F0004[C]_Site Layout - Option 3 Revision E, dated 27.01.2021

REV	DATE	DESCRIPTION	BY	CHD.	APR.
A	27.07.21	FIRST ISSUE	HD	SR	SR

Dimensions	Projection	Scale	Orig Size
m		See scale bar	A3

RSK GEOSCIENCES
Spring Lodge
172 Chester Road
Helsby
Cheshire
WA6 0AR
Tel: +44 1928 726006
Fax: +44 1928 725633
Web: www.rsk.co.uk

CLIENT: EOS INC LIMITED

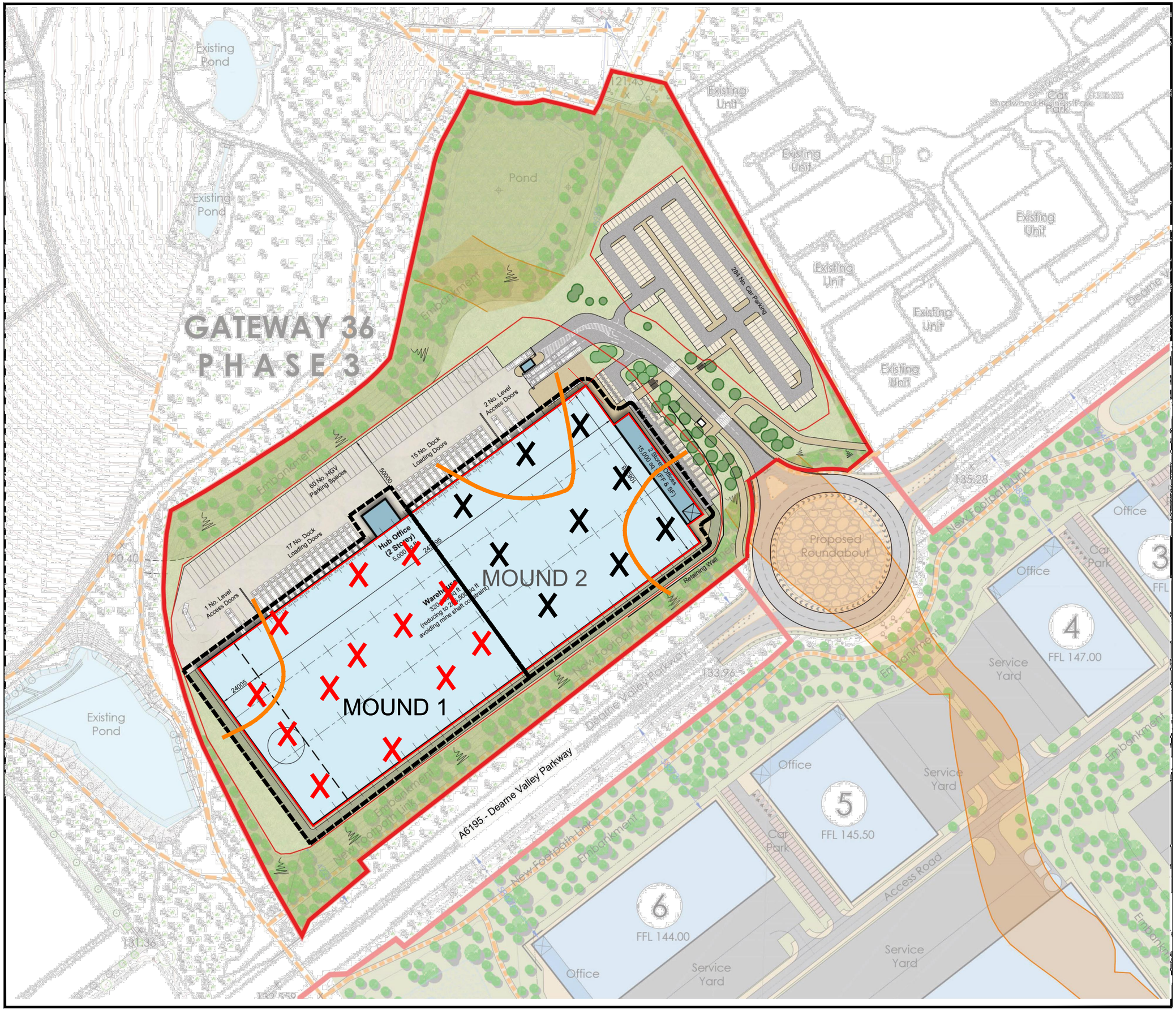
PROJECT: GATEWAY 36 DEVELOPMENT SITE - PHASE 3

TITLE: SCHEMATIC OF TWO-STAGE SURCHARGE TREATMENT

JOB No.:	DRAWING FILE:
325389	325389-R04(00)D003A

BY:	DATE:	CONTRACT NO.		REV:
HD	27.07.21		FIGURE 3	A

Scale bar
0 40 80 120 160 200m



LEGEND:

- Site boundary
- Outline of the top of the surcharge area (for Mound 1 and subsequently Mound 2)
- X — Surcharge Stage 1 ground markers, indicative position at sub-current ground level and moved locally according to ground conditions
- X — Surcharge Stage 2 ground markers, indicative position at approximate cut formation level
- HPG monitoring loop and headworks installed by HCE. RSK to monitor

NOTES:

- Ends of HPG trench to extend at least 3m beyond the toe of the proposed surcharge mound to facilitate access (provided and installed by Contractor)
- Trench to be a minimum 0.5m deep, with pipe bedding at base (provided and installed by Contractor)
- Base of the trench to rise at a gentle gradient towards the ends to enable the settlement probe to traverse the access pipe
- Base of trench to be surveyed by HCE
- Trench to be filled with pipe bedding (provided and installed by Contractor)
- Measures should be taken by the Contractor to protect the monitoring loop from plant movement to prevent the pipe from being crushed
- Headworks to be installed comprising 2m x 2m pad with shuttering and gravel to form a flat and stable monitoring platform with a ground marker datum installed (provided and installed by Contractor)
- Installation to be supervised by RSK

NOTE:
Proposed layout '21049_F0004[C]_Site Layout - Option 3 Revision E, dated 27.01.2021

REV	DATE	DESCRIPTION	BY	CHD.	APR.
A	27.07.21	FIRST ISSUE	HD	SR	SR

Dimensions	Projection	Scale	Orig Size
m		1:2,000	A3

RSK GEOSCIENCES
Spring Lodge
172 Chester Road
Helsby
Cheshire
WA6 0AR
Tel: +44 1928 726006
Fax: +44 1928 725633
Web: www.rsk.co.uk

CLIENT: EOS INC LIMITED

PROJECT: GATEWAY 36 DEVELOPMENT SITE - PHASE 3

TITLE: SETTLEMENT MONITORING INFRASTRUCTURE

JOB No.:	DRAWING FILE:
325389	325389-R04(00)D004A

BY:	DATE:	CONTRACT NO.		REV:
HD	27.07.21		FIGURE 4	A

Scale 1 : 2,000
0 20 40 60 80 100m

APPENDIX A
JPG REPORTS AND DRAWINGS

SITE SPECIFICATION – EARTHWORKS
CONSTRUCTION OF SURCHARGE MOUNDS

Phase 3
Rockingham

Reference	**4652-2-JPG-XX-XX-SP-G-0402-S4-P03**
Date	**May 2020**
Author	**P03**

5 John Charles Way
LEEDS
LS12 6QA

Tel: 0113 263 1155
admin@jpg.group
www.jpg.group



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APPENDICES

Appendix A Figures & Plans

JPG. Rockingham Phases 2 and 3. Location Plan. 4652-2-JPG-SW-00-DR-D-1450-S2-P01. Dated December 2019.

JPG. Rockingham Phase 3, Hoyland. Earthworks Strategy Stage 01. Drawing ref. 4652-2-JPG-P3-ZZ-DR-Z-1202 S2 P01, dated 14/07/2021.

JPG. Rockingham Phase 3, Hoyland. Earthworks Strategy Stage 02. Drawing ref. 4652-2-JPG-P3-ZZ-DR-C-1203 S2 P01, dated 14/07/2021.

UMC Architects. Dearne Valley Parkway, Barnsley. Site layout – Option 3. Drawing No. 20149 F0004 Rev C, dated 27/01/2021.

CONFIDENTIALITY STATEMENT

This report is addressed to and may be relied upon by the following:

Harworth Group
Advantage House
Poplar Way
ROTHERHAM
S60 5TR

This report has been prepared for the sole use and reliance of the above named parties. This report shall not be relied upon or transferred to any other parties without the express written authorisation of JPG (Leeds) Limited. No responsibility will be accepted where this report is used, either in its entirety or in part, by any other party.

DOCUMENT HISTORY

Rev	Date	Revision Details	Status	Author(s)	Approved
P01	15/04/2020	First Issue	Final	JBW	RJM
P02	18/05/2020	Second Issue	Final	JBW	OLT
P03	28/07/2021	Third Issue	Final	JBW	RJM

1.0 INTRODUCTION

JPG (Leeds) Limited has been instructed by the Harworth Group to prepare an earthworks specification for the construction of the surcharge mounds which are required as part of the site preparation works for a proposed commercial development on land immediately to the north of Dearne Valley Parkway (Phase 3).

This earthworks specification relates to the compaction of materials on site in order to create the surcharge mounds. It does not address other geotechnical / geoenvironmental constraints, including self-weight settlement of opencast backfill and potential issues relating to coal mining legacy. It is understood that a methodology and design for surcharging of the deep made ground to reduce future settlement is to be specified by RSK Environmental Limited (RSK).

1.1 Location

The site is located approximately 1km to the north east of Junction 36 of the M1 motorway, on the northern side of the Dearne Valley Parkway (A6195). The approximate centre of the site is located at NGR E435425, N401190.

1.2 Site Description and Topography

Phase 3 Development Area
The site is located to the north of Dearne Valley Parkway and is an irregular shape covering an area of approximately 9.72ha.

The site comprises restored former opencast working and currently is a mixture of fields interspersed with woodland areas.

The site is bounded by Dearne Valley Parkway to the south, open agricultural land to the north, an existing business park to the east and to the west is a watercourse/ditch, pond and further over an existing business park.

The site generally falls from south to north in the order of 21.0m.

A Site Location Plan is included in Appendix A.

1.3 Proposed Enabling Works

It is proposed to prepare the site for a future commercial development. A drawing showing the proposed development has been provided, which is referenced below, and a copy is provided in Appendix A.

- UMC Architects. Dearne Valley Parkway, Barnsley. Site layout – Option 3. Drawing No. 20149, F0004, Rev C, dated 27/01/2021.

In order to develop the site, it will be necessary to carry out surcharging (pre-loading) to limit future settlement including self-weight settlement of opencast backfill.

The design of the surcharging, which includes the specification for the extent and dimensions of the surcharge mounds, is to be provided by RSK.

This Specification details the methodology to be adopted in order to create the surcharge mounds.

The surcharging is proposed to be carried out in stages. Earthworks strategy drawings showing the proposed works for stage 01 and stage 02 are referenced below and provided in Appendix A.

- JPG. Rockingham Phase 3, Hoyland. Earthworks Strategy Stage 01. Drawing ref. 4652-2-JPG-P3-ZZ-DR-Z-1202 S2 P01, dated 14/07/2021.
- JPG. Rockingham Phase 3, Hoyland. Earthworks Strategy Stage 02. Drawing ref. 4652-2-JPG-P3-ZZ-DR-C-1203 S2 P01, dated 14/07/2021.

1.4 Previous Reports

A combined desk study and coal mining risk assessment report for the site has been prepared by RSK. This report is referenced below and should be read in conjunction with this specification.

- RSK. J36 Phase 2A, Phase 2B and Phase 3, Rockingham. Preliminary Risk Assessment and Coal Mining Risk Assessment. Report No. 322638-R01(01). Dated December 2019. For Harworth Estates Investments Limited.

RSK subsequently prepared a separate Phase 2 geoenvironmental and geotechnical site investigation report for both the Phase 2 and Phase 3 development areas. This report is referenced below and should be read in conjunction with this specification.

- RSK. J36 Phase 2A, Phase 2 and Phase 3 Rockingham. Phase 2 Geo-environmental and Geotechnical Site Investigation. Report No. 322368-R02. Dated March 2020. For Harworth Estates Investments Limited.

Pertinent information included in the aforementioned report is summarised below.

- Two maximum dry density (MDD) / moisture content relationship tests (Test 1 and Test 2) indicate that the colliery spoil is too wet to achieve sufficient compaction, i.e. >95% MDD and <5% air voids (heavy compaction – 4.5kg rammer).
- However, other samples (BH206 & TP211, TP303 & TP304 and TP401) indicate that the materials are suitable to be compacted and can achieve >95% MDD and <5% air voids.
- The made ground is thus deemed variable and some may require improvement in order to achieve sufficient compaction.
- The opencast backfill may contain significant quantities of oversized materials (cobbles and boulders) which will require processing (i.e. breaking up) if they are to be incorporated into the earthworks.

- The opencast backfill is susceptible to significant load-induced settlement – ground treatment by surcharging is required. To the west of the Elsecar Fault, further monitoring is required. Additional (treatment) surcharging may be required in this area dependent on the results.
- No shallow worked coal seams have been encountered other than those encountered during the opencast workings.
- Two mineshafts may require treatment. These mineshafts are located within the Phase 3 development area. One mineshaft (Coal Authority ref. 435401-003) has been located. It has been capped but below the cap, the shaft is voided. The other mineshaft has yet to be located.
- Buildings should not straddle the opencast highwalls, in particular the Elsecar Fault. The report states: 'it is recommended that the location of Unit 3 and Unit 4 in Phase 2 are switched in order to avoid the now better-defined constraint of the former opencast pits highwall / fault.'
- Buried concrete has been assessed as ACEC AC-2s / DS-2.
- Based on four ground gas monitoring visits, the sites have been assessed as Characteristic Situation (CS) 2, as defined by BS8485. Further ground gas monitoring is required to confirm the CS. On completion of monitoring the wells will require grouting or full removal to prevent them from acting as preferential pathways.
- A further six months of settlement monitoring is recommended.

RSK have provided a ground treatment specification report which details the proposed methodology for carrying out the surcharging works. This report is referenced below and should be read in conjunction with this specification.

- RSK. J36 Phase 2A, Phase 2 and Phase 3 Rockingham. Phase 3 Ground Treatment Specification. Report Ref. 325389-R04(00). Dated July 2021. For Harworth Estates Investments Limited.

2.0 GENERAL

The Engineer referred to in this specification shall mean the Consulting Geoenvironmental / Geotechnical Engineer.

The expressions approved and approval shall mean the written approval of the Engineer.

All British standards, specifications and British Standard Codes of Practice or any other standards referred to in this specification shall be the latest standards including all amendments published before the last day of returning tenders, unless otherwise stated.

The works described in this specification shall be carried out to the entire satisfaction of the Engineer.

3.0 STANDARD ACCEPTANCE

The earthworks shall be carried out in accordance with the Engineer's drawings and the Manual of Contract Documents for Highways Works, Volume 1 Specification for Highway Works, Series 600 Earthworks (hereinafter referred to as the HA Specification for Highway Works).

Except where otherwise specified, work shall be in accordance with the British Standards and other references referred to in the HA Specification for Highway Works. The latest editions shall be used, including all current amendments and additions.

4.0 SITE INFORMATION

Ground Conditions
The Contractor shall visit the site, inspect the subsoil information and ascertain for himself the nature of the ground, obtain all necessary information in respect of overhead and underground services, obstructions, site access, position of adjacent properties and any other features that may affect the cost or programme of the work. No claim shall be considered arising from lack of knowledge in this respect.

It is the responsibility of the Contractor to satisfy himself as to the suitability of his equipment and methods based on the recorded soil and ground conditions existing on the site. Information on soil and ground conditions is provided in the RSK Phase 2 Geo-environmental and Geotechnical Site Investigation report, which is referenced in Section 1.4 of this specification.

Should the Contractor feel that he requires additional information in order to finalise his design, he is at liberty to carry out further site investigation work at his own expense. The Engineer shall however be notified of this requirement so that any necessary permissions may be obtained, and the Engineer shall also be given the opportunity of attending the site during this additional investigation.

Ground Water Levels
The Contractor shall make all necessary enquiries concerning ground water level and allow for variations from this level when working on any part of the site.

Site Features
Before starting work the Contractor shall verify with the Engineer and/or Architect which existing fences, gates, walls, roads, paved areas and other site features are to be removed. Materials arising shall be removed from site subject to approval by the Engineer and/or Architect.

Trees and Undergrowth
Before starting work the Contractor shall verify with the Engineer and/or Architect those trees, shrubs and hedges that are to be removed.

As required, the Contractor shall clear the site of all trees, bushes, scrub and undergrowth. The Contractor shall grub up main roots and fill voids with suitable material. The Contractor shall dispose of all vegetation, roots, etc.

Schedule of Dilapidations
Prior to commencement on site the Contractor shall prepare and agree a Schedule of Dilapidations supported by photographs of all existing buildings, roads, footpaths, walls, fences, etc., adjacent to the site with the Engineer, the Architect and statutory authorities. The Contractor shall include for all costs in respect of this schedule and allow for providing two additional copies of all written information together with the photographs for the exclusive use of the employer.

Existing Levels

The Contractor shall satisfy himself that the existing levels of the ground shown on the drawings are correct and bring to the notice of the Engineer any discrepancies before any excavation is commenced. The drawings shall be deemed to be correct if no such notice is given to the Engineer.

Consideration will need to be given to a reduction in the volume of materials as a result of surcharging to avoid any shortfall of materials.

5.0 DEFINITION OF MATERIALS

Suitable Materials
Suitable materials shall comprise all that which is acceptable for the contract.

Unsuitable Materials
A summary of unsuitable materials is provided below:

- Material from swamps, marshes, etc., all organic or part organic material including topsoil.
- Material susceptible to spontaneous combustion.
- Frozen materials - Such material may be re-defined as suitable when thawing has occurred at the discretion of the Engineer.
- Clay if the liquid limit exceeds 80% and/or the plasticity index exceeds 55%.
- Materials having a moisture content greater than the maximum permitted for such materials as defined by the Engineer. The Engineer may redefine such materials when sufficient drying has occurred.
- Oversized materials, including cobbles and boulders, which will require breaking down if they are to be incorporated into the earthworks.

Topsoil
Topsoil shall be the top layer of soil that can support vegetation and shall include turf.

6.0 METHOD OF WORKING

The Contractor shall employ only that plant which is suitable for the soils to be handled. He shall not use plant that damages or reduces the natural strength of the soil either in its in situ state or during handling, placing and compacting.

Where excavation reveals a combination of suitable and unsuitable materials the Contractor shall, unless otherwise agreed by the Engineer, carry out the excavation in such a manner that the suitable materials are excavated separately for use in the works without contamination by the unsuitable materials.

The Contractor shall not use explosives.

Excavation from a cutting shall not proceed unless sufficient plant is available in the fill area to comply with the compaction requirements.

The gradient of slopes formed by cutting and filling areas shall be defined in the contract and shall be well graded, trimmed and free of loose material.

The Contractor shall be deemed to have included for temporarily supporting as necessary any services, drains or ducts encountered.

Before starting work the Contractor shall submit a detailed methodology containing how the works will be undertaken, phasing of the works and disposal and/or temporary storage of spoil and other arisings from the works.

The Contractor shall be deemed to have allowed for the deterioration of material as a result of inclement weather and the replacement with suitable material as appropriate.

Throughout the works the Contractor shall maintain the whole area of his operations in a clean, tidy and safe condition by arranging his materials in an orderly manner. All rubbish, waste, material, debris etc. shall be systematically cleared from the working areas as it accumulates.

7.0 EXCAVATION

Topsoil
As specified in Section 11, topsoil is to be used for surcharging development areas. This will comprise the moving of topsoil by the contractor to act as surcharge. The volumes to be used in the surcharging are to be specified by RSK.

Earthwork Support
The Contractor shall be entirely responsible for the sufficiency of all temporary earthwork support to excavations. Should a fall occur in any excavation, or excessive material be excavated, the Contractor shall carry out at his own expense any reinstatement or repairs which may become necessary as the result of such fall and excess. Any void caused by a fall shall be filled and compacted by the Contractor at his own expense, to the requirement of the Engineer.

Watercourses
The Contractor shall temporarily divert as necessary all field drains and other watercourses not shown on the drawings and encountered during the excavations, and if possible, reinstate on completion or if it is not possible to reinstate, obtain instructions from the Engineer.

Existing watercourses that have been diverted and are to be filled shall be cleared of all vegetation growth and soft deposits before filling.

Excess Excavation
The Contractor shall backfill any excavations taken wider than required with approved material.

8.0 FORMATIONS

It is the responsibility of the Contractor to satisfy himself as to the suitability of his equipment and methods based on the recorded soil and ground conditions existing on the site. Information on soil and ground conditions is provided in the RSK Phase 2 Geo-environmental and Geotechnical Site Investigation report and the Phase 3 Ground Treatment Specification which are referenced in Section 1.4 of this specification.

The Contractor shall proof roll the resulting formation to give the compactive effort of 4No. passes of a 'Bomag BW6 vibratory roller', or similar approved method.

9.0 FILLING

General
For approval to be given for filling the Contractor shall be required to demonstrate that the material is suitable and that the placing of the material conforms to the compaction requirements of the HA Specification for Highway Works.

The filling shall consist of materials that are selected to be free from deleterious materials. The material shall **NOT** contain the following:

- Materials containing sulphates.
- Materials susceptible to frost damage, weathering or mechanical damage Material in fill areas which has deteriorated due to the ingress of surface water, or the trafficking of the Contractor's plant shall be removed and replaced at the Contractor's expense.

Fill areas shall be built up evenly over the full area, unless the contract requires otherwise, and sufficient camber shall be maintained at all times to enable surface water to drain from them. The containment or disposal of surface water, during the construction period shall be the Contractor's responsibility.

The Contractor shall ensure that excavations and areas to be filled are free from organic material, loose soil, rubbish and standing water.

Plant employed for transporting, laying and compacting shall be suited to the type of material being handled.

The Contractor shall lay differing materials separately so that only one type of material occurs in each layer.

Benching In Fill
Where during the progress of the work the difference in level between adjacent areas of filling exceeds 600mm, the Contractor shall cut into the edge of the higher filling to form benches having a minimum width of 600mm and a height equivalent to the depth of a layer of compacted filling. New filling shall be spread and compacted to ensure maximum continuity with the previous filling.

Cold Weather Working
Frozen material or materials containing ice shall not be used. Fill material shall not be placed on a frozen surface.

Imported Material

It is not anticipated that any materials will require to be imported onto site in order to complete the works.

Sources, types of suitable material and the moisture content at which they may be placed and compacted shall be those approved by the Engineer and agreed at tender stage.

The Contractor shall have delivered to site sample loads of any imported material proposed for use for the approval of the Engineer before any filling material is placed in position. A minimum of 48 hours' notice shall be provided for inspection with a further 24 hours for approval. Grading analyses, aggregate crushing value or 10% fines test and Atterberg limits plus natural moisture content details, as appropriate, shall accompany all samples.

Materials shall be properly protected from snow, frost and inclement weather and any materials damaged shall be removed from the site immediately and replaced with sound materials.

The movement of material across the site will be subject to the requirements of a Materials Management Plan (MMP), which will make reference to a site-specific remedial strategy report or design statement.

Laboratory chemical testing results should be provided to confirm that any materials to be imported comply with the requirements of the MMP and remedial strategy report or design statement.

Topsoil
The topsoil shall be reduced to a fine tilth with no stone or other debris with any dimension greater than two thirds of the thickness of the topsoil layer and not upstanding more than 50mm above the upper surface of the topsoil. Topsoil should be kept separate from and not allowed to 'contaminate' suitable fill materials.

Specification for Compaction - Granular (Class 1A and 1B) and Cohesive (Class 2B and 2C)
Materials should be placed and compacted in accordance with the requirements of the HA Specification for Highway Works.

It is understood that the surcharge mounds will be temporary and on completion of surcharging they will be excavated and will not form part of the final development platform. On this basis it is recommended that both Class 1 and Class 2 materials are compacted in accordance with the method specification as prescribed in the HA Specification for Highway Works.

Any materials placed and compacted as part of the permanent works should be placed and compacted in accordance with an earthworks specification provided by the final design engineers.

General Filling
All cobbles or boulders of a size not compliant with the earthwork's specification shall require to be removed or broken down to an acceptable size.

10.0 SUPERVISION

The Contractor shall ensure that a competent supervisor is on the site during all working hours.

The Contractor shall allow the Engineer access to the works at any reasonable time and shall afford the Engineer reasonable facilities to enable him to check the adequacy of the works.

In the event of ground or other conditions changing such that the Contractor feels that a change in his plant or his method of working is required, he shall give the Engineer 36 hours' notice for approval of the proposed plant and working method.

It is the Contractor's responsibility to ensure that the materials are placed and compacted in accordance with the HA Specification for Highway Works.

11.0 DISPOSAL OF MATERIALS

All materials arising from the excavations and not used on the works shall be disposed of as directed by the Engineer.

Topsoil
The Contractor shall remove surplus topsoil from site, subject to approval by the Engineer.

Surplus and/or Unsuitable Materials
The Contractor shall comply with the requirements of the Environment Protection Act 1990 with particular reference to the duty of care for the disposal of waste.

The Contractor shall provide the Engineer with copies of all necessary licences, approvals, delivery notes and receipts relating to the discharge of the duty of care for the disposal of waste.

The Contractor shall remove all suitable materials surplus to the contract requirements and unsuitable materials to an appropriately licensed landfill unless other provisions are specifically made in the contract, subject to approval by the Engineer.

Water
The permanent drainage system shall not to be used for disposal of water from excavations without approval by the Engineer and the local authority.

The Contractor shall keep all excavations free from water.

The Contractor shall not disturb material in or around excavations by pumping operations.

The Contractor shall obtain approval of the location of any sumps and fill with approved materials when no longer required.

12.0 VALIDATION AND REPORTING

The Contractor will maintain records of the works to include the following:

- Daily record sheets to include a summary of the day's activities.
- Weather conditions.
- Plant, personnel and visitors present.
- Aspects relating to Health and Safety, environmental control or non-compliance with the Specifications or the Contractors Method Statement.
- As built surveys, including final level survey, base of excavation survey, base (where proven) and top of made ground, and as-built drainage survey.

The Engineer (JPG and RSK) shall ensure that the requirements of this strategy are complied with. On satisfactory completion of all of the works, the Engineer will provide an initial report, comprising relevant site records that will act as confirmation that the earthworks have been carried out in accordance with this specification.

The report shall include the following:

- A description of the works undertaken.
- Records of the works.
- Progress photographs.
- Waste transfer notes.
- Any chemical and geotechnical test results.
- As built surveys, including base of excavation and final level survey, base (where proven) and top of made ground as supplied by the Contractor.
- A statement that the works have been undertaken in accordance with the agreed specification.

13.0 GENERAL SITE REQUIREMENTS

13.1 Introduction

The Contractor shall comply at all times with this Strategy, the Conditions of Contract and all relevant health and safety requirements. Site works will be supervised periodically by a GE appointed by the client.

The Contractor shall prepare and submit a programme for the works to the client prior to commencement on site.

Site cabins, stores and welfare facilities shall be established at a convenient location to be agreed between the Contractor and the Client.

Prior to commencement of works, the Contractor shall establish the boundaries of the site and working areas and shall make adequate provision to secure the site boundary and prevent unauthorised access to the site during the course of the works.

If works are anticipated to extend beyond the hours of 08.00 to 17.00 Monday to Friday and 08.00 to 13.00 Saturday, then the site working hours shall be discussed and agreed with the Local Authority prior to commencement. No works shall take place on Sundays or Bank Holidays.

13.2 Adjacent Carriageways and Properties

The Contractor is to undertake a dilapidation survey of site boundaries, adjacent properties and highways prior to starting works on site. Such a survey shall include roads, footpaths, street lighting and road signs. A copy of the survey, including a record of photographs shall be provided to the client within seven days of commencement of site works.

An appropriate traffic management system should be agreed with the Local Authority Highways Section and employed for traffic entering/exiting the site.

13.3 Services

The Client shall be responsible for obtaining all relevant service records for the site and undertake any consultation with the statutory undertakers in relation to identifying the location of live services, including those to any adjacent properties and electrical substations within the site. The Client shall ensure the safe disconnection of all existing services entering the site, except for those which are to remain operational.

Prior to site works commencing, the position and depth of all services shall be determined and clearly identified on site by the contractor. The locations should be confirmed on site by appropriate investigation and observations. The following should be undertaken:

- Copies of a consolidated services location drawing should be retained and displayed in the contractor's office.
- Cable Avoidance Tool (CAT) scanning of areas where works are to be carried out.
- Hand dug holes to expose service location shall be undertaken (where possible).
- Physical marking out on the site of service routes on the ground and appropriate lay-offs/easements using paint, pegging, bunting etc.
- Retaining on the site, drawings showing locations of all services.
- Where services are being re-routed during the works both the drawings and site markings must be kept up to date.
- When works commence on a new area of the site the site manager or relevant foreman must brief all operatives on the location of services in this area.
- Method statements/risk assessments must be read by all relevant personnel and their understanding of them confirmed in writing.
- If coloured sands, service ductwork or services are exposed during operations then work must cease until the site manager has confirmed it is safe to continue.

All manholes to remain should be located and clearly identified on site to prevent damage. The location, overall depth and diameter of each manhole, and the size and depth of all connections, shall be recorded.

Service providers shall be contacted by the contractor to determine any precautions, safe working distances etc. relating to services, both underground and overhead.

13.4 Health and Safety

The earthworks shall be undertaken in accordance with all relevant legislation including, but not limited to:

- The Health and Safety at Work etc. Act, 1974.
- The most current Construction (Design and Management) Regulations.
- Construction (Health Safety and Welfare) Regulations, 1996.
- The Control of Substances Hazardous to Health Regulations, 2002, and
- The Control of Asbestos at Work Regulations, 2012.

Before site operations are commenced the necessary COSHH Assessment, Method Statements and Health and Safety Plans should be completed and issued by the contractor in accordance with the current CDM Regulations.

All site personnel shall undergo a site-specific health and safety induction prior to commencement of work on site.

The contractor shall provide details of emergency procedures. Emergency Services shall be informed of the site operations prior to commencement.

13.5 Mobile Plant

Mobile plant shall be operated by competent personnel for each item of plant. When not in use all plant shall be locked to prevent unauthorised access.

All traffic entering or working on site shall obey a maximum 10mph 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 (August 2011).

Specifically, any fuel storage tanks should:

- Be situated within an oil-tight secondary containment system such as an impermeable bund.
- The secondary containment must provide storage of at least 110% of the tank's maximum capacity.
- Be located within a secured area.
- All taps and valves should be fitted with a lock and be adequately secured when not in use.

Waste oil, hydraulic fluid etc. should not be tipped directly or otherwise discharged onto site. Such materials shall be stored separately, in a secure bunded area, for off-site disposal. Waste oil is a Hazardous Waste, and disposal shall be undertaken by a registered carrier in accordance with the Duty of Care (DoC) Regulations (2006) and the Waste (England and Wales) Regulations (2011).

Contractors shall provide a fuel spill kit, to be kept on site in an accessible place near to the designated refuelling area.

13.6 Dust

Appropriate measures shall be implemented at all times during the earthworks, to minimise any dust emissions.

During all operations, the risk of dust release will be continually assessed, and appropriate mitigation measures will be put in place. This will typically be a bowser with hose attachment to wet down and suppress dust, although other alternative techniques may be considered as necessary.

Any haul roads shall, where practical to do so, be constructed of crushed hardcore products. These haul roads shall be maintained for the duration of their use to minimise any build-up of mud, loose spoil etc. Mobile water bowsers and sprayers shall be made available to dampen unpaved haul roads and working areas. An adequate supply of clean water shall be maintained on site at all times to allow dust suppression activities to be carried out at short notice.

Traffic both entering and working on the site shall obey a maximum speed limit of 10 mph.

Regular inspections of the public highway adjacent to the site entrance shall be carried out by the contractor. If deemed necessary, the highway shall be swept regularly to remove any mud, slurry or dust deposited by vehicles entering or departing the site, and a wheel wash provided for exiting vehicles if required. If the contractor considers that significant amounts of any detritus have been deposited on the public highway then operations shall be temporarily suspended until appropriate cleaning operations have been undertaken.

Any wagons that are to be used for the haulage of potentially contaminated material from the site shall be sheeted to prevent the release of fugitive dust.

13.7 Odour

It is unknown whether the earthworks will give rise to odours. Where this gives rise to nuisance to neighbouring properties, odour control measures should be considered, and an appropriate method statement supplied by the contractor.

Any odorous materials shall be covered at the end of each working day and any stockpiles will be located away from any residential properties. This shall be continually assessed through the programmed works.

13.8 Noise

The requirements of BS 5228:2009 '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 and practicable.

13.9 Surface Waters

A surface watercourse is shown to extend along the southern section of the eastern boundary.

Any surface watercourses should be suitably protected against contamination or spillages.

13.10 General

No fires shall be permitted on site, unless previously agreed with the local authority.

Details of all monitoring will be retained on site by the contractor and made available to the Local Authority Environmental Health Department on request.

Appendix A Figures & Plans

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NOTES

GENERAL NOTES

1. ALL MATERIALS AND WORKMANSHIP IS TO COMPLY WITH JPG CONSULTANTS STANDARD SPECIFICATION & ALL RELEVANT BRITISH & EUROPEAN STANDARDS.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, M & E CONSULTANTS AND JPG CONSULTANTS DRAWINGS.
3. ANY DISCREPANCIES SHOULD BE REPORTED TO THE ENGINEER IMMEDIATELY SO THAT CLARIFICATION CAN BE SOUGHT PRIOR TO COMMENCEMENT OF WORKS.

SITE INFORMATION

SITE ADDRESS
ADDRESS - DEARNE VALLEY PARKWAY
NEAREST POSTCODE - S74 9LH
OS SHEET/TILE - SE354010
OS CO-ORDINATES - E435470, N401042

SITE LOCATION PHASE 2

SITE LOCATION PHASE 3

REV	DESCRIPTION	DATE	BY

Project
ROCKINGHAM PHASES 2 AND 3

Drawing Title
LOCATION PLAN

INFORMATION ISSUE

Architect
THE HARRIS PARTNERSHIP

JPG
www.jpg.group
Leeds London Birmingham 0113 263 1155

JPG Project Ref	Scale at A1	Date	Checked	Drawn
4652-2	1:2500	DEC 2019	JDM	JDM

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NOTES

GENERAL NOTES

1. EXTENTS OF SURCHARGE REQUIREMENT BASED ON UMC ARCHITECT DRAWING NO. '21049-F0004-REVC' AND SHOULD BE IN LINE WITH RSK GROUND TREATMENT SPECIFICATION '325389-R04(00) PHASE 3 GROUND TREATMENT SPECIFICATION'.
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BORROW PIT 01
EXCAVATION TO A LEVEL OF 117.00m AOD
MATERIAL CUT VOLUME: 9775.005 Cu.M.

BORROW PIT 02
EXCAVATION OF 1.00m FROM EXISTING LEVELS.
MATERIAL CUT VOLUME: 9393.197 Cu.M.

FW DIVERSION PREPARATORY EARTHWORKS
MATERIAL CUT: 3491.415 Cu.M.
MATERIAL FILL: 7799.192 Cu.M.
NET SHORTFALL: 4307.777 Cu.M.

EXISTING FOUL DRAINAGE

STAGE 01 CUT
BASE OF CUT TO A LEVEL OF 124.90m AOD (2.00m BELOW UNIT FORMATION LEVEL).
MATERIAL CUT VOLUME: 61298.138 Cu.M.

STAGE 01 SURCHARGE MOUND
CREST OF SURCHARGE EXTENDS 5.00m FROM EDGE OF PROPOSED UNIT AND TO A LEVEL OF 134.40m AOD (7.00m ABOVE FFL).
MATERIAL FILL VOLUME: 82544.313 Cu.M.

Mine Shaft
CA Ref. 435401-002

Mine Shaft
CA Ref. 435401-003

A 6195

JPG-PROPOSED EARTHWORKS - STAGE 01
SCALE 1:1000

0m 25m 50m
SCALE 1:1000

REV	DESCRIPTION	DATE	CHK	BY
P01	FIRST ISSUE.	14.07.21	OLT	OLT

Project
ROCKINGHAM PHASE 3
HOYLAND

Drawing Title
EARTHWORKS STRATEGY
STAGE 01

INFORMATION ISSUE

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NOTES

GENERAL NOTES

1. EXTENTS OF SURCHARGE REQUIREMENT BASED ON UMC ARCHITECT DRAWING NO. '21049-F0004-REVC' AND SHOULD BE IN LINE WITH RSK GROUND TREATMENT SPECIFICATION '325389-R04(00) PHASE 3 GROUND TREATMENT SPECIFICATION'.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, M & E CONSULTANTS AND JPG CONSULTANTS DRAWINGS & SPECIFICATIONS.

STAGE 02 SURCHARGE MOUND
CREST OF SURCHARGE EXTENDS 5.00m FROM EDGE OF PROPOSED UNIT AND TO A LEVEL OF 134.40m AOD (7.00m ABOVE FFL).
MATERIAL FILL VOLUME (WHEN COMPARED AGAINST STAGE 01 COMPLETION LEVELS): 165436.289 Cu.M.

EXISTING FOUL DRAINAGE

STAGE 02 CUT
BASE OF CUT TO A LEVEL OF 124.90m AOD (2.00m BELOW UNIT FORMATION LEVEL).
MATERIAL CUT VOLUME (WHEN COMPARED AGAINST STAGE 01 COMPLETION LEVELS): 165215.851 Cu.M.

Mine Shaft
CA Ref. 435401-002

Mine Shaft
CA Ref. 435401-003

A 6195

JPG-PROPOSED EARTHWORKS - STAGE 02
SCALE 1:1000

0m 25m 50m
SCALE 1:1000

REV	DESCRIPTION	DATE	CHK	BY
P01	FIRST ISSUE.	14.07.21	OLT	OLT

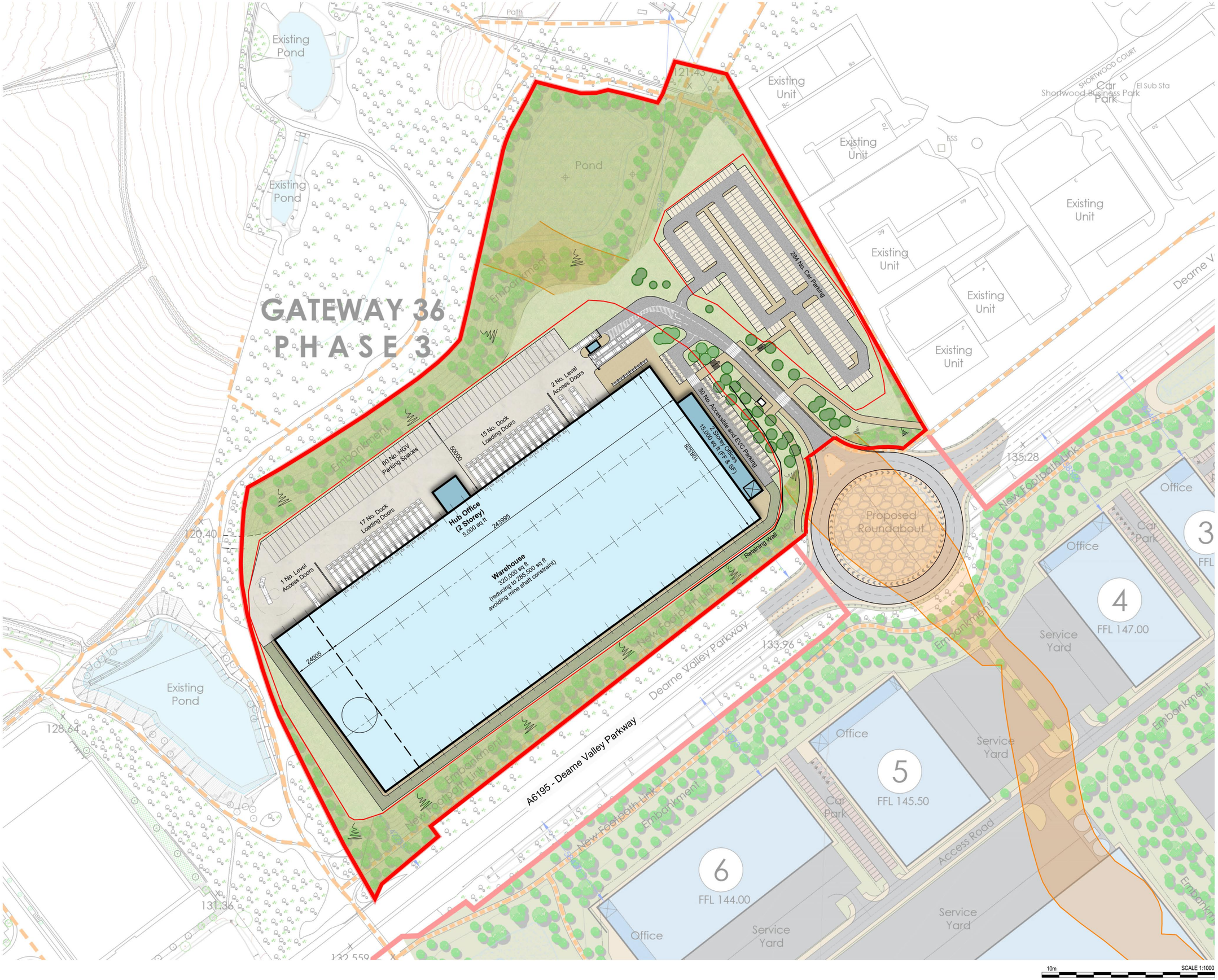
Project
ROCKINGHAM PHASE 3
HOYLAND

Drawing Title
EARTHWORKS STRATEGY
STAGE 02

INFORMATION ISSUE

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- Dimensions are in millimeters, unless stated otherwise.
- Scaling of this drawing is not recommended.
- It is the recipients responsibility to print this document to the correct scale.
- All relevant drawings and specifications should be read in conjunction with this drawing.

N

SCHEDULE OF ACCOMMODATION
(Gross Internal Area)

Warehouse Area	-	320,000 sq ft (29,725 m²)
2-Storey Office (FF&SF)	-	15,000 sq ft (1,394 m²)
Hub Office	-	5,000 sq ft (465 m²)
Gatehouse	-	300 sq ft (28 m²)
Total Area	-	**340,300 sq ft** (31,612 m²)
Plot Area	-	14.76 Acres (5.97 Ha)
Site Area	-	23.63 Acres (9.562 Ha)

Parking Standards
Barnsley Metropolitan Borough Council
Barnsley Local Plan SPD: Parking (Nov 2019)

Recommended Spaces

B2 General Industrial
1:50m² less than 500 m²
1:60m² 500m² to 2,500m²
1:30-50m² over 2,500m²

B8 Storage and Distribution
1:60m² up 300m²
plus 1:100m² thereafter

Charging Bays - 10%

rev	amendments	by	ckd	date

Dearne Valley Parkway, Barnsley

Site Layout - Option 3

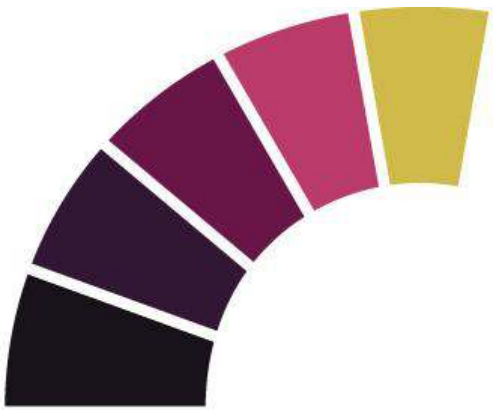
Firethorn TRUST

umc architects
Newark Beacon, Cafferata Way, Newark, Nottinghamshire NG24 2TN
t: +44 (0)1636 653027 e: info@umcarchitects.com

Drawing Status:	Feasibility
Drawn / Checked:	JB / GMc
Date:	27/01/2021
Scale:	1:1000 A1
Drawing no:	Revision:
21049 F0004	C

5 John Charles Way
LEEDS
LS12 6QA

Tel: 0113 263 1155
admin@jpg.group
www.jpg.group



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NOTES

GENERAL NOTES

1. EXTENTS OF SURCHARGE REQUIREMENT BASED ON UMC ARCHITECT DRAWING NO. '21049-F0004-REVC' AND SHOULD BE IN LINE WITH RSK GROUND TREATMENT SPECIFICATION '325389-R04(00) PHASE 3 GROUND TREATMENT SPECIFICATION'.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, M & E CONSULTANTS AND JPG CONSULTANTS DRAWINGS & SPECIFICATIONS.



JPG-PROPOSED EARTHWORKS - STAGE 01

SCALE 1:1000

0m 25m 50m

SCALE 1:1000

REV	DESCRIPTION	DATE	CHK	BY
P03	BORROW PIT ADDED.	22.07.21	OLT	OLT
P02	SURCHARGE HEIGHT REDUCED TO 6.00m ABOVE FFL.	21.07.21	OLT	OLT
P01	FIRST ISSUE.	14.07.21	OLT	OLT

Project
ROCKINGHAM PHASE 3
HOYLAND

Drawing Title
EARTHWORKS STRATEGY
STAGE 01

INFORMATION ISSUE

JPG
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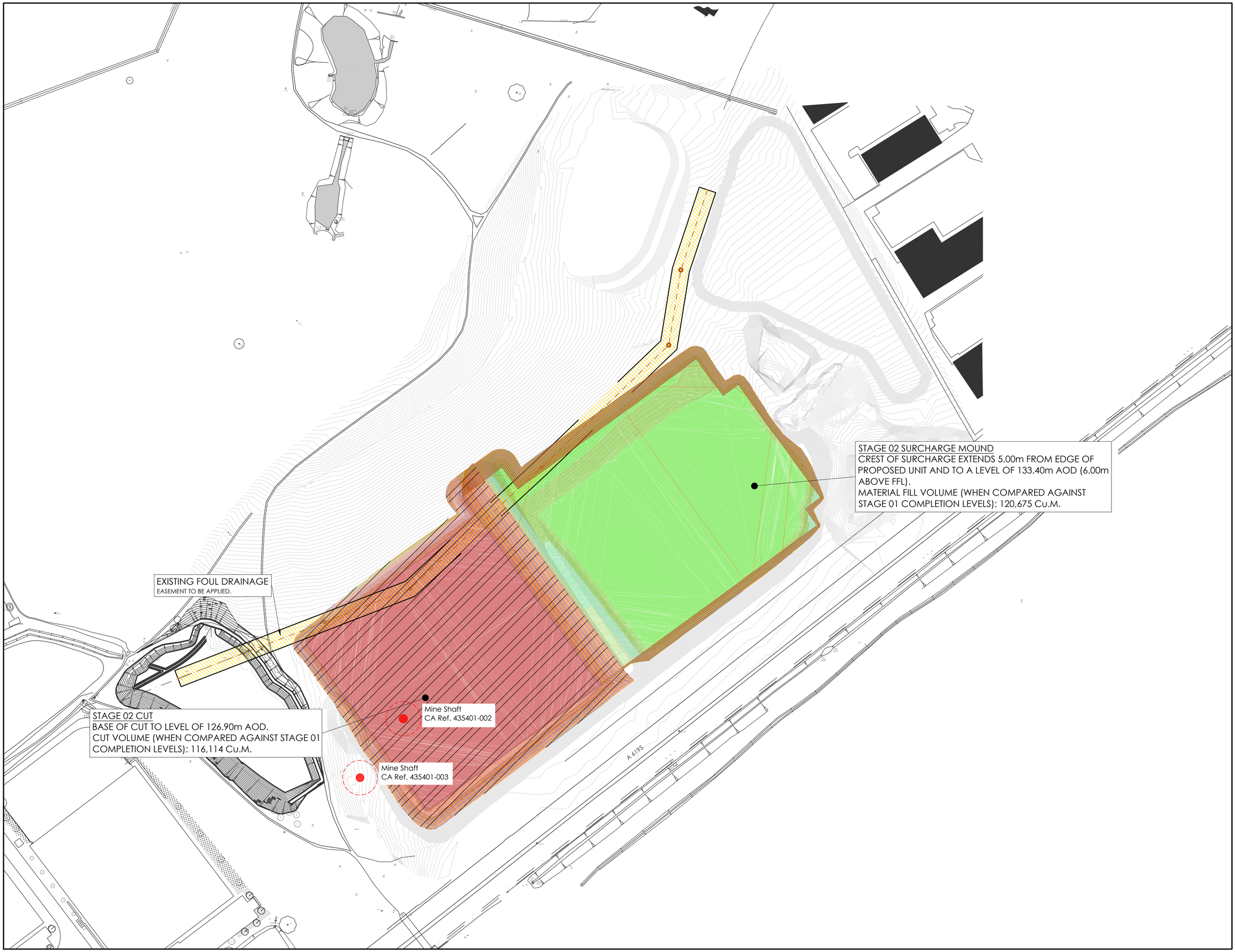
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DO NOT SCALE (A1)

NOTES

GENERAL NOTES

1. EXTENTS OF SURCHARGE REQUIREMENT BASED ON UMC ARCHITECT DRAWING NO. '21049-F0004-REVC' AND SHOULD BE IN LINE WITH RSK GROUND TREATMENT SPECIFICATION '325389-R04(00) PHASE 3 GROUND TREATMENT SPECIFICATION'.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, M & E CONSULTANTS AND JPG CONSULTANTS DRAWINGS & SPECIFICATIONS.



JPG-PROPOSED EARTHWORKS - STAGE 02
SCALE 1:1000

0m 25m 50m
SCALE 1:1000

REV	DESCRIPTION	DATE	CHK	BY
P03	AMENDMENT TO CUT LEVEL.	22.07.21	OLT	OLT
P02	SURCHARGE HEIGHT REDUCED TO 6.00m ABOVE FFL.	21.07.21	OLT	OLT
P01	FIRST ISSUE.	14.07.21	OLT	OLT

Project
ROCKINGHAM PHASE 3
HOYLAND

Drawing Title
EARTHWORKS STRATEGY
STAGE 02

INFORMATION ISSUE

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APPENDIX B
GEOTECHNICAL MODELLING

29th July 2021

Our reference: 372079-L02 (00)

EOS Inc Limited
Advantage House
Poplar Way
Rotherham
South Yorkshire
S60 5TR

For the attention of Mr Robert Cole

Dear Sir,

RE: PHASE 3 UNIT 1, ROCKINGHAM - GROUND SETTLEMENT ASSESSMENT

1. INTRODUCTION

RSK Environment Limited (RSK) was commissioned by EOS Inc Limited to carry out a geo-environmental assessment work of the land at the Rockingham Phase 3 development site in South Yorkshire. This site forms part of the larger former Rockingham opencast coal mining site and is anticipated to be redeveloped with a number of commercial/industrial units. An area to the northwest, Rockingham 1 has already been developed and ground treatment and earthworks are ongoing in the Phase 2 area to the south.

The Phase 3 area is proposed for development with a single large building (Unit 1) as indicated in UMC Architects Site Layout Option 3, drawing reference 21049 F0004 Revision C.

The comments given in this report and the opinions expressed are based on the ground conditions indicated by previous investigation carried out by RSK. However, there may be conditions pertaining to the site that have not been disclosed by these investigations and therefore could not be taken into account. In particular, it should be noted that there may be areas of made ground not detected due or the thickness and quality of made ground including groundwater levels may at variance to that reported.

The settlement calculations undertaken in this work assumes that the un-engineered made ground placed within the former open cast mine has ceased settling and so does not account for further self-weight settlement of the backfill material.

This report is subject to the RSK service constraints given in **Appendix A**.

2. PROPOSED SITE USE

It is understood that the site is being considered for redevelopment for commercial purposes (see UMC Architects Site Layout Option 3, drawing reference 21049 F0004 Revision C).

The proposed development is to include cut and fill exercise to provide a level development platform for Unit 1. The following loadings for the commercial unit have been considered in the settlement modelling:

i. Floor slab loading of 50kPa acting at the ground level, 127.4mAOD;

ii. Column pad foundations (1m x 1m) loading of 100kPa acting at 1.0mbgl; and

iii. Possible 1.0m thickness of engineered fill.

A cross section from the latest layout is provided in **Appendix B**.

3. GROUND CONDITIONS AND GROUND MODEL

The ground conditions have been obtained from previous RSK reports including report reference 372079-L01 (00), dated July 2020. This letter report should read conjunction with this previous report.

The previous investigations included borehole drilling with in situ standard penetration testing (SPT). The results of the SPTs and the results of the previous large load test on the Phase 3 area have been used to prepare a ground stiffness model. The ground conditions vary along the length of the proposed Unit 1 building with opencast backfill varying from a thickness of approximately 25m beneath the western end to around 50m beneath the eastern end. This variation in ground conditions is included within the ground model. Information on ground stiffnesses used in the model are included in Table 1.

Table 1 PDISP Model input stiffness - Phase 3 Unit 1

Strata	BH Extensometer Magnet Level (Top of Strata)	Depth	PDISP back calculated Lower Bound Stiffness	Possion Ratio
	(mAOD)	(mBGL)	(kN/m^2)	
MG2	127.4	0	6250	0.2
MG3	125.7	5.3	7500	0.2
MG4	123.7	6.7	14500	0.2
MG5	121.2	8.6	18500	0.2
MG6	119.6	10.6	25000	0.2
MG7	116.6	13.1	33500	0.2
MG8	113.6	14.7	40000	0.2
MG9	109.8	17.7	47750	0.2
BR	93.4 to 77.4	34.0 to 50.0	75000 – 100,000	0.2

4. RESULTS AND DISCUSSIONS

The settlement modelling carried out by RSK has used specialist software prepared by Ove Arup – OASYS PDISP 20.0.0.2 software package. This software allows estimates of settlement from applied loads and can also be used for back calculations.

Detailed PDISP modelling results are presented in **Appendix C**. A summary of the settlement modelling is presented in Table 2.

Table 2 Calculated PDISP settlements using estimated building loads (Pads = 100kPa, Slab = 50kPa) and possible 1.0m engineered fill (20kPa) and three surcharge scenarios

Phase	Unit	Pad & Slab Loading (kPa)	Max settlement of units without treatment SU_{max} (mm)	Max. Settlement S_{max} (mm)
3	Unit 1 with1.0m Engineered Fill	100 & 50	105	
3	Unit 1 area -with 1.0m Engineered Fill & 5.0m Surcharge		-	142
3	Unit 1 area -with 1.0m Engineered Fill & 6.0m Surcharge		-	165
3	Unit 1 area - with 1.0m Engineered Fill & 7.0m Surcharge		-	225

Table 2 summarises the estimated maximum and net settlement for a number of surcharge treatment heights based on the back-calculated average ground stiffness profile (i.e. from the recorded ground conditions, in situ SPT tests and the large scale Load Test, given in report ref 372079-L01 (00)).

The measured settlement during the large scale Load Test and initial results of the ongoing settlement monitoring work being carried out for the Phase 2 area, demonstrate that almost all of the recorded long term settlement was measured during or shortly after construction/ placement of the surcharge. It is conservatively assumed that the surcharge, in place for 3 months, will induce 75% of the predicted long-term settlement.

Following the above, it is assumed that of 75% of S_{max} is likely to induced in a relatively short period. Therefore, the estimated net settlement for the corresponding surcharges (in place for a short period) would be 0.75 x S_{max}. Table 3 summarises the estimated maximum and net settlement for a number of surcharge treatment heights.

Table 3 Surcharge heights and net settlements achieved

Surcharge height (m)	Surcharge (kPa)	Max. Settlement S_{max} (mm)	Net Settlement within short period 0.75 x S_{max} (mm)
5.0	100	142	107
6.0	120	165	124
7.0	140	225	169

Table 2 summarised the maximum expected settlement under the proposed Unit 1 (SU_{max}) when there was no surcharging prior to constructing the building. At the time of this assessment, it has been assumed that the requirement is to limit the maximum residual (post construction) settlement under the Unit to 25mm. Therefore, in order to achieve a final settlement of less than 25mm after surcharge treatment, we would require a surcharge height that would satisfy the following criteria:

$SU_{max} - 0.7S_{max} \leq 25$ mm

Table 4 summarises the required surcharge height for different SU_{max} based on the above criteria.

Table 4 Surcharge heights and net settlements achieved

Surcharge height (m)	Surcharge (kPa)	Max. Settlement S_{max} (mm)	Net Settlement 0.75 x S_{max} (mm)	Max settlement of Unit 1 without treatment SU_{max} (mm)	$SU_{max} - 0.5S_{max}$
5.0	100	142	107	105	-2 (<25)
6.0	120	165	124	105	-19 (<25)
7.0	140	225	169	105	-31 (<25)

Based upon the above assumptions, it is indicated that 5.0m surcharge may be adequate to achieve the settlement required. However, it is expected that a small amount of rebound settlement will occur, and consequently it is recommended that a 6.0m high surcharge load be adopted on site.

From the previous Load Test settlement monitoring data, it was demonstrated that the majority of the settlement would take place within approximately 3 months of construction. A practical minimum timescale, for placement and monitoring of the surcharge load would likely be of the order of 3 months.

5. CONCLUSIONS AND RECOMMENDATIONS

The settlement calculations presented make the assumption that the self-weight settlement of the made ground is already complete due to its placement over a relatively long period of time (approximately 25 years).

It should be noted that where new engineered fill is to be placed the material has been considered as a separate competent stratum and the analyses does not account for any self-weight settlement within the engineered fill. The settlement calculations presented in this report are based on assumed building loads and 1.0m thickness of engineered fill load only and make no allowance for any ongoing long-term settlement or creep.

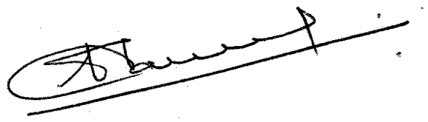
The modelling presented above indicates that surcharge treatment will be required for the proposed Unit 1 on Rockingham, Phase 3. Information is also provided on the height of surcharge required and the likely duration of the treatment. Given the available volumes of material and required timescales it is recommended that an accelerated programme of ground treatment works is adopted using a 6.0m high surcharge in place for at least 3 months (but timescales subject to confirmation by on site monitoring).

As previously stated, the made ground present on site is opencast backfill and understood to be un-engineered and hence variation in ground conditions highly likely. Therefore, it will be necessary that each of the surcharging operations should be fitted with reliable settlement monitoring instrumentation (at existing level and top of the engineered fill) and be monitored on a regular basis to make sure that the expected settlements are induced within the expected timescales. This monitoring will be critical in determining when sufficient settlement has been induced and the surcharge can be removed.

We trust our services and report are satisfactory and meet with your expectations, if however you have any comments or require additional assistance then please do not hesitate to contact the undersigned.

Yours faithfully

For **RSK Environmental Ltd**



Dr T Navaneethan

Technical Director

Encl.

Appendix A Service Constraints
Appendix B Site Cross Sections
Appendix C PDISP Results

APPENDIX A
SERVICE CONSTRAINTS

1. This report and the site investigation carried out in connection with the report (together the "Services") were compiled and carried out by RSK Environment Limited (RSK) for Harworth Estate Limited (the "Client") in accordance with the terms of a contract between RSK and the Client. The Services were performed by RSK with the reasonable skill and care ordinarily exercised by an environmental consultant at the time the Services were performed. Further, and in particular, the Services were performed by RSK taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between RSK and the Client.
2. Other than that, expressly contained in paragraph 1 above, RSK provides no other representation or warranty whether express or implied, in relation to the Services.
3. Unless otherwise agreed in writing, the Services were performed by RSK exclusively for the purposes of the Client. RSK is not aware of any interest of or reliance by any party other than the Client in or on the Services. Unless expressly provided in writing, RSK does not authorise, consent or condone any party other than the client relying upon the Services. Should this report or any part of this report, or otherwise details of the Services or any part of the Services be made known to any such party, and such party relies thereon that party does so wholly at its own and sole risk and RSK disclaims any liability to such parties. **Any such party would be well advised to seek independent advice from a competent environmental consultant and/or lawyer.**
4. It is RSK's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances by the client without RSK 's review and advice shall be at the client's sole and own risk. Should RSK be requested to review the report after the date of this report, RSK shall be entitled to additional payment at the then existing rates or such other terms as agreed between RSK and the client.
5. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of RSK. In the absence of such written advice of RSK, reliance on the report in the future shall be at the Client's own and sole risk. Should RSK be requested to review the report in the future, RSK shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between RSK and the client.
6. The observations and conclusions described in this report are based solely upon the Services which were provided pursuant to the agreement between the Client and RSK. RSK has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between the client and RSK. RSK is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, RSK did not seek to evaluate the presence on or off site of asbestos, invasive plants, electromagnetic fields, lead paint, heavy metals, radon gas, persistent, bioaccumulative or toxic chemicals (including PFAS/ PFOS) or other radioactive or hazardous materials, unless specifically identified in the Services.
7. The Services are based upon RSK's observations of existing physical conditions at the Site gained from a visual inspection of the site together with RSK's interpretation of information, including documentation, obtained from third parties and from the Client on the history and usage of the site, unless specifically identified in the Services or accreditation system (such as UKAS ISO 17020:2012 clause 7.1.6):
    a. The Services were based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely.
    b. The Services were limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the visual inspection.

c. The Services did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services.

RSK is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to RSK and including the doing of any independent investigation of the information provided to RSK save as otherwise provided in the terms of the contract between the Client and RSK.

8. The intrusive environmental site investigation aspects of the Services are a limited sampling of the site at pre-determined locations based on the known historic / operational configuration of the site. The conclusions given in this report are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around those locations. The extent of the limited area depends on the properties of the materials adjacent and local conditions, together with the position of any current structures and underground utilities and facilities, and natural and other activities on site. In addition, chemical analysis was carried out for a limited number of parameters (as stipulated in the scope between the client and RSK, based on an understanding of the available operational and historical information) and it should not be inferred that other chemical species are not present.

9. Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan but is (are) used to present the general relative locations of features on, and surrounding, the site. Features (intrusive and sample locations etc) annotated on site plans are not drawn to scale but are centred over the approximate location. Such features should not be used for setting out and should be considered indicative only.

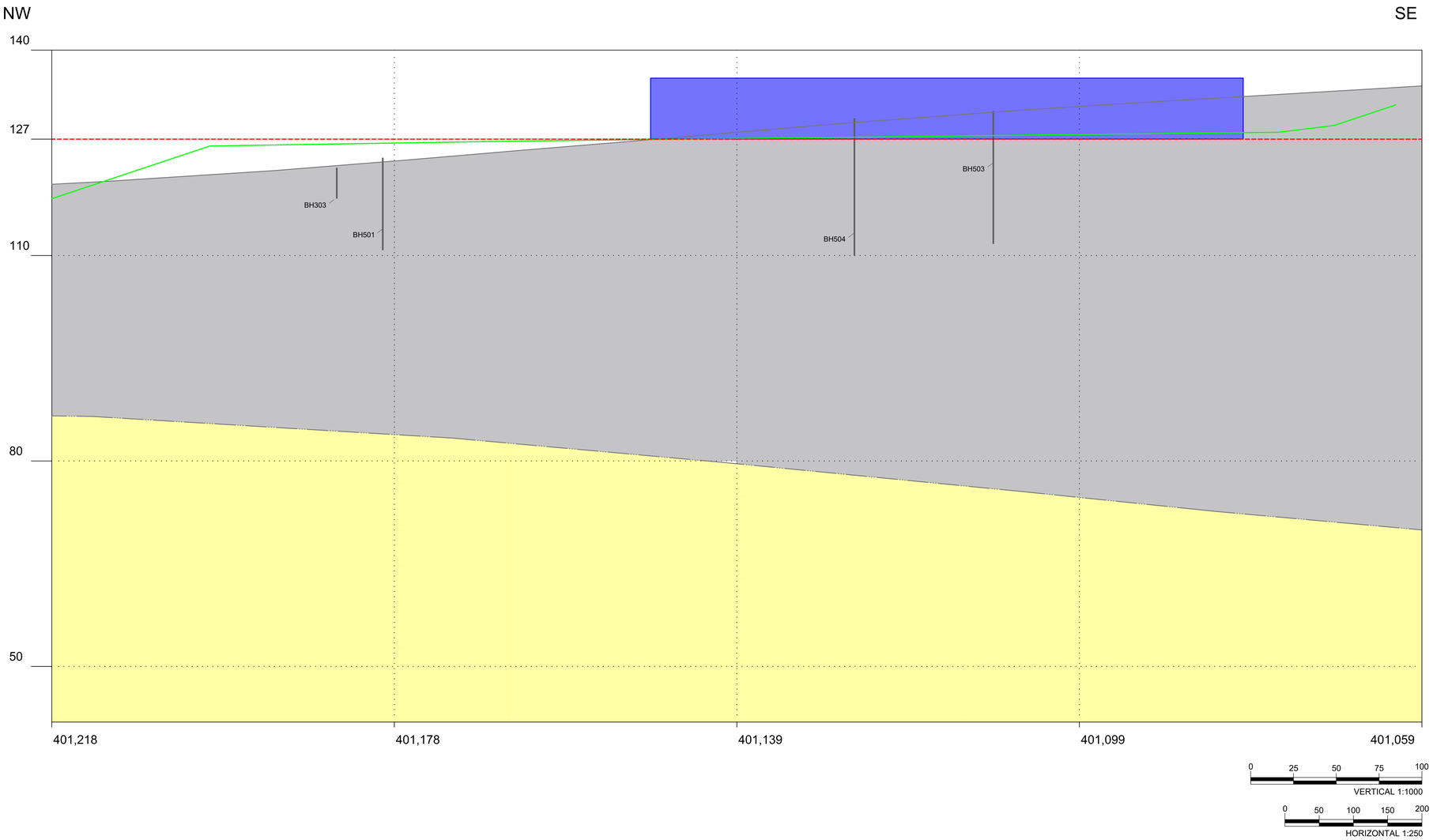
10. The comments given in this report and the opinions expressed are based on the ground conditions encountered during the site work and on the results of tests made in the field and in the laboratory. However, there may be conditions pertaining to the site that have not been disclosed by the investigation and therefore could not be taken into account. In particular, it should be noted that there may be areas of made ground not detected due to the limited nature of the investigation or the thickness and quality of made ground across the site may be variable. In addition, groundwater levels and ground gas concentrations and flows, may vary from those reported due to seasonal, or other, effects and the limitations stated in the data should be recognised.

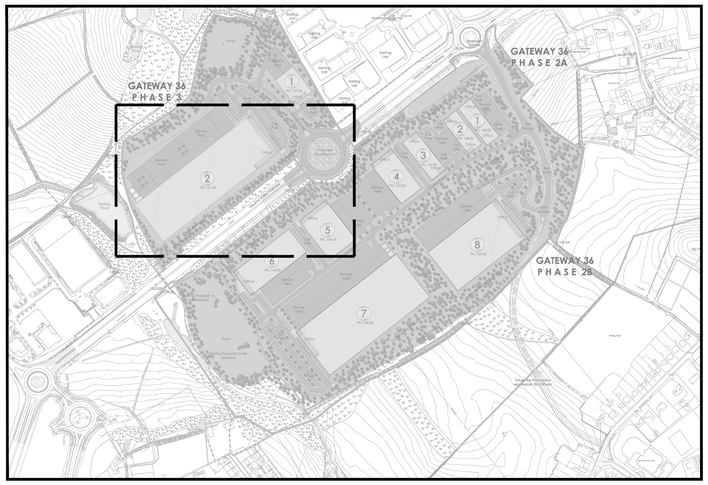
11. Asbestos is often observed to be present in soils in discrete areas. Whilst asbestos-containing materials may have been locally encountered during the fieldworks or supporting laboratory analysis, the history of brownfield and demolition sites indicates that asbestos fibres may be present more widely in soils and aggregates, which could be encountered during more extensive ground works.

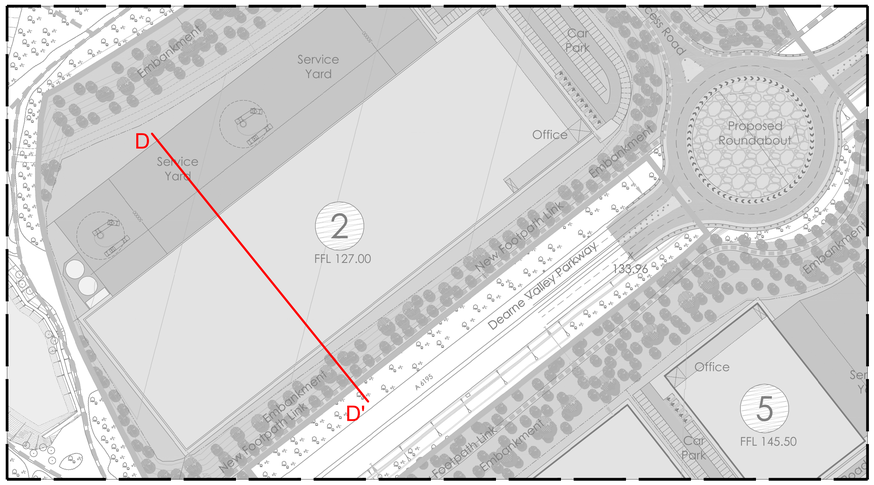
12. Unless stated otherwise, only preliminary geotechnical recommendations are presented in this report and these should be verified in a Geotechnical Design Report, once proposed construction and structural design proposals are confirmed.

APPENDIX B
SITE CROSS SECTION

SECTION D-D'







LEGEND:

- GROUND MATERIAL - HR
- GROUND MATERIAL - MG
- BUILDING
- BUILDING PLATFORM
- AOD
- BH — BORE HOLE

REV	DATE	DESCRIPTION	BY	CHD.	APR.
01	16.07.21	FIRST ISSUE	FP	SR	SR

Dimensions	Projection	Scale	Orig Size
m		-	A0

RSK GEOSCIENCES
Spring Lodge
172 Chester road
Helsby
Cheshire
WA6 0AR
Tel: +44 1928 726006
Fax: +44 1928 725633
Web: www.rsk.co.uk

CLIENT
HARWORTH ESTATES INVESTMENTS LTD

PROJECT
ROCKINGHAM PHASE 3

TITLE
GEOLOGICAL SECTIONS

JOB NO:	DRAWING FILE:
322638	CROSS SECTION

BY:	DATE:	CONTRACT NO.		REV:
FP	16.07.21			01

APPENDIX C
PDISP RESULTS - UNIT 1, PHASE 3

Oasys

RSK ENVIRONMENT LIMITED

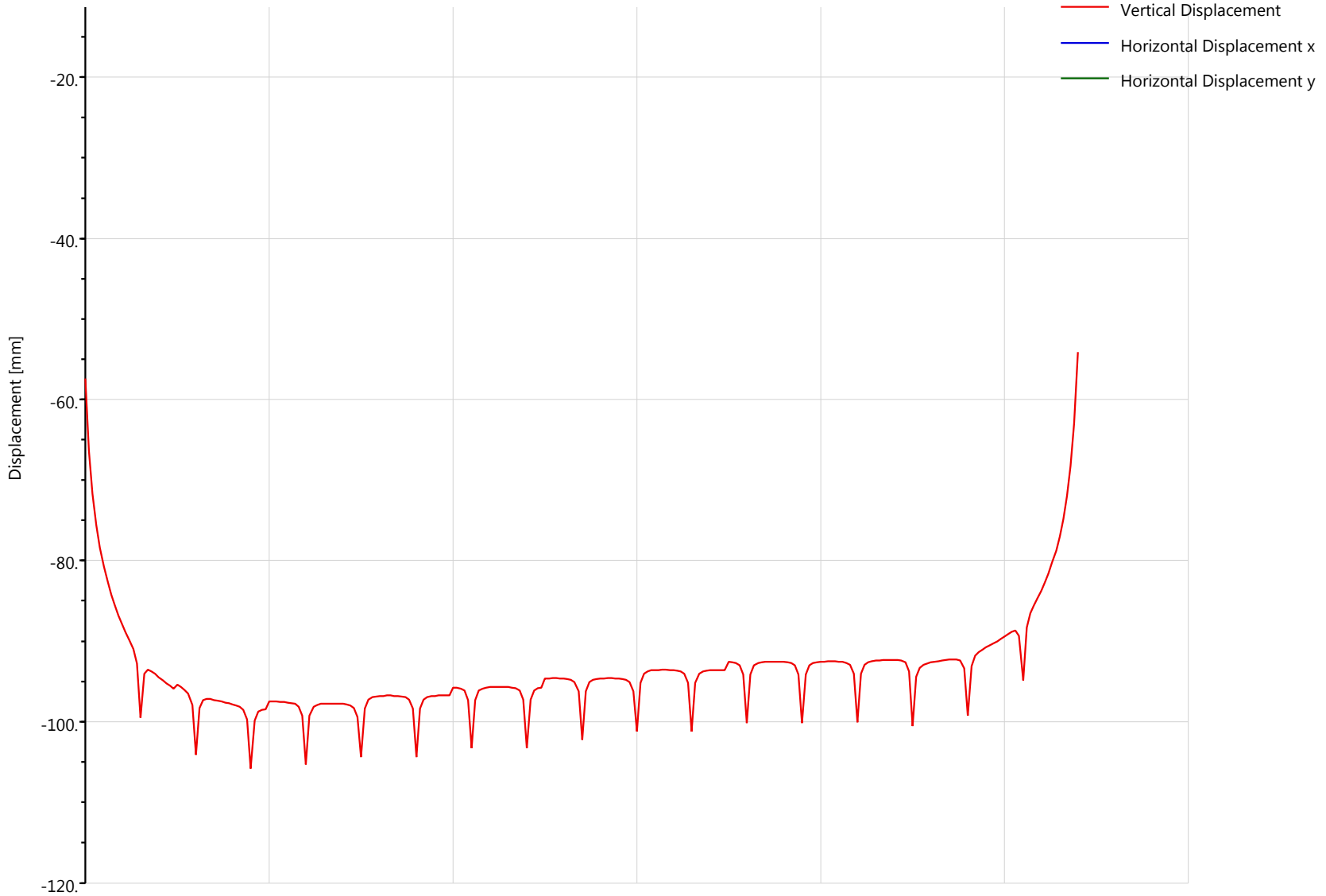
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Displacement for L1



Oasys

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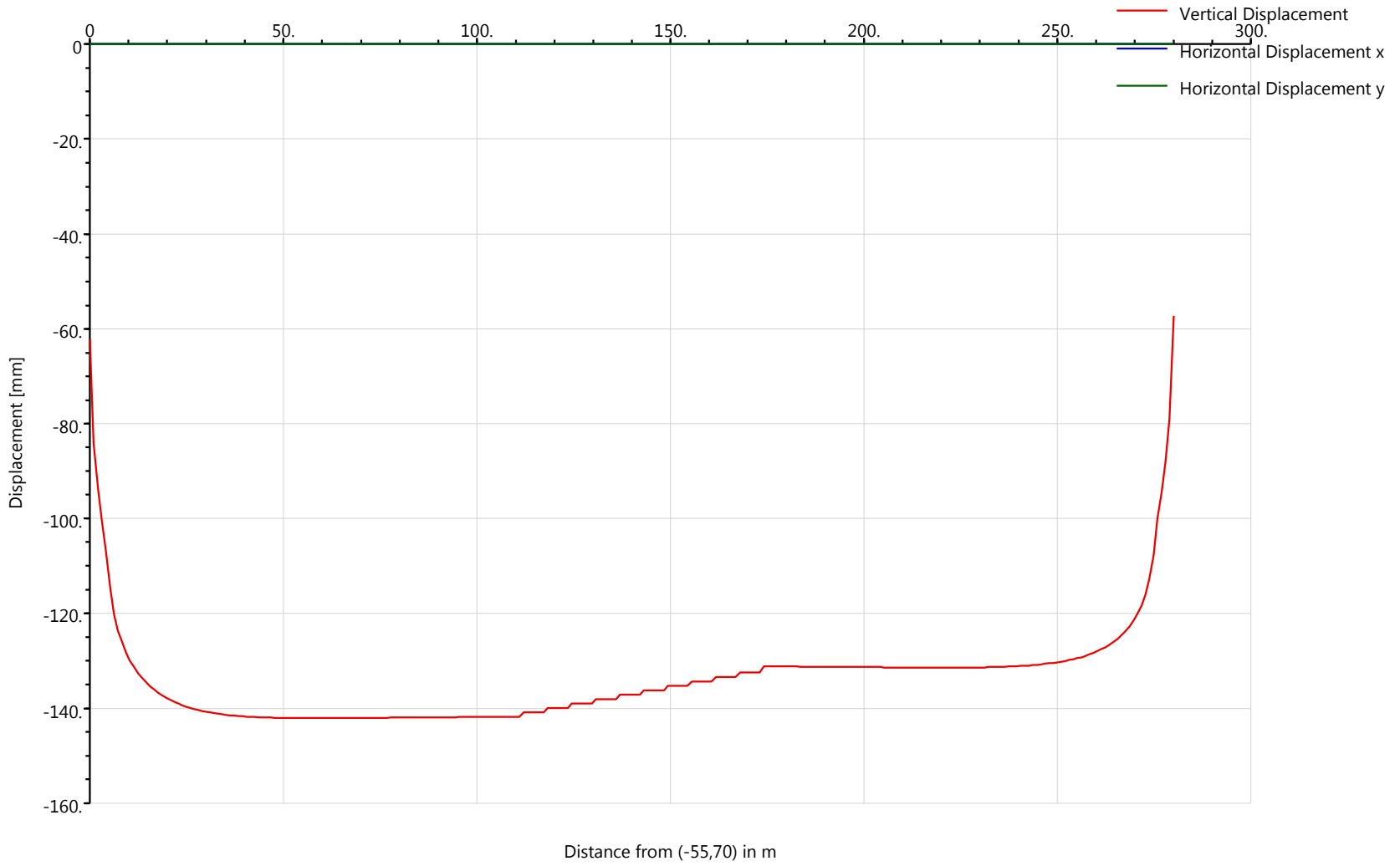
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Unit 1 Phase 3

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Displacement for L1



Oasys

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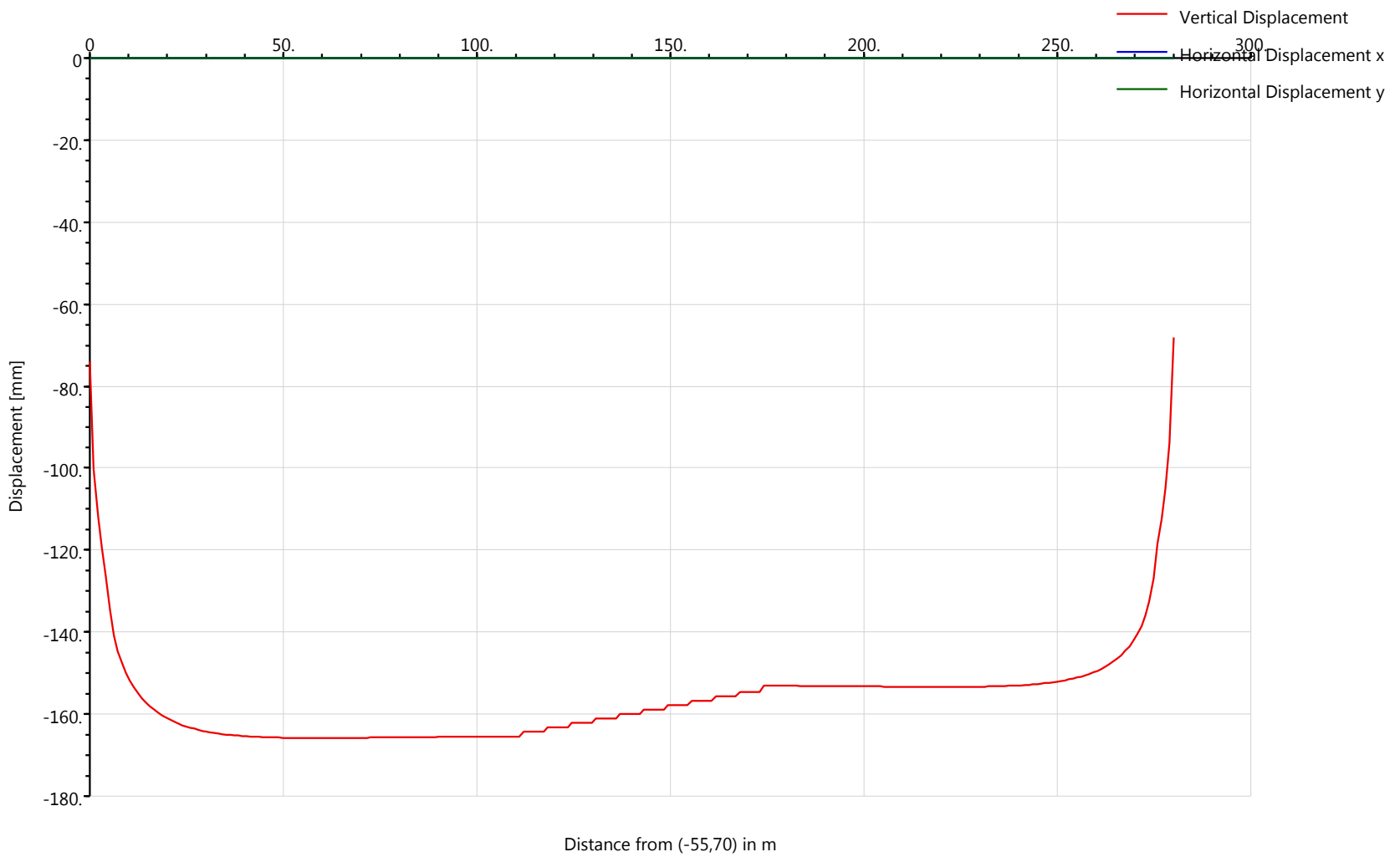
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Unit 1 Phase 3

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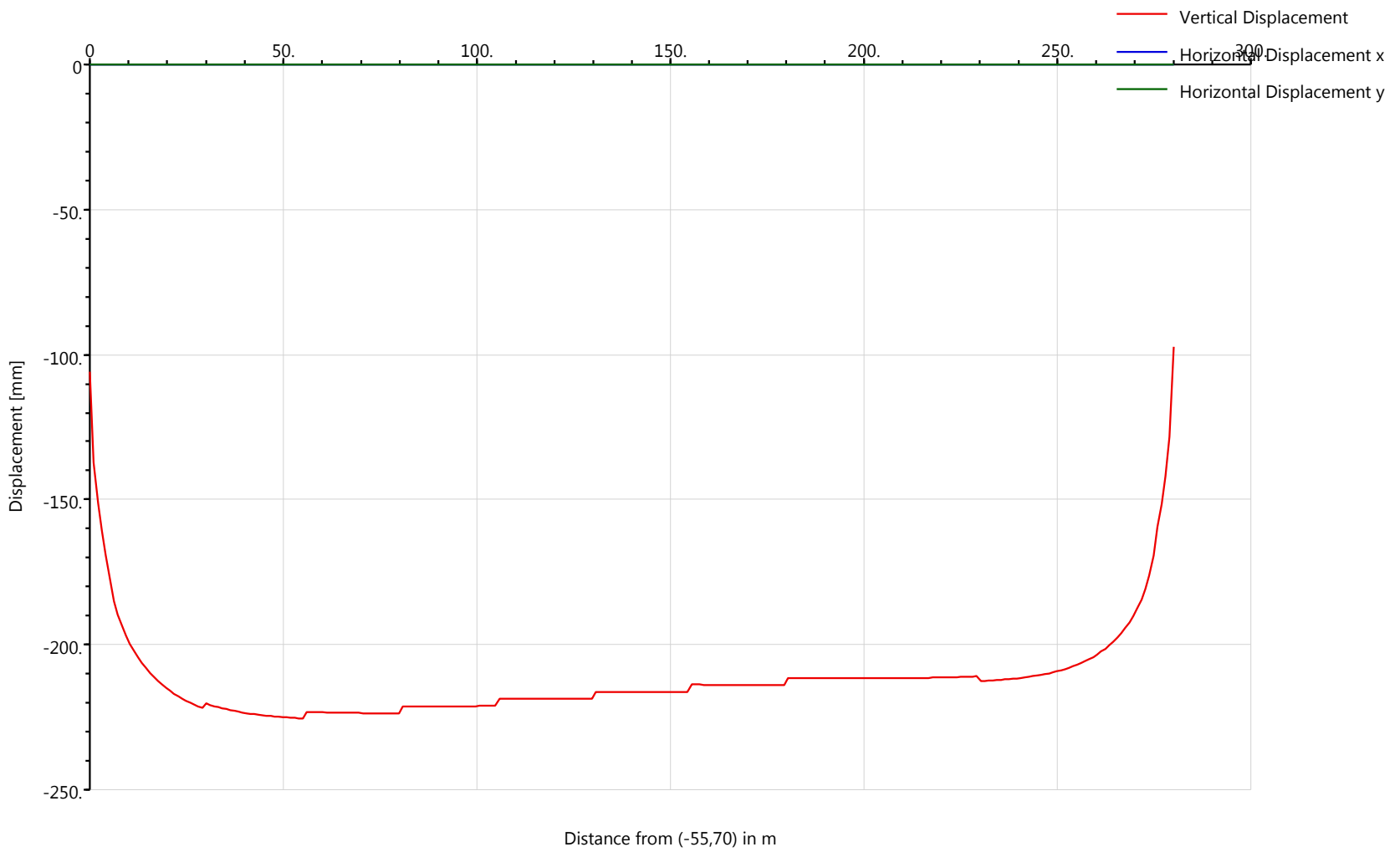
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Displacement for L1



Displacement for L1



Oasys

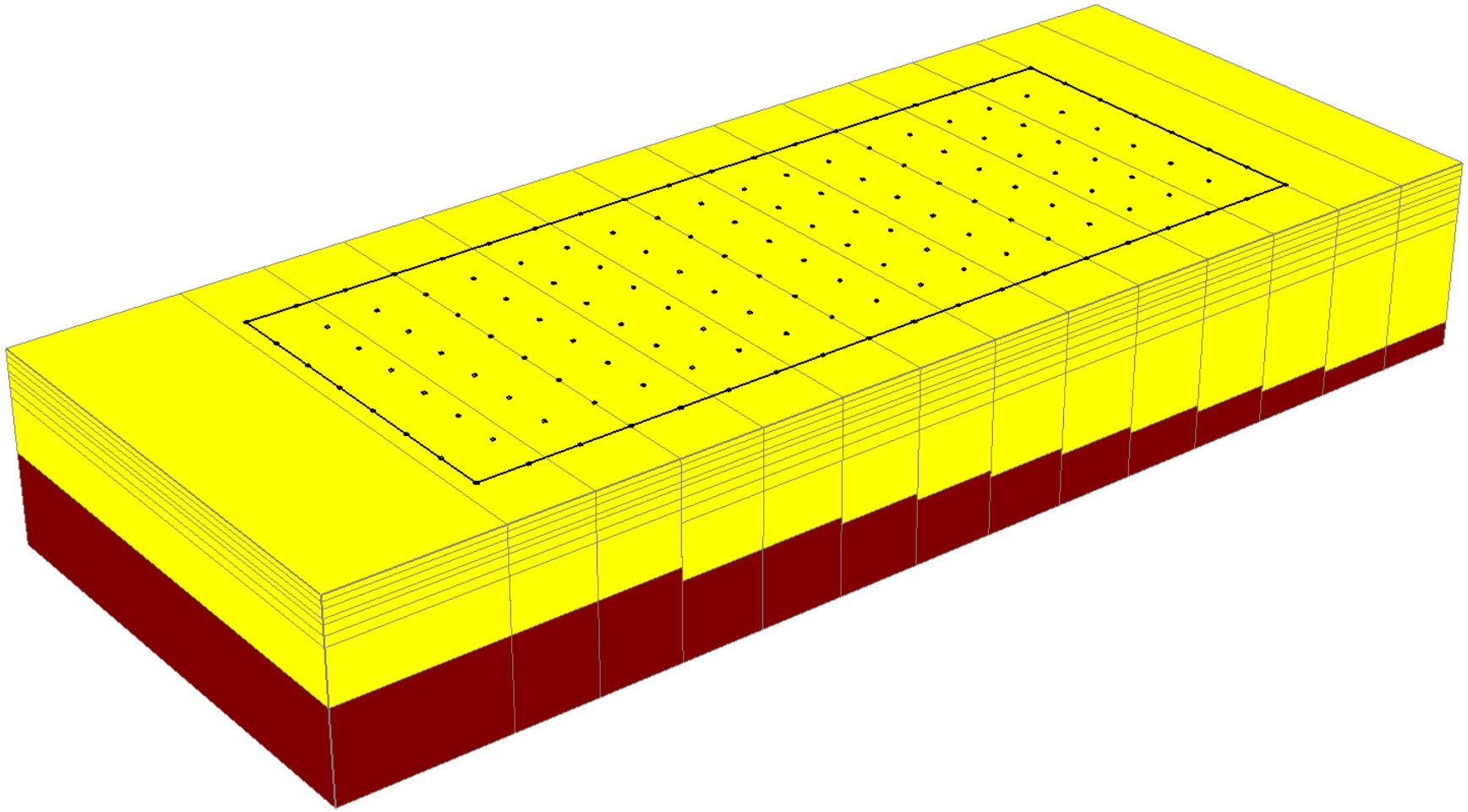
RSK ENVIRONMENT LIMITED

ROCKINGHAM 2-3
Unit 1 Phase 3

Job No.	Sheet No.	Rev.
372079		

Drg. Ref.

Made by	Date	Checked
GS		



APPENDIX C
SCHEDULE OF TESTING

Appendix C
Testing schedule

The testing requirements are detailed below. The Principal Contractor shall note that additional testing may be required at the discretion of the Supervisor.

Test	Frequency	Comment
Classification* of general fill materials	1 per 10,000m^3	Scheduling to include (but not limited to): - natural moisture content determination - loss on ignition - particle size distribution - plastic limit - compaction tests (dry density/moisture content relationship) using the 4.5kg rammer method - any other testing necessary to permit a classification in accordance with SHW
Soil chemical testing	1 per 10,000m^3.	Broad suite of chemical determinands including: - pH - loss on ignition - metals - speciated TPH (CWG) - speciated PAH - BRE sulphate suite (pyritic ground)
Note: * Testing of materials that are to be used as fill materials are to allow classification of materials in accordance with Series 600 Earthworks' of the Specification for Highway Works published by the Stationary Office in February 2016 as Volume 1 of the Manual of Contract Documents for Highway Works including all subsequent published amendments		