

## **RECLAMATION METHOD STATEMENT FOR THE PROPOSED RESIDENTIAL DEVELOPMENT ON LAND AT WATER'S EDGE, WHITEHAVEN**

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|------------------|-----------------------------------------------------------------------------------------------------------|---------|
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# RECLAMATION METHOD STATEMENT FOR THE PROPOSED RESIDENTIAL DEVELOPMENT ON LAND AT WATER'S EDGE, WHITEHAVEN

## 1 INTRODUCTION

FWS Consultants Ltd (FWS) was instructed by Gleeson Homes Cumbria (the 'Client') to prepare a reclamation method statement and earthworks specification for the for the proposed residential development on land at Water's Edge, Whitehaven (the 'site'), as shown in Drawing Site Location Plan, Appendix 1.2.

This document sets out the Method Statement for the proposed reclamation works, the specification for the mitigation measures to be incorporated into the built development and the validation procedures that will be adopted during redevelopment of the site. All proposals, methods and techniques to be adopted by the Contractor shall be to the approval of FWS and statutory bodies, including the Local Authority and Environment Agency.

## 2 DEVELOPMENT PROPOSALS

### **Buildings**

The residential development is to comprise 40no detached and semi-detached properties as shown in Drawing 21201-D001-Rev2, Appendix 1.2. Finished floor levels between 93.65 m AOD (northwest) to 96.125 m AOD (southern boundary) are currently proposed.

The detailed foundation design is currently in progress and it proposed that the low rise residential buildings are supported on a combination of shallow strip or deep trench across the majority of the site. Final design of gas protection measures to all structures with confined spaces is currently in progress, but will include detailed design of the floor slab design, ventilation, gas/vapour proof membranes in accordance with Characteristic Situation 2 conditions (with vapour proof membranes proposed to plots 20, 28 and 29).

### **Roadways**

Construction of the carriageways and hardstand areas is expected to be undertaken within 0.85 m of the proposed finished floor levels of adjacent structures.

### **Earthworks**

It is currently proposed to regrade the entire site as shown in Drawing 21201-D601-Rev1, Appendix 1.2, with an area of public open space and attenuation storage in the southwestern part of the site, that results in a cut of 1,953 m<sup>3</sup> and fill of 3,751 m<sup>3</sup>, with net shortfall of material of ~1,800 m<sup>3</sup> to achieve the proposed formation level. During the construction phase of works a further 1,534 m<sup>3</sup> of materials is expected to be generated from drainage excavations to make up the majority of the shortfall and at this stage no allowance for foundation or highways construction excavations have been included.

It is proposed (following consultation and agreement with the Environment Agency) to utilise 1,015 m<sup>3</sup> of the topsoil materials in Stockpile 3 under a mobile plant licence and end of waste recovery operation as clean cover soils within garden and landscaped areas.

### **Landscaping**

There will be public green space with new planting of trees and all properties will have domestic gardens. Therefore, where made ground materials are to remain insitu in future garden and landscaped areas they will need to be either contained beneath hardstanding / buildings or a designed clean cover soil layer. In addition, the POS area in the southwestern part of the site and selected gardens to Plots 27 to 28 where localised disseminated asbestos were proven in the made ground associated with the former railway (Drawing 8190OD04, Appendix 1.1) will incorporate an anti-dig layer as part of the clean cover design.

### **Sustainable Drainage**

At this stage, an area of proposed offline cellular storage (1.2 m deep with minimum of 0.5 m cover and volume of up to 240 m<sup>3</sup>) is proposed in the POS area in the southwestern part of the site.

## **3 INTERESTED PARTIES**

### **3.1 Parties to the Contract**

#### **Employer**

Gleeson Homes Cumbria  
Rural Enterprise Centre  
Redhills  
Penrith  
Cumbria  
CA11 0DT  
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#### **Consulting Engineer**

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NE13 6DS  
Contact Tel: 0191 258 5632

#### **Environmental Engineer**

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St John's Road  
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Durham  
DH7 8ER  
Contact Tel: 01388 420633

#### **Main Contractor**

To Be Confirmed

### **3.2 Parties to be consulted**

#### **Council**

Contaminated Land Officer

Copeland Borough Council  
The Market Hall  
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**Environment Agency**

Phil Taylor  
National Permitting Service  
Environment Agency  
Richard Fairclough House  
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Email: [REDACTED]

Ms Julie Dingwell  
Waste Regulatory Specialist  
Northeast Area Office  
Tyneside House  
Skinnerburn Road  
Newcastle Business Park  
NEWCASTLE UPON TYNE  
NE4 7AR  
Contact Tel: 0191 203 4143  
Email: [REDACTED]

## **4 SITE DESCRIPTION**

### **4.1 Location**

The 1.4 ha site at National Grid Reference 296680E, 516290N is located off High Road at Water's Edge, Whitehaven, as shown on the Client's Site Plan, Appendix 1.2.

### **4.2 Topography and Site Features**

The site is generally flat-lying at an elevation of around 95 m AOD and is surfaced by demolition fill with localised hardstanding in the southeast. Three stockpiles (Stockpile 1 approx. 65 x 254 x 3 m, Stockpile 2 approx. 45 x 20 x 3 m and Stockpile 3 approx. 70 x 30 x 5 m) comprising fill were present at the time of the ground investigations in 2019 and 2020 in the central and southwestern areas as shown in Drawing 8190OD01Rev1, Appendix 1.1. The site is bordered by residential development to the north and east with derelict open space to the south and west.

## **5 PREVIOUS INVESTIGATIONS**

The following sections present details of the previous ground investigations, particular hazards identified, risks to human health and pollution to controlled waters, and specific remedial mitigation requirements.

## 5.1 Previous Investigations

Four previous phases of ground investigation were carried out for the site, as summarised below.

### **2013 – Integra Consulting Engineers, Geotechnical Ground Investigation including a review of previous URS 2001 and 2003 ground investigations (Ref. 1 and 2)**

These initial investigations comprised 6no window sample boreholes and 1no rotary open hole borehole followed by supplementary geotechnical investigations including 47no trial pits, 6no cable percussive boreholes and 9no rotary open hole boreholes and geotechnical SPT and U100 testing. The text of the main report and an exploratory hole location plan (which shows that the investigations were from a larger area than the current proposed development) have been provided for review. However, none of supporting appendices such as borehole logs, insitu or laboratory geotechnical testing data were available at the time of preparing this report. Therefore, we were only able to provide an outline review of the factual data presented within the text of the main report.

### **2020 – FWS Consultants Ltd – Phase 1 and 2 Geoenvironmental Investigation for Residential Development on Land at Water's Edge, Whitehaven (8190OR03Rev1, Ref. 3)**

The fieldwork was carried out between 22 and 23 August 2019 and subsequently 20 to 23 January 2020 and as shown in Drawing 8190OR02Rev1, Appendix 1.1 and comprised 5no window sample boreholes (mini-rig) to depths of 4.45 m bgl and 38no trial pits to depths of up to 3.5 m across the development site, with a further 21no trial pits within the three demolition fill stockpiles onsite and installation of gas and groundwater monitoring wells.

## 5.2 Summary of Previous Investigation Findings

A contamination and geotechnical review report was issued by FWS on 3 March 2020 (Ref. 3) that is summarised below:-

### **Previous Land Use**

The site history is summarised below and the principle land uses are illustrated in Drawing 8190OD01Rev1, Appendix 1.1:

- Pre-1850s to 1920s - Agricultural land.
- 1920s - Railway/sidings constructed in the southwest of the site.
- 1938 to 1957 - Building constructed in the north of the site as part of the development of the Rhodia chemical works, extending beyond the site boundary to the north, which is indicated to be a steel frame warehouse. 'L' shaped building constructed in the southeast of the site and indicated to be an office, with adjacent ancillary 'works' buildings and possible tanks/storage silos in the southeast and west
- Possible tanks/storage silos in the southeast and west have been removed by 1976 along with a number of the ancillary 'works' buildings in these areas.
- Railway/sidings in the southwest of the site have been removed by 1983.
- We understand that the main site operations ceased in 2005 and the majority of the former works buildings and infrastructure had been demolished and removed by 2012.

It is understood that the wider Rhodia Chemical Works extending to the south of the current development site manufactured naphthalene and coal distillate firelighters, sulphuric acid, cement plant, phosphate, phosphoric acid, fatty alcohol, surfactants and oil additives. It is unknown what

specific process activities were undertaken within the site boundary of the current proposed development. Review of the available records implies the site was predominantly utilised as office, warehouse and storage space with the main chemical works to the south.

### **Ground and Groundwater Conditions**

Granular and cohesive made ground of between 0.3 and 1.5 m thick was proven across the site. Locally in the southeast and southwest made ground extended to depths of up to 3.5 m bgl associated with the former tanks / silos and railway, respectively. Glacial Till was encountered beneath the made ground and was proven to extend to depths of up to 4.45 m bgl. Weathered sandstone bedrock recovered as clayey gravelly sand was encountered between 0.4 and 1.6 m bgl in the southeast and 1 to 2.4 m bgl in the east of the site. Competent sandstone bedrock was encountered between 0.8 and 2.4 m bgl in the southeast and 1.1 and 2.5 m bgl in the east.

Groundwater was encountered at depths between 0.3 and 1.2 m bgl and is anticipated to be shallow perched groundwater within granular made ground and granular horizons in cohesive made ground and Glacial Till deposits with a hydraulic gradient to the south / southwest of the site.

### **Contamination**

Testing of the granular and cohesive made ground has identified localised contamination, as summarised below:-

- None of the localised made ground topsoil or granular stockpiled made ground samples tested contained concentrations of contaminants above the generic assessment criteria.
- General granular made ground and cohesive made ground samples across the site (Hazard 1) recorded elevated concentrations of sulphate aqueous extract which pose a risk to the proposed properties.
- Cohesive stockpiled made ground (Hazard 2) recorded elevated concentrations of sulphate aqueous extract however, these materials are to be removed from site and as such will not pose a risk to the proposed development.
- Made ground in the areas of the former tanks / silos (Hazard 3) recorded elevated benzo(b)fluorene, benzo(a)pyrene, dibenzo(a,h)anthracene and sulphate aqueous extract in the west (TP102 and 103) and sulphate aqueous extract in the south of the site (TP117, 118 and 125) which pose a risk to human health and the proposed properties, respectively.
- Made ground in the area of the former railway (Hazard 4) recorded elevated sulphate aqueous extract and chrysotile/amosite asbestos fibres in the southwest/west of the site which pose a risk to human health and the proposed properties (Drawing 8190OD05, Appendix 1.1).
- Localised granular made ground (Hazard 1) along the southern boundary recorded elevated concentrations of TPH aromatic 12-16, 16-21 and 21-35 hydrocarbons and sulphate aqueous extract which pose a risk to human health and the proposed properties, respectively.

Characteristic Situation 2 gas conditions have been determined across the site and as such gas protection measures will be required for the proposed development. A hydrocarbon resistant membrane is also required along the south/southwestern boundary (Drawing 8190OD04, Appendix 1.1). No radon protection measures are required.

The schematic conceptual model (CSM) of the site (Ref. 3) is presented in Drawing 8190OD03Rev01, Appendix 1.1.

### 5.3 Reclamation Requirements

To address the contamination risks detailed in Ref. 3 and summarised above, the reclamation works shall incorporate the following mitigation measures:-

#### **Earthworks**

The following outline earthworks are currently anticipated:-

- 1 Excavation of cohesive fill arisings within Stockpiles 1 and 2 and the surplus volume from Stockpile 3 for removal offsite as predominantly Inert wastes. A proportion of Stockpile 3 is to be retained onsite, subject to further characterisation testing, for reuse as part of the proposed clean cover soil layers under a mobile plant licence and recovery operation.
- 2 Site preparation by excavation of surface vegetation and made ground to a depth of 0.2 m (including surface debris, vegetation, fly tipped waste, unsuitable made ground etc for offsite disposal) and existing hardstand areas to a depth of 0.4 m (for reuse in the permanent works following reprocessing, crushing and screening).
- 3 Site turnover and regrade of site levels including a cut of 1,953 m<sup>3</sup> and proposed fill of 3,751 m<sup>3</sup>, with an overall net shortfall of material of ~264 m<sup>3</sup> to achieve the proposed formation level. This will involve the sequential excavation and reinstatement:-
  - Removal of relic structures including all remaining pipework/infrastructure associated with the former tanks, and foundations, drainage and service ducts associated with the former works. Demolition arisings can undergo reprocessing by crushing and screening to generate Class 1 General Fill or Class 6F2 capping materials for re-use beneath buildings, hardstanding and road pavements to achieve the proposed site levels.
  - Excavation of 1,953 m<sup>3</sup> localised contaminated granular made ground (contaminated Class 1 General Fill) and localised contaminated cohesive made ground (contaminated Class 2 General Fill) and of natural clay (Class 2 General Fill or Class 4 Landscape Fill) as part of the site turnover and cut to the proposed sub-formation levels.
  - Reinstatement of 3,751 m<sup>3</sup> Site Won Contaminated Class 1 and 2 General Fill as an engineered fill to achieve the proposed subformation levels beneath carriageways, plots and garden areas.
  - Excavation of localised contaminated granular made ground (contaminated Class 1 General Fill) and localised contaminated cohesive made ground (contaminated Class 2 General Fill) to cut the private drainage (1,534 m<sup>3</sup>) and foundation arisings (Volume TBC). From the earthworks materials balance and proposed phasing, it is anticipated that these arisings will require be reinstated beneath buildings and structures (as part of the construction make-up) and any surplus arisings will then be disposed offsite.
  - Placement of 0.6 m thick anti-dig layer comprising compacted engineered fill and/or a geotextile membrane in the southwest of the site (Drawing 8190OD05, Appendix 1.1).
- 4 Reuse of clean Site Won natural clay (Class 4 Landscape Fill; Volume TBC) and importation of clean Class 4 Landscape Fill (Volume TBC) for placement as a clean cover layer in future gardens and landscaped areas.
- 5 Reuse of 1,015 m<sup>3</sup> Site Won Class 5 Topsoil (Stockpile 3) for placement as a clean cover layer in future gardens and landscaped areas under a mobile plant licence and end of waste recovery operation.

#### **Buildings and Infrastructure**

- 6 Incorporate a clean soil cover in garden and landscaped areas where underlain by contaminated made ground. As a minimum the clean cover soil layer in garden areas should comprise 0.45 m

thick subsoil and 0.15 m thick topsoil and in landscaped areas should comprise 0.3 m of subsoil and 0.15 m of topsoil.

- 7 An anti-dig layer comprising compacted engineered fill and/or a geotextile membrane should be installed in all domestic gardens and soft landscaped in the southwest of the site to mitigate the risk from localised asbestos (Drawing 8190OD05, Appendix 1.1). A capping layer comprised of at least 0.6 m thick inert material should be installed above the anti-dig layer.
- 8 Implement gas protection measures in the buildings to mitigate soil gas conditions designed for Characteristic Situation 2 in accordance with BS8485:2015 and CIRIA 665 (Refs. 4 and 5). Localised hydrocarbon contamination was recorded in the south/southwest of the site and as such, hydrocarbon resistant membranes should be installed within proposed buildings in this area (Drawing 8190OD04, Appendix 1.1).
- 9 Subject to the approval from the Water Authority, the water supply pipework will either need to be hydrocarbon resistant, or alternatively the service corridor backfilled with inert materials.
- 10 In-ground concrete should be designed for Sulphate Class DS-2 ACEC Class AC-2 for future structures in contact with the made ground.

### **Engineering**

- 11 Adoption of normal strip shallow foundations across the majority of the site, although, where higher foundation loads are required, or foundation depths have to be deepened to accommodate for the variable depth of made ground deep trench foundations may be utilised.
- 12 Where deep made ground (>2.5m) is encountered in the area of the former railway/sidings in the southwest of the site, and the former tanks / silos in the south, alternative foundation solutions such as deep trench or reinforced rafts may need to be considered.

## **6 RECLAMATION SCHEME**

The remediation scheme presented in the following sections has been developed in order to mitigate the risk to receptors detailed in Section 5.2 and meet the remediation requirements detailed above (Section 5.3).

### **Site Preparation Works (Section 6.1)**

- Site Preparation and Clearance (Section 6.1.1)
- Disconnection of Services (Section 6.1.2)
- Inspection of Formation Level (Section 6.1.3)

### **Reclamation Works (Section 6.2)**

- Treatment of Relict Structures (Section 6.2.1)
- Excavation and Reinstatement of Made Ground (Section 6.2.2)
- Treatment of Unidentified Contamination Hotspots (Section 6.2.3)

### **Earthworks Engineering (6.3)**

- Scope of Earthworks Operations (6.3.1)
- General Earthworks Procedures (6.3.2)
- Classification and Reuse of Materials (6.3.3)
- Classification of Site Won Materials (6.3.4)
- Importation of Materials (6.3.5)
- General Filling Requirements (6.3.6)
- Earthworks Validation (6.3.7)

## **General Measures Required During Built Development (Section 6.4)**

- Gas Protection Measures (Section 6.4.1)
- Concrete Protection and Design (Section 6.4.2)
- Services (Section 6.4.3)
- Provision of Clean Cover (Section 6.4.4)

## **Engineering Works (Section 6.5)**

- Lime/Cement Stabilisation (Section 6.5.1)
- Ground Improvement and Piled Foundations (Section 6.5.2)

### **6.1 Measures Required During Site Preparation Works**

The following works should be undertaken during site clearance as part of the enabling works.

#### **6.1.1 Site Preparation and Clearance**

The site shall be closed to the general public. The Contractor shall repair, renew or construct a perimeter fence, as necessary, to secure the site and works from unauthorised access.

Site clearance of surface detritus, such as timber and scrap materials including fly tipping shall be undertaken and appropriately disposed of. Vegetation (trees, shrubs, stumps, roots etc.) excavated as part of the site clearance shall be disposed off-site as non-hazardous waste. The proposed development will also include the removal of surface hardstanding (redundant access roads and floor slabs etc) that will be reprocessed by crushing and screening to generate a capping material for reuse in the permanent works

#### **Validation**

The Contractor shall provide inspection and validation records following the removal of surface hardstanding (redundant access roads and footpaths etc) and details of all materials disposed off-site (material type, volume, waste carrier, destination etc.) for inclusion within the Completion Report.

#### **6.1.2 Disconnection of Services**

Since the site has been historically developed, unidentified relict buried services and drainage is likely to remain onsite.

Where encountered during the demolition and site preparation works, the Contractor will remove relict drainage and carry out an inspection of pipework and interceptors, if present. Localised olfactory hydrocarbon contamination was noted associated with a former drainage pipe encountered in the southwestern part of the site, which was further investigated and only low concentrations of total hydrocarbons were encountered, with no vapour phase reported. As part of the grubbing out of all the former pipework/drainage, this area will ultimately be inspected for further significant contamination.

If evidence of unidentified contamination is observed by the Contractor then the Environmental Engineer will be informed and these areas dealt with in accordance with Section 6.2, below.

### **Validation**

Details of services disconnected or left on-site and records of any surveys undertaken are to be provided to the Environmental Engineer for inclusion in the Completion Report.

#### **6.1.3 Inspection of Formation Level**

On completion of site clearance, removal of surface hardstanding, preparation of the subformation level and during any deep excavations, the Contractor should inspect the site surface for visual and olfactory evidence of significant contamination. If evidence of unidentified contamination is observed by the Contractor then the Environmental Engineer will be informed and these areas dealt with in accordance with Section 6.2, below.

### **Validation**

The Contractor shall inspect the formation level for evidence of unidentified contamination and these inspection records, including photographs, shall be included within the Completion Report.

## **6.2 Remediation**

#### **6.2.1 Treatment of Relict Structures**

Surface hardstanding (concrete and asphalt surfacing) remains across parts of the site and a number of relict structures have been recorded during the previous investigations including concrete slabs and possible foundations. Given the historical development of the site further unrecorded below ground relict structures (foundations, floor slabs and drainage to former buildings and former railway sidings) should be anticipated.

All relict structures and hard strata (slabs, foundations, hardstanding, drains/service ducts, reinforced concrete) encountered during the reclamation works are to be removed. If any relict below ground structures are to be left in place, this is to be agreed with the Client in advance and the position of these structures are to be surveyed.

Due to the potential for unidentified relict structures that have not been previously investigated, the presence of contamination within these areas cannot be discounted. Should soil or groundwater hydrocarbon contamination (or buried asbestos) be identified or suspected, then the procedures detailed in Section 6.2.3 should be undertaken.

Where possible, all hard materials generated from the works should be crushed for re-use within the permanent works, as detailed in Section 6.3.

### **Validation**

The Contractor is to provide a record of the relict structures encountered and removed, along with those that were agreed to be left in place, including:-

- Correspondence relating to agreement for structures to be left in place; and,
- Before and after surveys and photographs.

#### **6.2.2 Excavation and Reinstatement of Made Ground**

### **Excavation**

It is proposed to regrade the site levels, which will include excavation of the following materials:-

- Locally contaminated granular made ground (contaminated/ combustible Class 1 General Fill);
- Locally contaminated cohesive made ground (contaminated Class 2 General Fill); and,
- natural Glacial Till (maybe clean or contaminated Class 2 General or Class 4 Landscape Fill) from general site turnover.

All excavated materials will be reinstated as an engineering fill (Class 1 or 2 General Fill) as summarised below and in accordance with Section 6.3 and Appendix 2.

### **Reinstatement**

Site Won contaminated granular made ground (contaminated Class 1 General Fill) and contaminated cohesive made ground (contaminated Class 2 General Fill); and natural Glacial Till (maybe clean or contaminated Class 2 General or Class 4 Landscape Fill) is to be reinstated within the permanent works in accordance with Section 6.3 and Appendix 2 to achieve the proposed subformation levels.

### **Validation**

The top level (existing) and final excavation level (base of dig after removal) of all made ground shall be surveyed.

On completion of these works, the Contractor is to provide a full record of the made ground removed and the reinstatement works and methods undertaken for inclusion within the Completion Report, including details of the volumes of made ground materials, their characterisation for re-use and their location within the permanent works.

## **6.2.3 Treatment of Unidentified Contamination Hotspots**

With the exception of the localised hydrocarbon contamination associated with a former drainage pipe and the occurrence of localised asbestos contamination associated with relict/buried rail infrastructure which were both in the southwestern part of the site, no other specific significant contamination hotspots have been identified (only general contamination associated with the made ground onsite and localised/isolated visual/olfactory evidence and low concentrations of hydrocarbons in the vicinity of the former above ground tanks and relict drainage).

Should additional visual or olfactory evidence of significant contamination be encountered either during the site inspection of the formation level (Section 6.1.3, above) or during the works, the Contractor is to liaise with the Environmental Engineer and implement an appropriate investigation strategy. The Local Authority shall be informed of the presence of such hotspots and will be presented with details of the proposed investigation and subsequent remediation scheme/mitigation measures to be adopted, as appropriate.

### **Validation**

If unidentified contamination is encountered, validation records shall be prepared detailing the locations, reclamation works and testing undertaken. These records shall be provided to the Environmental Engineer for inclusion within the Completion Report.

## **6.3 Earthworks Engineering**

### **6.3.1 Outline Scope of Earthworks Operations**

The following outline earthworks are currently anticipated:-

- 1 Excavation of cohesive fill arisings within Stockpiles 1 and 2 and the surplus volume from Stockpile 3 for removal offsite as predominantly Inert wastes. A proportion of Stockpile 3 is to be retained onsite, subject to further characterisation testing, for reuse as part of the proposed clean cover soil layers under a mobile plant licence and recovery operation.
- 2 Site preparation by excavation of surface vegetation and made ground to a depth of 0.2 m (including surface debris, vegetation, fly tipped waste, unsuitable made ground etc for offsite disposal) and existing hardstand areas to a depth of 0.4 m (for reuse in the permanent works following reprocessing, crushing and screening).
- 3 Site turnover and regrade of site levels including a cut of 1,953 m<sup>3</sup> and proposed fill of 3,751 m<sup>3</sup>, with an overall net shortfall of material of ~264 m<sup>3</sup> to achieve the proposed formation level. This will involve the sequential excavation and reinstatement:-
  - Removal of relic structures including all remaining pipework/infrastructure associated with the former tanks, and foundations, drainage and service ducts associated with the former works. Demolition arisings can undergo reprocessing by crushing and screening to generate Class 1 General Fill or Class 6F2 capping materials for re-use beneath buildings, hardstanding and road pavements to achieve the proposed site levels.
  - Excavation of 1,953 m<sup>3</sup> localised contaminated granular made ground (contaminated Class 1 General Fill) and localised contaminated cohesive made ground (contaminated Class 2 General Fill) and of natural clay (Class 2 General Fill or Class 4 Landscape Fill) as part of the site turnover and cut to the proposed sub-formation levels.
  - Reinstatement of 3,751 m<sup>3</sup> Site Won Contaminated Class 1 and 2 General Fill as an engineered fill to achieve the proposed subformation levels beneath carriageways, plots and garden areas.
  - Excavation of localised contaminated granular made ground (contaminated Class 1 General Fill) and localised contaminated cohesive made ground (contaminated Class 2 General Fill) to cut the private drainage (1,534 m<sup>3</sup>) and foundation arisings (Volume TBC). From the earthworks materials balance and proposed phasing, it is anticipated that these arisings will require be reinstated beneath buildings and structures (as part of the construction make-up) and any surplus arisings will then be disposed offsite.
  - Placement of 0.6 m thick anti-dig layer comprising compacted engineered fill and/or a geotextile membrane in the southwest of the site (Drawing 8190OD05, Appendix 1.1).
- 4 Reuse of clean Site Won natural clay (Class 4 Landscape Fill; Volume TBC) and importation of clean Class 4 Landscape Fill (Volume TBC) for placement as a clean cover layer in future gardens and landscaped areas.
- 5 Reuse of 1,015 m<sup>3</sup> Site Won Class 5 Topsoil (Stockpile 3) for placement as a clean cover layer in future gardens and landscaped areas under a mobile plant licence and end of waste recovery operation.

All materials excavated are to be inspected and selectively stockpiled into materials for on-site processing and recovery, including:-

- granular made ground for re-use as “contaminated” Class 1 material;
- cohesive made ground for re-use as “contaminated” Class 2 material;
- natural Glacial Till for re-use as “clean” and “contaminated” Class 2 or 4A material;
- crushed and screened demolition arisings for reuse as “clean” and “contaminated” Class 6F2 Capping material;
- Class U1 and U2 unacceptable materials for off-site disposal including wood, metal, rebar, plastic etc.

Following the selective stockpiling, all materials will require further earthworks and materials classification testing in accordance with the frequencies and requirements stated in this Specification.

All Class U1 and U2 unsuitable materials (including wood, timber, plastic, metal and rebar etc.) will be disposed off-site at a suitable waste treatment or disposal facility.

### **6.3.2 General Earthworks Procedures**

The following procedures will be implemented to control general aspects of the earthworks operations.

#### **Dust**

Dust generation during the development of the site may arise as a result from loading, haulage and placement of materials. Dust liberation will be more problematic during periods of extended dry weather and periods of high winds. Dust control by water spray shall be implemented, as necessary, and appropriate measures adopted to ensure that no deposition of mud and detritus occurs on public roads.

Due to the presence of localised asbestos containing materials and potentially loose disseminated fibres in the southeastern part of the site, all future construction works should be undertaken in accordance with the current CIRIA guidance document C733 - Asbestos in soil and made ground: a guide to understanding and managing risks (Ref. 6). Asbestos fibre monitoring shall be undertaken during excavation, crushing and placement of all “contaminated” made ground materials.

The Contractor shall provide, in a Dust Management Plan, details of the risk assessment undertaken and the health and safety precautions to be adopted to ensure dust presents no adverse risk to human health or nuisance to adjacent properties.

#### **Crushing**

If processing by crushing is required for any materials generated during the works to allow recycling and re-use this shall be undertaken by crushing, screening and grading. Any deleterious materials shall be disposed offsite. The crushed arisings shall be tested in accordance with an Earthworks Specification to confirm chemical and geotechnical suitability for re-use.

The Contractor is responsible for obtaining all appropriate licenses associated with the onsite crushing operations.

#### **Stockpiling**

It is likely that there will be a requirement for temporary stockpiles for demolition materials and excavations for foundations, including:-

- A proportion of Stockpile 3 is to be retained.
- Demolition arisings for reprocessing by crushing and screening.
- Granular and cohesive made ground from excavations to achieve the proposed site levels and from foundation excavations.
- Natural Glacial Till from excavations to achieve the proposed site levels and from foundation excavations.

- Class U1 and U2 unacceptable materials for off-site disposal including wood, metal, rebar, plastic etc.

These stockpiles shall be covered to minimise the liberation of dust and particulate matter, and minimise the generation of leachates that would otherwise need collecting by cut off trenches and onsite tanks prior to disposal offsite.

### **Control of Surface Water Run-Off**

Temporary stockpile areas constructed to receive earthworks materials should incorporate a Terram membrane basal layer and perimeter bunding to prevent excess sediment and surface water entering the existing onsite drainage and from egressing the site.

### **6.3.3 Classification and Re-use of Materials**

The reclamation method statement has been designed, in accordance with current legislation, to achieve the most sustainable earthworks solution practicable and meet the development design level requirements. All earthworks are to be undertaken in accordance with the requirements of the Specification for Highway Works (Ref. 7).

In the following sections, details are provided on:-

- How re-use of site won materials will be undertaken in compliance with the Waste Framework Directive.
- Classification of Site Won Materials.
- Requirements of Imported Materials.
- Acceptability of Materials for Incorporation into the Permanent Works.
- General Filling Requirements.

### **Compliance with Hazardous Waste and Waste Management Licensing Regulations**

The remediation strategy for the site has been designed to comply with current legislation and industry guidance, including:-

- Hazardous Waste (England and Wales) Regulations 2005.
- Environmental Permitting.
- Contaminated Land Regulations.
- Waste Framework Directive.
- Framework for the Classification of Hazardous Waste, Environment Agency 2004.
- CIRIA Report C733 Asbestos in Soil and made ground: a Guide to Understanding and Managing Risks

In compliance with Government policy on the treatment and disposal options of contaminated soil that, subject to the best practicable environmental option (BPEO) in each case, waste management of materials generated by the works will be based on a hierarchy in which the order of preference will be as follows:-

- Reduction.
- Re-use.
- Recover.
- Disposal.

In compliance with the Waste Framework Directive, it is proposed, where possible, to “re-use” materials and, where necessary undertake “recovery” operations, to enable incorporation of the materials within the earthworks operations. All appropriate licenses are to be obtained by the Contractor, in accordance with Environmental Permitting. Where re-use and recovery is not considered viable, offsite disposal to a suitably licensed facility is to be undertaken.

Where surface or groundwater is to be disposed of offsite to sewer, the Contractor is to undertake analysis of the liquids in accordance with the Water Authorities requirements to determine treatment requirements prior to disposal to sewer and obtain an appropriate discharge consent.

#### 6.3.4 Classification of Site Won Materials

All site-won earthworks materials are to be classified, in terms of their suitability for re-use in accordance with an Earthworks Specification. Presented below are the definitions of acceptable and unacceptable materials and a review of the classification of materials that may be generated as part of the works.

##### Acceptability of Earthworks Materials

The material types to be excavated will include relict hardstanding, granular and cohesive made ground and Glacial Till. The table below details the anticipated classification of site-won materials for re-use:-

**TABLE 1: CLASSIFICATION OF SITE WON MATERIAL**

| SHW CLASS | SUBDIVISION | PURPOSE                                     | DEFINITION                                                                          |
|-----------|-------------|---------------------------------------------|-------------------------------------------------------------------------------------|
| 1         | A - C       | Granular Fill                               | Site Won demolition arisings and granular made ground (maybe clean or contaminated) |
| 2         | A - C       | Cohesive Fill                               | Site Won cohesive made ground and cohesive Glacial Till (likely contaminated)       |
| 4         | A           | Cohesive Fill to Garden and Landscape Areas | Site Won cohesive Glacial Till (can only be clean)                                  |
| 5         | A           | Topsoil (Stockpile 3 to be retained)        | Site won Topsoil (maybe clean subject to further characterisation testing)          |
| 6         | F           | Selective Capping Materials                 | Site Won demolition arisings (maybe clean or contaminated)                          |

Notes:- SHW – Specification for Highway Works

| SOURCE                                        | ACCEPTABLE RE-USE                                  | CLASSIFICATION (IN ACCORDANCE WITH SHW) | TESTING REQUIREMENTS                                                                                                                                    |
|-----------------------------------------------|----------------------------------------------------|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Granular Fill (from regrading of site levels) | Contaminated and Combustible Granular General Fill | Class 1A/B (c) & Class 6R (c)           | Appendix 2 (Table 1/5 and 6/1 of the Earthworks Specification).<br>To only to be re-used beneath clean cover layers or beneath hardstanding/ buildings. |
| Cohesive Fill (from regrading of site levels) | Contaminated Cohesive Landscape Fill               | Class 2A/B (c) & Class 7E (c)           | Appendix 2 (Table 1/5 and 6/1 of the Earthworks Specification).<br>To only be re-used beneath clean cover layers or beneath hardstanding/buildings.     |
| Natural Glacial Till (from                    | Contaminated Cohesive General Fill                 | Class 2A/B (c) & Class 7E (c)           | Appendix 2 (Table 1/5 and 6/1 of the Earthworks Specification).                                                                                         |

| SOURCE                    | ACCEPTABLE RE-USE             | CLASSIFICATION (IN ACCORDANCE WITH SHW) | TESTING REQUIREMENTS                                                                                                                                                                                                                                              |
|---------------------------|-------------------------------|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| regrading of site levels) | Clean Cohesive General Fill   | Class 2A/B & Class 7E                   | Contaminated materials only to be re-used beneath clean cover layers or beneath hardstanding/ buildings.                                                                                                                                                          |
|                           | Clean Cohesive Landscape Fill | Class 4A                                | Where used as clean soils in gardens and landscaped areas - Table 6/6 (frequency of sampling: minimum of 3 samples per source or one sample per 250m <sup>3</sup> , whichever is greater).                                                                        |
| Topsoil (Stockpile 3)     | Clean Topsoil                 | Class 5A                                | Appendix 2 (Table 1/5 and 6/1 of the Earthworks Specification).<br><br>Where used as clean soils in gardens and landscaped areas - Table 6/6 (frequency of sampling: minimum of 3 samples per source or one sample per 250m <sup>3</sup> , whichever is greater). |

### ***Chemical Acceptability***

As part of the reclamation works, chemical acceptability testing will need to be undertaken on all site-won materials to be reused as “clean” fill and classified in terms of their contamination concentrations as defined below:-

- All material that is to be re-used as “clean” fill material shall be tested for total concentrations of contaminants and compared to ‘Acceptance Criteria’ presented in Table 6/6, Appendix 2. “Clean materials” will comprise inert materials that present no risk to the development, human health or the wider environment.
- Site-won “contaminated” fill materials (denoted ‘c’) may be generated by the works and will only be re-used as contaminated general and capping fills beneath hardstanding, buildings and clean cover layers.

### ***Geotechnical Acceptability***

In terms of a material’s geotechnical acceptability, all earthworks materials will first be tested as defined in an Earthworks Specification (to be prepared following detailed design) and acceptable earthworks materials will be those which meet the requirements of said Specification and do not contain the following constituents:-

- Perishable materials (i.e. wood, straw, sawdust and paper).
- Materials in a frozen condition.
- Materials having hazardous chemical, biological or physical properties.

### ***Unacceptable Materials***

Materials that cannot be incorporated into the works will be classified in accordance with the Specification for Highway Works (Ref. 7) as follows:-

- Class U1 unacceptable non-hazardous.
- Class U1A unsuitable.
- Class U1B contaminated non-hazardous.
- Class U2 unacceptable hazardous.

Where practicable, all unacceptable materials will be processed to permit re-use as acceptable materials within the works. Based on the current reclamation strategy, such reprocessing is

expected to include the following, subject to the Contractor obtaining the necessary approvals from the Regulators:-

- Selective segregation of materials.
- Crushing, screening and hand picking.
- Lime/cement stabilisation

Where reprocessing is impracticable to generate acceptable material, such materials will be considered as discard and will require to be disposed of offsite in accordance with the requirements of Section 8.

### **6.3.5 Importation of Materials**

Based on the earthworks requirements and development proposals, it is anticipated that there will be a requirement for the importation of clean subsoil and subject to the further characterisation testing of the topsoil (Stockpile 3) potentially further topsoil materials for the soil cover layer in future garden and landscaped areas. The following assessment and testing shall be undertaken by the Contractor prior to importation of any materials to site:-

- Review of available data; desk study and ground investigation information available for the source site shall be provided to the Engineer for review.
- Source material inspection; to confirm that there is no historical or visual evidence of hazardous contamination or materials.
- Source material testing; a minimum of three samples per sourced of imported materials shall be tested to demonstrate compliance with the acceptance criteria detailed in Table 1, Appendix 2.

#### ***Chemical Acceptability***

It is not acceptable to import materials from sources having known former contaminative use. Therefore, appropriate documentation (e.g. a desk study) and a record of a site inspection, will be required to demonstrate that the material has not been impacted on by contaminative land-uses.

Chemical analysis for total concentrations shall be undertaken on all imported materials at a typical frequency of three samples per source or 1 sample per 250 m<sup>3</sup> for subsoil/topsoil or 1 sample per 500 m<sup>3</sup> for general fill materials to assess the suitability of imported materials prior to acceptance onsite.

Only materials complying with the chemical acceptance criteria detailed in Table 1, Appendix 2 will be considered acceptable for use onsite.

#### ***Geotechnical Acceptability***

All imported materials will be tested in accordance with an Earthworks Specification, and acceptable earthworks materials will be those which meet the requirements of the Specification and do not contain the following constituents:-

- Perishable materials (i.e. wood, straw, sawdust and paper).
- Materials in a frozen condition.
- Materials having hazardous chemical, biological or physical properties.

### 6.3.6 General Filling Requirements

As part of the design of the reclamation strategy, to mitigate the risk of harm and pollution to controlled waters and to prepare a geotechnically stable development platform, the following specific requirements are to be imposed on the earthworks operations:-

#### **Finished Site Levels**

To prepare the site and provide a suitable working platform across the development, it is currently proposed to regrade the entire site as shown in Drawing 21201-D601-Rev1, Appendix 1.2. The residential development is to comprise 40 no detached and semi-detached properties as shown in Drawing 21201-D001-Rev2, Appendix 1.2, with finished floor levels between 93.65 m AOD (northwest) to 96.125 m AOD (southern boundary) are currently proposed. Construction of the carriageways and hardstand areas is expected to be undertaken within 0.85 m of the proposed finished floor levels of adjacent structures. There will be public green space with new planting of trees and all properties will have domestic gardens. At this stage, an area of proposed offline cellular storage (1.2 m deep with minimum of 0.5 m cover and volume of up to 240 m<sup>3</sup>) is proposed in the POS area in the southwestern part of the site.

#### **Requirements for Excavation, Deposition and Compaction**

The Contractor shall undertake the earthworks in accordance with the requirements for excavation, deposition and compaction as set out in a detailed Earthworks Specification (Appendix 2).

#### **Re-use of Site Won “Contaminated” Materials**

Granular and cohesive made ground onsite has been determined to contain localised elevated concentrations of non-hazardous contaminants. To mitigate the risk to the development and to minimise the complexity of onsite screening of soils, all granular and cohesive made ground excavated onsite shall be considered as contaminated and shall not be re-used above formation level to garden, landscaped areas or within service corridors.

All “contaminated” non-hazardous materials will be placed below a clean cover, hardstanding or building floor slab.

#### **Re-use of Site Won “Clean” Materials**

Where site won materials have been classified as ‘clean’ they may be re-used within all areas of the site including as a clean cover material within the garden and landscaping areas.

#### **Destination of Materials within Earthworks**

It is anticipated that to achieve the designed levels, the following use of site won and imported materials will be necessary within the proposed filling operations.

**TABLE 2: DESTINATION OF MATERIALS**

| LOCATION/PURPOSE                                        | SHW CLASS  | SOURCE                                              | COMMENTS                                                                  |
|---------------------------------------------------------|------------|-----------------------------------------------------|---------------------------------------------------------------------------|
| Topsoil for garden and landscaped areas across          | Class 5A&B | Site won and Imported topsoil materials             | Materials shall not contain contaminants in excess of acceptance criteria |
| Subsoil for clean covers in garden and landscaped areas | Class 4    | Site Won Glacial Till or Imported subsoil materials | Materials shall not contain contaminants in excess of acceptance criteria |

| LOCATION/PURPOSE                                                                                                                  | SHW CLASS                                                                                                                         | SOURCE                                                                                            | COMMENTS                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Inert insulation/break layer for clean covers in garden and landscaped areas in the southwestern area                             | Class 4                                                                                                                           | Site Won Glacial Till and Imported cohesive subsoils                                              | Materials shall not contain contaminants in excess of acceptance criteria                                                                                                                                                                                                                                  |
| General Fill and Capping materials to be placed beneath properties and highways to achieve the proposed finished formation levels | Class 1 (c)<br>Class 2 (c)<br>Class 6F2 (c)<br><br>Where wet of optimum moisture Class 6R and 7E (to be stabilised as Class 9D/F) | Site Won reprocessed demolition materials, made ground and natural Glacial Till from excavations. | Maybe clean or contaminated.<br><br>Only re-use contaminated materials beneath hardstanding, buildings or clean soil covers in garden and landscaped areas.<br><br>However, where materials are to be re-used as “clean” fill – materials shall not contain contaminants in excess of acceptance criteria. |

### 6.3.7 Earthworks Validation

Compliance records will be compiled of:-

- Classification and acceptability testing;
- Volumes and types of site won material reused;
- Import volumes and material types used;
- Basic waste characterisation, destination and volumes of materials disposed of offsite; and,
- Topographic survey records including pre-works and finished ground levels.

These records will be compiled by the Contractor in an Earthworks Completion Report.

## 6.4 General Measures Required During Built Development

### 6.4.1 Gas Protection Measures

The proposed residential development is to be designed to incorporate Characteristic Situation 2 gas protection measures in accordance with BS8485:2015 (Ref. 4). However, the soil gas conditions across the site will need to be re-evaluated following completion of the gas monitoring programme, which is still currently ongoing. For a Type A private residential building (high risk) the designed gas protection system should have a minimum 3.5 points in compliance with Tables 5, 6 and 7 (Ref. 4). This requires low level gas protection measures consisting of a combination of two or more of the following:-

- A structural barrier (floor and substructure design) – Table 5 of Ref. 4.
- Ventilation measures – Table 6 of Ref. 4.
- A propriety gas resistant membrane meeting all of the criteria detailed in Table 7 of Ref. 4.

Where localised visual/olfactory and low concentrations of hydrocarbons have been proven in the southwestern parts of the site associated with the former above ground tanks and onsite drainage, it would be precautionary to incorporate a vapour proof membrane into the final gas protection measures (Drawing 8190OD04, Appendix 1.1). However, this should be reviewed following the site reclamation works and removal of relict structures and turnover of the made ground onsite as subject to the materials encountered and remaining insitu, further additional areas may warrant vapour proof membranes.

Detailed design of the gas protection measures to be accommodated for in the development will be in accordance with BS8485:2015 (Ref. 4).

#### **Validation**

Full details of the gas protection system installed are to be provided to the Environmental Engineer on completion, including installation Method Statements meeting the requirements of the Manufacturer, a gas membrane manufacturer's certificate and product details.

Following completion of the installation works, the Contractor shall provide the Engineer with an installation compliance certificate and separate validation report for the installation of gas protection measures in accordance with CIRIA C735 (Ref. 8).

### **6.4.2 Concrete Protection and Design**

All in-ground concrete in contact with made ground should be designed to Design Sulphate Class DS-2 ACEC Class AC-2 in accordance with BRE Special Digest 1:2005, Concrete in Aggressive Ground (Ref. 9).

#### **Validation**

Documentary records of the in-ground concrete used shall be provided to the Environmental Engineer for inclusion within the Completion Report.

### **6.4.3 Services**

Where in-ground potable water supply pipes shall be in contact with made ground materials these are to be designed to be chemically resistant, or placed within a clean corridor, as specified by the respective statutory undertaker, to accommodate for the contaminants identified onsite.

Where low level residual asbestos contamination remains in the made ground, either a separation layer, mechanical break layer or geogrid marker layer should be placed around the services and backfill materials across this area.

#### **Validation**

Documentary records of the in-ground potable water supply pipework used in areas of made ground shall be provided to the Environmental Engineer for inclusion within the Completion Report.

### **6.4.4 Clean Cover Soils**

Localised elevated concentrations of hydrocarbons and isolated asbestos in the southwestern area were recorded in the made ground that would present a risk of harm to end-users in future garden and landscaped areas. In addition, it is also considered that these made ground materials present across the rest of the site would be unsuitable as a rooting medium for plant growth.

Therefore, where made ground materials are to remain insitu in future garden and landscaped areas they will need to be either contained beneath hardstanding / buildings or a designed clean cover soil layer, including an inert 'insulation' layer where localised asbestos contaminated made ground is present in the southwestern part of the site (Drawing 8190OD05, Appendix 1.1), as summarised below:-

- General Plots / Gardens = 600 mm (Total Clean Cover)
  - 250 mm topsoil/growing medium.
  - 350 mm sub-soil.
- Southwestern Area Plots / Gardens = 1000 mm (Total Clean Cover)
  - 250 mm topsoil/growing medium.
  - 150 mm sub-soil.
  - 600 mm of inert compacted material or geotextile membrane that will act as a break layer for any potential asbestos contamination.
- Landscape / POS areas = 450 mm (Total Clean Cover)
  - 250 mm topsoil/growing medium.
  - 200 mm sub-soil.
  - (southwestern area only; additional 600 mm of inert compacted material or geotextile membrane that will act as a break layer for any potential asbestos contamination).

Following detailed design of the earthworks, the final requirements for clean cover soil layers will be reviewed.

### **Validation**

All site won and imported topsoil (Class 5) and subsoil (Class 4) materials utilised in future garden areas or as part of the landscaping shall be tested, prior to re-use, at a minimum frequency of 3 samples per source or 1 test per 250 m<sup>3</sup> for the suite of determinands detailed in Table 1, Appendix 2.

Validation of the thickness of the clean cover placed within each area is to be provided by means of a contoured topographic survey for clean cover formation level, the plan area and top of the mechanical break layer (granular or geotextile) and the top of the subsoil and topsoil layers.

Validation of the thickness and chemical quality of the as placed subsoil and topsoil materials placed to form the clean cover in garden areas will be verified by undertaking hand excavated trial pits through the clean cover in each plot. A sample of the topsoil and subsoil material will be obtained and tested for the suite of determinands and acceptability criteria detailed in Table 1, Appendix 2 at a frequency of 1 pit per 3 plots.

## **6.5 Engineering Works**

The following ground improvement and foundation engineering works will be required within the development:-

- Lime/cement modification may be required of bulk fill during earthworks.
- Raft foundations to the selected residential plots may be required.

### **6.5.1 Lime/Cement Stabilisation**

Lime cement stabilisation may be used to modify wet Site Won General Fill materials to generate acceptable general fill for re-use in the earthworks.

Where implemented, records of the site trials, processes used, the modification and stabilisation achieved and materials placed are to be provided to the Environmental Engineer for inclusion in the Completion Report.

### **6.5.2 Raft Foundations**

The detailed foundation design is currently in progress and it proposed that the low rise residential buildings are supported on a combination of shallow strip or deep trench across the majority of the site. At this stage, only Plots 14, 15 and 29 may require alternative foundation solutions such as reinforced rafts, but this design is subject to further investigations in these areas.

## **7 CONTINGENCY MEASURES**

The following contingency arrangements are incorporated into the Reclamation Method Statement to ensure changes or unforeseen conditions during the works are accommodated for.

### **7.1 Out of Specification Materials**

In the event that site won materials do not meet the acceptance criteria for the proposed purpose of reuse, the Contractor will be responsible for undertaking all necessary material segregation, testing and pre-treatment to make the material suitable for reuse for either its intended or an alternative purpose within the permanent works.

Where practicable, and cost effective, materials that do not meet the Specification and are unsuitable for reuse and require offsite disposal should be selected and pre-treated to minimise characterisation and disposal as hazardous waste and to maximise characterisation as either non-hazardous or, where possible, inert waste.

### **7.2 Surplus Materials**

In the event that surplus materials are generated by the works, the Contractor will be responsible for undertaking all necessary material segregation, testing and pre-treatment to make the material suitable for reuse for an alternative purpose within the permanent works. Where necessary, the reuse of materials generated from the works will be prioritised to achieve a materials balance.

### **7.3 Programme Changes and Extensions**

In the event of changes to the earthworks programme or materials balance, the Contractor is to amend their Phasing Programme accordingly. If unforeseen events occur that impact on the programme, the Contractor will be responsible for mitigating the programme delays, where reasonably possible, and providing for additional temporary stockpiling, and providing the Client with an amended earthworks programme.

## **8 WASTE DISPOSAL**

### **8.1 General**

It is currently proposed that the existing Stockpiles 1 and 2, and the surplus volume of stockpile 3 will undergo excavation and removal offsite as predominantly Inert wastes. Where site won contaminated materials are identified, these will be selectively stockpiled and tested as detailed in Section 6.2. Grossly contaminated materials are not anticipated, however, if encountered (e.g.

free product or cached asbestos) these materials will be selectively excavated and stockpiled for offsite disposal, it is likely that these materials would classify as Hazardous Waste for disposal purposes.

Where possible, the Contractor shall re-use all excavated materials within the works. However, depending on the final development levels to be adopted and the final earthworks cut/fill balance there may be a requirement for made ground materials to be disposed offsite at a suitably licenced waste disposal facility.

## **8.2 Waste Characterisation and Acceptance Criteria**

Should materials be generated that require offsite disposal, the Contractor will be responsible for characterising all wastes in accordance with The Landfill Directive, the List of Wastes (England) Regulations 2005, the Hazardous Waste (England and Wales) Regulations 2005 and Technical Guidance WM3 Guidance on the classification and assessment of waste (1<sup>st</sup> edition V1.1 2018), including any subsequent amendments. The Contractor will be fully responsible for undertaking all additional necessary testing. The Contractor will ensure that no mixing of generated wastes occurs and that no cross contamination of waste streams occurs.

Where practicable, and cost effective, materials requiring off-site disposal should be selected and pre-treated to allow disposal as either non-hazardous or, where possible, inert waste.

## **8.3 Liaison with Waste Disposal Operators**

The Contractor shall be responsible for identifying suitable waste disposal operators for all types of waste likely to be generated by the site. The Contractor shall provide all information required by the operator for them to accept the waste in a timely manner so that waste can be removed from site quickly and large stockpiles of contaminated material are not held onsite.

## **8.4 Chain of Custody**

Where materials are to be removed for disposal offsite the Contractor shall comply with current legislation and shall operate a full consignment note system.

# **9 HEALTH AND SAFETY REQUIREMENTS**

## **9.1 General**

The works are to be undertaken in accordance with all relevant legislation and industry guidance including:-

- The Health and Safety at Work Act 1974.
- The Construction (Design and Management) Regulations 2015.
- Construction Health and Safety and Welfare Regulations 1996.
- The Control of Substances Hazardous to Health Regulations 1994.
- CIRIA guidance document C733 - Asbestos in soil and made ground: a guide to understanding and managing risks.

A Construction Phase Health and Safety Plan will be prepared by the Contractor for approval by the Client. The Contractor will be responsible for providing all necessary information (drawings

and documentation etc.) required by the Construction Phase Health and Safety Plan, which will be compiled into the project Health and Safety File.

## 9.2 Provision of Personal Protective Equipment

Contaminated soils have been identified on-site, therefore, appropriate health and safety measures and working practices will be adopted to be generally in accordance with The Health and Safety Executive Publication “Protection of Workers and the General Public during the Development of Contaminated Land” (Ref. 13) and CIRIA guidance document C733 (Ref. 6) and will include:-

- Site personnel should be issued with protective clothing, hard hats, footwear and gloves and provided with instruction on how these are to be used.
- Site personnel will wear protective clothing and equipment at all times.
- Hand washing and boot cleaning facilities will be provided.
- No smoking except in designated areas.
- Good practices relating to personal hygiene will be adopted.

This will reduce the possibility of harm to construction and maintenance workers by direct contact particularly in relation to earthwork operations.

All site workers will be clearly informed by formal notice about the health and safety risks from the identified soil contaminants and will be trained in the procedures to be adopted if such materials are encountered in the works.

## 9.3 Asbestos

Due to the presence of localised asbestos containing materials and potentially loose disseminated fibres in the southwestern part of the site, the site health and safety file should be updated to highlight the potential for asbestos to be encountered during intrusive site works. This information should be made available to all future construction and maintenance workers that may come into contact with the made ground materials onsite.

All future construction works should be undertaken in accordance with the current CIRIA guidance document C733 - Asbestos in soil and made ground: a guide to understanding and managing risks (Ref. 6). Asbestos fibre monitoring shall be undertaken during excavation, crushing and placement of all “asbestos contaminated” made ground materials. The Contractor shall provide, in a Dust Management Plan, details of dust prevention measures, the boundary and staff personnel monitoring to be undertaken for this purpose and assessment limits to be applied.

## 9.4 Soil Gas Monitoring

Soil gas and vapour monitoring shall be undertaken in areas of made ground prior to, and during man entry, where man access to excavations, buried chambers and confined spaces is carried out.

Before man entry into any excavation or confined space a risk assessment shall be carried out to determine the appropriate level of PPE and personal monitoring required. Only personnel trained to use this equipment shall be allowed to work in gas or vapour impacted areas. A permit to work system under the supervision of both the Contractor and the Engineer’s Representative shall be used to control access to and work in excavations and confined spaces.

If the following action levels are exceeded, appropriate measures as defined by the Principal Contractor's Health and Safety Plan should be taken in order to protect workers.

| SOIL GAS/VAPOUR | ACTION LEVEL |
|-----------------|--------------|
| Methane         | 1.0%         |
| Carbon Dioxide  | 1.5%         |
| Oxygen          | <17%         |

## 10 TRACKING SYSTEMS

The Contractor is to maintain a tracking system that must include: -

- Annotated plans of the site identifying different excavation areas (referenced to site investigation data, as appropriate), stockpile locations, treatment areas (if applicable) and placement locations.
- Inspection procedures.
  - Visual and olfactory;
  - Field tests (as appropriate); and,
  - Laboratory confirmation (as appropriate).
- Details of the registered waste carrier and non-waste hauliers used.
- Tracking form / control sheets and a cumulative record of materials cut and placed from each source.
- Movement through any authorised treatment facility.
- Treatment results (if applicable).
- Delivery tickets for non-waste materials (if moving from one site to another):
  - Drivers name and vehicle registration;
  - Quantity (running tally for each receiving site / sub area); and,
  - Destination (receiving site and / or sub area).
- Acceptance procedures for non-waste materials:
  - Visual and olfactory;
  - Field tests (as appropriate);
  - Laboratory confirmation (as appropriate);
  - Signed delivery tickets (including instructions where to off load, as appropriate); and,
  - Record of where placed.

## 11 REMEDIATION AUDIT PROCEDURE

### 11.1 Responsibilities of the Contractor

The Contractor shall provide documentary records of the procedures carried out during the course of the works for collation by the Environmental Engineer, including:-

- Method Statements.
- Site diary of the works or programme of works.
- Records of the demolition works undertaken, materials generated and reprocessing undertaken to generate materials for reuse.
- Records of the decommissioning of services across the site.
- Record of the inspection of the cut made ground surface for evidence of contamination following site clearance and preparation.

- Plans and records of the volumes and nature of materials excavated during the enabling pre-construction works, including top level (existing), final excavation level (base of dig after removal) and reinstatement level (completion of works) surveys for the following:-
  - Made ground; and,
  - Natural Glacial Till.
- All earthworks characterisation and acceptability testing undertaken in accordance with an Earthworks Specification.
- Design details, method statements and validation records (in accordance with CIRIA C735) for the construction of the gas protection measures including supplier method statements, product information, delivery notes, as-built drawings and photographs.
- Details water supply pipework used and classification of in-ground concrete.
- Documentary evidence including desk study and source sampling of all imported materials used on-site, delivery dates, quantities and delivery tickets, and a record of where they have been placed onsite.
- Documentation of all licenses, consents, permits etc issued by the Statutory and Regulatory Authorities and evidence of compliance with any requirements of the above.
- Documentation for all wastes disposed of off-site including quantities, waste transfer notes, landfill details and waste carrier certificates.

The Contractor will provide the Environmental Engineer with all the required documentation relating to the remediation works within one week of receipt of the test results and topographic surveys, with a final collated record of all data on completion.

## 11.2 Audit of Site Remediation

The Environmental Engineer shall audit the site remediation works by undertaking the following:-

- Inspect and validate all occurrences of unidentified contamination reported by the Contractor and undertake liaison with the Regulators, as necessary.
- Audit that the sampling and laboratory analyses of materials handled during the works are undertaken in compliance with the Method Statement.
- Audit compliance testing records of the site won clean materials and verification of the thickness of clean cover soils and mechanical break layer placed within garden and landscaped areas.
- Inspection and validation sampling of placed subsoil and topsoil to confirm the depths placed in garden and landscaped areas and their chemical quality.
- Inspect and audit that the construction of the gas protection measures to ensure they are undertaken in compliance with the Method Statement and verified by a suitable independent contractor.
- Liaise with the Regulatory and Statutory Authorities on environmental matters, as required, to ensure their satisfaction with the site works and compliance with all planning consent conditions, licensing requirements etc.
- Collate documentary records to be provided by the Contractor on the remediation procedures undertaken and prepare the Validation Report to be submitted on completion of the remediation works.

### 11.3 Regulatory Approval

The Developer will be responsible for advising the Local Authority and the NHBC of the programme for the works, providing access for them to inspect the works to enable gaining regulatory and NHBC approval for the Remediation Scheme and for submission of the Validation report on completion of the works.

### 11.4 Reporting

The Environmental Engineer will be responsible for co-ordinating and documenting all aspects of the reclamation, as detailed above in Sections 11.1 and 11.2.

### 11.5 Validation and Certification of Reclamation

A Validation Report, including the certification of the reclamation works, will be submitted to the Local Authority on completion.

A handwritten signature in black ink, appearing to read 'M. R. Lakey', enclosed within a hand-drawn oval.

M LAKEY  
DIRECTOR

## 12 REFERENCES

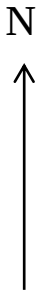
- 1 URS Corporation Ltd, February 2008. Former Albright & Wilson Works, Whitehaven, Cumbria. Ref. MARP0002.
- 2 Integra Consulting Engineers, May 2013. Geotechnical Ground investigation at Land at Former Rhodia Offices, High Road, Whitehaven, Cumbria For Story Homes, Ref. 2599.
- 3 FWS Consultants Ltd, March 2020. Phase 1 and 2 Geoenvironmental Investigation for Residential Development on Land at Water's Edge, Whitehaven. Report Ref. 8190OR03Rev1.
- 4 BS8485:2015. Code of Practice for the Characterisation and Remediation from Ground Gas in Affected Developments. BSI.
- 5 CIRIA C665, 2007. Assessing Risks Posed by Hazardous Ground Gases to Buildings.
- 6 CIRIA C733, 2014. Asbestos in soil and made ground: a guide to understanding and managing risks.
- 7 Volume 1, Specification for Highways Works, Series 600 Earthworks. November 2009.
- 8 CIRIA C735, 2014. Good practice on the testing and verification of protection systems for buildings against hazardous ground gases.
- 9 BRE, 2005. Concrete in Aggressive Ground, BRE Special Digest 1.
- 10 UK Water Industry Research Ltd, 'Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites', Ref 10/WM/03/21, August 2010.
- 11 CIRIA, 1996, SP124 Barriers, liners and cover systems for containment and control of land contamination.
- 12 BRE, 2004, Cover Systems for Land Regeneration.
- 13 Health and Safety Executive Publication "Protection of Workers and the General Public during the Development of Contaminated Land".

# **APPENDIX 1**

## **DRAWINGS**

## **APPENDIX 1.1**

### **FWS DRAWINGS**



| NOTES / KEY                     |  | DRAWING TITLE            |  | CLIENT                |                |
|---------------------------------|--|--------------------------|--|-----------------------|----------------|
| SITE LOCATION                   |  | SITE FEATURES            |  | GLEESON HOMES CUMBRIA |                |
| FOOTPRINT OF HISTORIC BUILDINGS |  |                          |  | STATUS                | PROJECT NUMBER |
| DEMOLITION STOCKPILES           |  |                          |  | FINAL                 | 8190           |
| WATERLOGGED GROUND              |  | PROJECT TITLE            |  | DRAWN BY              | DATE           |
|                                 |  | WATER'S EDGE, WHITEHAVEN |  | GH                    | April 2019     |
|                                 |  |                          |  | SCALE                 | DRG. No.       |
|                                 |  |                          |  | NOT TO SCALE          | 81900001Rev1   |

FORMER TANKS

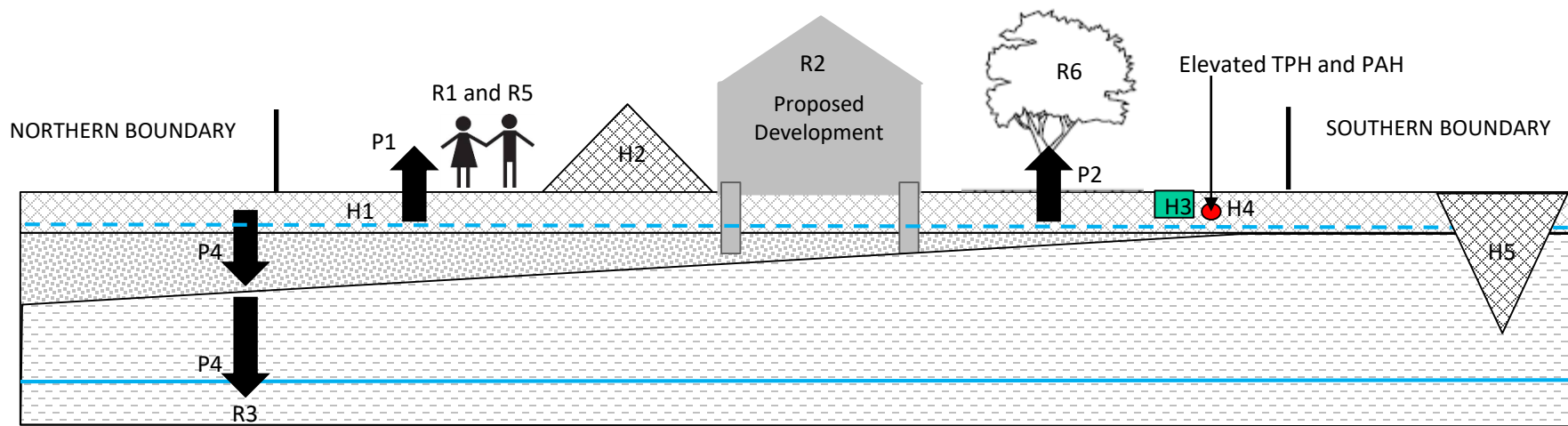
**FWS** Geotechnical & Environmental Consultants  
1 Redwood Crescent,  
Office 1.8, Peel Park  
East Kilbride  
South Lanarkshire  
G745PA  
Tel: 01355 207 778  
admin@fwsconsultants.com www.fwsconsultants.com



| NOTES / KEY                     |   | DRAWING TITLE                  |  | CLIENT        |                |
|---------------------------------|---|--------------------------------|--|---------------|----------------|
| SITE LOCATION                   | — | EXPLORATORY HOLE LOCATION PLAN |  | GLEESON HOMES |                |
| FOOTPRINT OF HISTORIC BUILDINGS | — | PROJECT TITLE                  |  | STATUS        | PROJECT NUMBER |
| DEMOLITION STOCKPILES           | — |                                |  | FINAL         | 8190           |
| WATERLOGGED GROUND              | — | WATER'S EDGE, WHITEHAVEN       |  | DRAWN BY      | DATE           |
|                                 |   |                                |  | NT            | February 2020  |
|                                 |   |                                |  | SCALE         | DRG. No.       |
|                                 |   |                                |  | NOT TO SCALE  | 8190002Rev1    |

|                       |       |
|-----------------------|-------|
| TRIAL PITS (Aug 2019) | TP1   |
| TRIAL PITS (Jan 2020) | TP101 |
| SOIL BOREHOLES        | 1     |
| STOCKPILE PITS        | S1    |
| FORMER TANKS          |       |

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| Source of Hazard / Pollutant |                                                                                                                                       | Pathway |                                                                 | Receptor |                                                                              | Severity of Consequence | Probability of Occurrence | Level of Risk |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|---------|-----------------------------------------------------------------|----------|------------------------------------------------------------------------------|-------------------------|---------------------------|---------------|
| H1                           | Made ground associated with the demolition of the former chemical works including hydrocarbon contamination recorded in the southwest | P1      | Inhalation, ingestion and dermal contact                        | R1<br>R5 | Future End Users<br>Construction Workers                                     | Severe                  | Likely                    | High          |
|                              |                                                                                                                                       | P2      | Direct contact                                                  | R6       | Plants/Landscaping (If proposed on future development)                       | Medium                  | Low Likelihood            | Low           |
|                              |                                                                                                                                       | P4      | Leaching of contaminants vertically or laterally to groundwater | R3<br>R4 | Perched Groundwaters<br>Whitehaven Sandstone Formation - Secondary A Aquifer | Medium                  | Low Likelihood            | Low           |
|                              |                                                                                                                                       | P3      | Soil gas or soil vapours pooling within the structures          | R2       | Property (Human Health in confined spaces)                                   | Medium                  | Likely                    | Moderate      |
| H2                           | Stockpiled made ground in the centre, north and west of the site                                                                      | P1      | Inhalation, ingestion and dermal contact                        | R1<br>R5 | Future End Users<br>Construction Workers                                     | Severe                  | Likely                    | High          |
|                              |                                                                                                                                       | P2      | Direct contact                                                  | R6       | Plants/Landscaping (If proposed on future development)                       | Medium                  | Low Likelihood            | Low           |
| H3                           | Elevated PAHs associated with the former tanks / silos in the west and southeast of the site                                          | P1      | Inhalation, ingestion and dermal contact                        | R1<br>R5 | Future End Users<br>Construction Workers                                     | Severe                  | Likely                    | High          |
|                              |                                                                                                                                       | P2      | Direct contact                                                  | R6       | Plants/Landscaping (If proposed on future development)                       | Medium                  | Likely                    | Moderate      |
|                              |                                                                                                                                       | P4      | Leaching of contaminants vertically or laterally to groundwater | R3<br>R4 | Perched Groundwaters<br>Whitehaven Sandstone Formation - Secondary A Aquifer | Medium                  | Low Likelihood            | Low           |
|                              |                                                                                                                                       | P3      | Soil gas or soil vapours pooling within the structures          | R2       | Property (Human Health in confined spaces)                                   | Mild                    | Likely                    | Low           |

#### NOTES / KEY



MADE GROUND



STOCKPILE



GLACIAL TILL



WHITEHAVEN SANDSTONE FORMATION

#### DRAWING TITLE

CONCEPTUAL SITE MODEL AND PRELIMINARY RISK ASSESSMENT

#### PROJECT TITLE

WATER'S EDGE, WHITEHAVEN

#### CLIENT

GLEESON HOMES CUMBRIA

#### STATUS

FINAL

#### DRAWN BY

NT

#### SCALE

NOT TO SCALE

#### PROJECT NUMBER

8190

#### DATE

Sept 2019

#### DRG. No.

8190D03Rev1

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| Source of Hazard / Pollutant |                                                                                                                                          | Pathway |                                                                 | Receptor |                                                                              | Severity of Consequence | Probability of Occurrence | Level of Risk |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|---------|-----------------------------------------------------------------|----------|------------------------------------------------------------------------------|-------------------------|---------------------------|---------------|
| H4                           | Contaminated made ground associated with the former railway in the southwest of the site including sulphate aqueous extract and asbestos | P1      | Inhalation, ingestion and dermal contact                        | R1<br>R5 | Future End Users<br>Construction Workers                                     | Severe                  | Likely                    | High          |
|                              |                                                                                                                                          | P2      | Direct contact                                                  | R6       | Plants/Landscaping (If proposed on future development)                       | Medium                  | Low Likelihood            | Low           |
|                              |                                                                                                                                          | P4      | Leaching of contaminants vertically or laterally to groundwater | R3<br>R4 | Perched Groundwaters<br>Whitehaven Sandstone Formation - Secondary A Aquifer | Medium                  | Low Likelihood            | Low           |
|                              |                                                                                                                                          | P3      | Soil gas or soil vapours pooling within the structures          | R2       | Property (Human Health in confined spaces)                                   | Medium                  | Likely                    | Moderate      |
| H5                           | Landfill gas migration sourced form the backfilled coal pit to the south                                                                 | P3      | Soil gas or soil vapours pooling within the structures          | R2       | Property (Human Health in confined spaces)                                   | Medium                  | Low Likelihood            | Low           |

NOTES / KEY



MADE GROUND



GLACIAL TILL



WHITEHAVEN SANDSTONE FORMATION



STOCKPILE

DRAWING TITLE

CONCEPTUAL SITE MODEL AND PRELIMINARY RISK ASSESSMENT

PROJECT TITLE

WATER’S EDGE, WHITEHAVEN

CLIENT

GLEESON HOMES CUMBRIA

STATUS

FINAL

PROJECT NUMBER

8190

DRAWN BY

NT

DATE

Sept 2019

SCALE

NOT TO SCALE

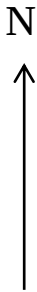
DRG. No.

8190OD03Rev01

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MADE GROUND: Firm blackish brown slightly sandy slightly gravelly CLAY with low cobble and boulder content. Gravel is fine to coarse angular to rounded of sandstone mudstone coal brick plastic concrete metal and ceramic. Boulders are angular to subangular of concrete.

TP101 0.4 m bgl Chrysotile

TP104 0.6 m bgl Amosite

MADE GROUND: Firm brownish grey mottled white slightly gravelly sandy CLAY. Gravel is fine to coarse angular to subrounded of sandstone brick concrete and slag.

Historic railway line

#### NOTES / KEY

SITE LOCATION



AREA OF PROPOSED ANTI-DIG LAYER



#### DRAWING TITLE

PROPOSED ANTI-DIG LAYER

#### PROJECT TITLE

WATER'S EDGE, WHITEHAVEN

#### CLIENT

GLEESON HOMES CUMBRIA

#### STATUS

FINAL

#### DRAWN BY

GH

#### SCALE

NOT TO SCALE

#### PROJECT NUMBER

8190

#### DATE

September 2022

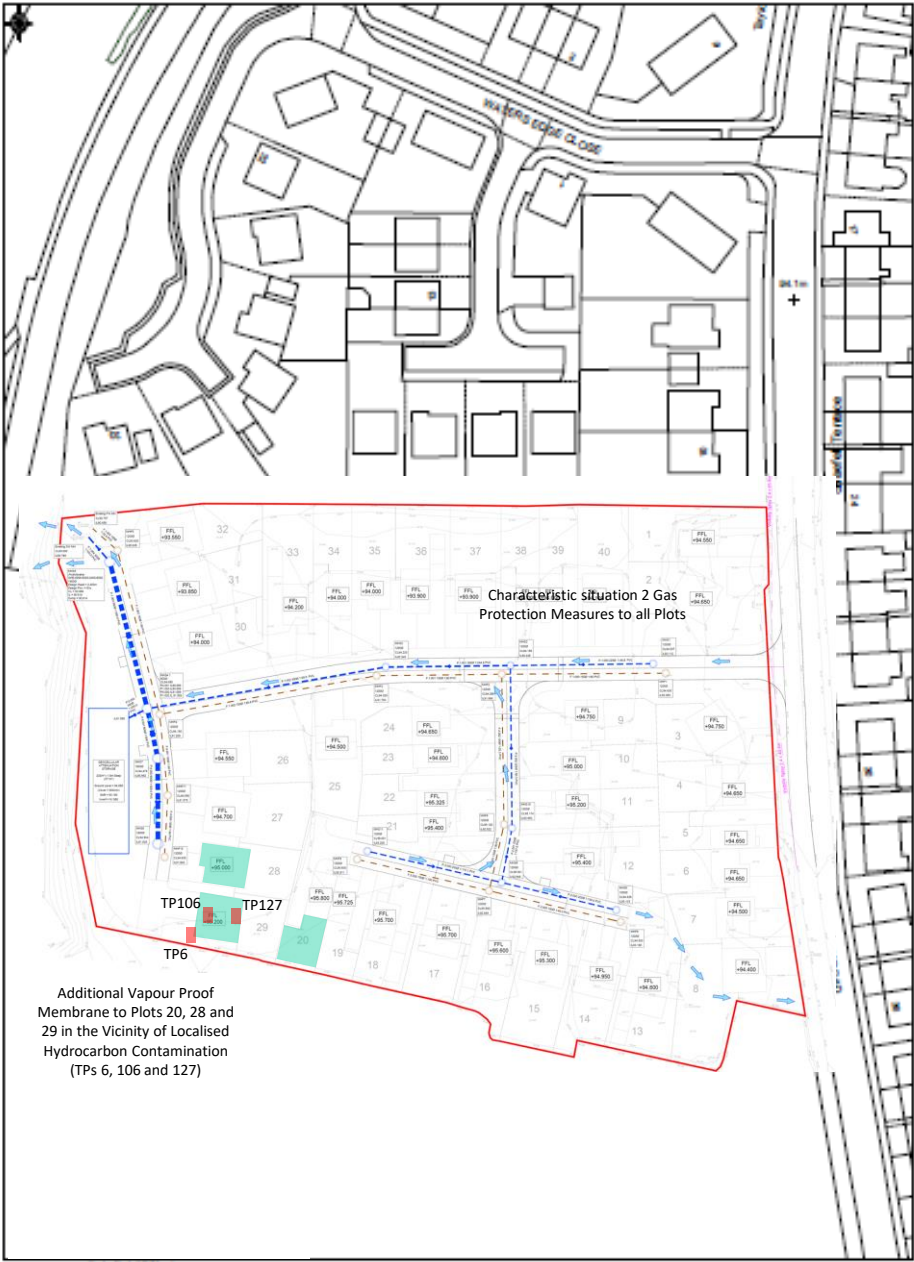
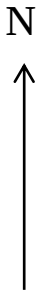
#### DRG. No.

81900004

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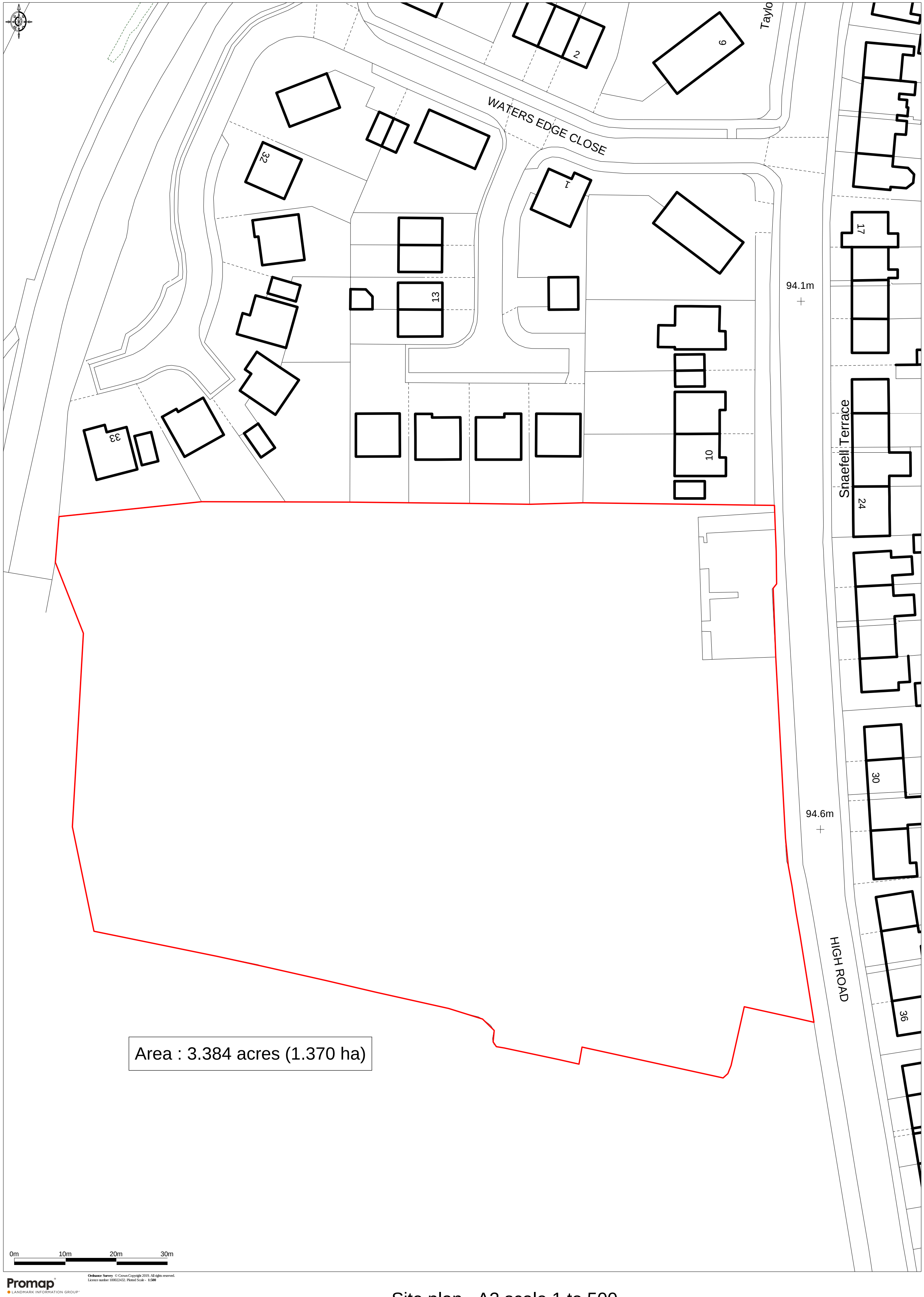


|                                                                                                   |                                                                                |                                                    |                                           |                                                                                                                                                                                                                                                                        |
|---------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|----------------------------------------------------|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div>NOTES / KEY</div> <div>SITE LOCATION</div> <div>AREA OF PROPOSED VAPOUR PROOF MEMBRANE</div> | <div>DRAWING TITLE</div> <div>PROPOSED VAPOUR MEMBRANE TO SELECTED PLOTS</div> | <div>CLIENT</div> <div>GLEESON HOMES CUMBRIA</div> |                                           | <div><div>FWS</div><div>Geotechnical &amp; Environmental Consultants</div><div>1 Redwood Crescent,<br/>Office 1.8, Peel Park<br/>East Kilbride<br/>South Lanarkshire<br/>G745PA<br/>Tel: 01355 207 778<br/>admin@fwsconsultants.com www.fwsconsultants.com</div></div> |
|                                                                                                   | <div>PROJECT TITLE</div> <div>WATER'S EDGE, WHITEHAVEN</div>                   | <div>STATUS</div> <div>FINAL</div>                 | <div>PROJECT NUMBER</div> <div>8190</div> |                                                                                                                                                                                                                                                                        |
|                                                                                                   |                                                                                | <div>DRAWN BY</div> <div>GH</div>                  | <div>DATE</div> <div>September 2022</div> |                                                                                                                                                                                                                                                                        |
|                                                                                                   |                                                                                | <div>SCALE</div> <div>NOT TO SCALE</div>           | <div>DRG. No.</div> <div>81900004</div>   |                                                                                                                                                                                                                                                                        |
|                                                                                                   |                                                                                |                                                    |                                           |                                                                                                                                                                                                                                                                        |
|                                                                                                   |                                                                                |                                                    |                                           |                                                                                                                                                                                                                                                                        |

## **APPENDIX 1.2**

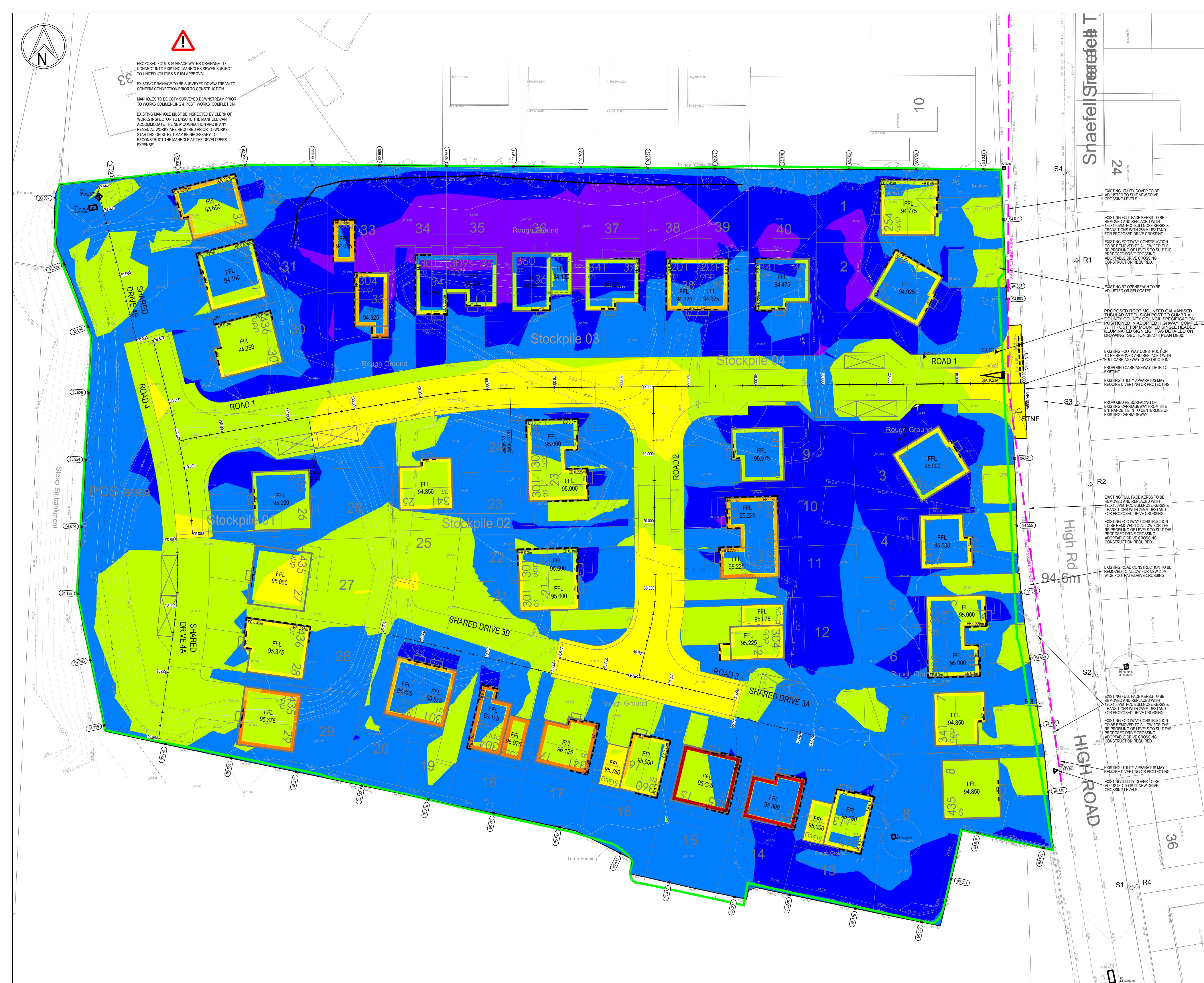
### **THIRD PARTY DRAWINGS**

# Water's Edge, High Road, Whitehaven CA28 9PD



Site plan - A2 scale 1 to 500





| FORMATION LEVEL COMPARISON KEY |               |               |        |           |
|--------------------------------|---------------|---------------|--------|-----------|
| SURFACE LEVEL DATA             |               |               |        |           |
| NUMBER                         | MINIMUM LEVEL | MAXIMUM LEVEL | COLOUR | VOLUME m3 |
| 1                              | -3.55         | -3.00         | Red    | 24.85     |
| 2                              | -3.00         | -2.50         | Red    | 13.65     |
| 3                              | -2.50         | -2.00         | Red    | 1.41      |
| 4                              | -2.00         | -1.50         | Red    | 80.30     |
| 5                              | -1.50         | -1.00         | Orange | 96.50     |
| 6                              | -1.00         | -0.50         | Yellow | 1214.69   |
| 7                              | -0.50         | 0.00          | Yellow | 3680.37   |
| 8                              | 0.00          | 0.50          | Blue   | 5623.59   |
| 9                              | 0.50          | 1.00          | Blue   | 2436.04   |
| 10                             | 1.00          | 1.77          | Blue   | 617.95    |

| FORMATION LEVEL CONSTRUCTION DEPTHS        |                            |
|--------------------------------------------|----------------------------|
| CONSTRUCTION                               | AVERAGE BUILD UP (m)       |
| ADOPTABLE HIGHWAY INCLUDING PATHS/SERVICES | 0.940                      |
| SHARED PRIVATE DRIVES                      | 0.435                      |
| PRIVATE DRIVES                             | 0.435                      |
| PLOT FORMATION                             | AS PER FOUNDATION SCHEDULE |
| GARDENS/POS                                | 0.150                      |

| ESTIMATED DRAINAGE ARISING TABLE |             |
|----------------------------------|-------------|
| CONSTRUCTION                     | VOLUME (m³) |
| ADOPTABLE DRAINAGE               | 633.500     |
| PRIVATE DRAINAGE                 | 879.500     |
| GULLYS & LEADS                   | 20.100      |
| TOTAL                            | 1533.500    |

- DESIGN NOTE:**
- ADOPTABLE DRAINAGE VOLUME IS BASED UPON NOMINAL TRENCH WIDTHS PER PIPE RUN AS PIPE DIA WITH CLASS S BED & SURROUND, AS PER SFA - REFER TO DRAWING D701.
  - PRIVATE DRAINAGE VOLUMES ARE BASED UPON NOMINAL TRENCH WIDTH AS 100DIA PIPE WITH MIN 150mm CLASS S BED & SURROUND.
  - GULLY & LEAD VOLUMES ARE BASED UPON NOMINAL TRENCH WIDTH AS 150DIA PIPE WITH MIN 150mm CLASS S BED & SURROUND.
  - NO BULKING OR COMPACTION FACTOR HAS BEEN ALLOWED.

| TOTAL FORMATION VOLUME SUMMARY |                                                                   |
|--------------------------------|-------------------------------------------------------------------|
| ESTIMATED TOTAL VOLUME         | = 1797.795m³ (FILL) + ESTIMATED DRAINAGE ARISING 1533.500m³ (CUT) |
|                                | = 264.295m³ (FILL)                                                |

**DESIGN NOTE:**

- STOCKPILES 2, 3 & 4 ARE TO BE REMOVED FROM SITE.
- STOCKPILE 1 IS TO BE RE-TESTED FOR POTENTIAL RE-USE ON SITE IF NEEDED PRIOR TO ANY REMOVAL.
- REFER TO TOPOGRAPHY SURVEY BY GSM FOR STOCK PILE NUMBERING AND VOLUMES.

| TOP SOIL STRIP VOLUME SUMMARY |              |
|-------------------------------|--------------|
| CUT VOLUME                    | = 2738.600m³ |
| FILL VOLUME                   | = 0.0m³      |

NET COMPARISON VOLUME = 2738.600m³ (CUT)

**DESIGN NOTE:**

- VOLUME IS BASED UPON THE EXISTING SURFACE OVER THE EXISTING SURFACE MINUS 200mm TOPSOIL STRIP TO THE SITE EXTENTS
- NO BULKING OR COMPACTION FACTOR HAS BEEN ALLOWED.
- TOP SOIL VOLUME AS PER SITE INVESTIGATION BY FWS.

| TOP SOIL VOLUME REQUIRED TABLE |                      |           |             |
|--------------------------------|----------------------|-----------|-------------|
| CONSTRUCTION                   | AVERAGE BUILD UP (m) | AREA (m²) | VOLUME (m³) |
| GARDENS & POS                  | 0.150                | 6771.600  | 1015.740    |

- DESIGN NOTE:**
- VOLUME IS BASED UPON TOPSOIL THICKNESS AS PER CLIENT SPECIFICATION. AREAS ARE BASED UPON TAKE OFF FROM LATEST ARCHITECTS LAYOUT.
  - NO BULKING OR COMPACTION FACTOR HAS BEEN ALLOWED.
  - IT IS ASSUMED THAT THE TOPSOIL IS TO BE IMPORTED FOLLOWING FWS RECOMMENDATION UNLESS TESTING IS UNDERTAKEN ON THE MATERIAL ON SITE TO CONFIRM SUITABILITY.

| TOP SOIL VOLUME SUMMARY     |                             |
|-----------------------------|-----------------------------|
| ESTIMATED TOTAL CUT VOLUME  | = 2738.6m³ (CUT) FROM SITE. |
| ESTIMATED TOP SOIL IMPORTED | = 1015.740m³ (FILL)         |

THERE IS SCOPE TO INCREASE THE DEPTH OF TOPSOIL WITHIN POS AND GARDENS.

TOPSOIL MATERIAL CAN BE RETAINED WITHIN POS AREAS BY MOUNDING AT A MAX GARDE OF 1 IN 6.

- HEALTH & SAFETY:**
- CONTRACTOR SHOULD BE AWARE OF GENERAL CONSTRUCTION RISKS TO PREVENT SLIPS, TRIPS AND FALLS AND TAKE NECESSARY PRECAUTIONS WITHOUT SPECIAL INSTRUCTION.
  - CONTRACTOR TO PROVIDE TRENCH SUPPORTS AS APPROPRIATE AND ENSURE THAT PLANT REMAINS A SAFE DISTANCE FROM TRENCHES PRIOR TO INSTALLING DRAINAGE.
  - THE TIME THAT EXCAVATIONS ARE OPEN ON SITE SHOULD BE KEPT TO A MINIMUM AND ALL TRENCHES SHOULD BE SURFACED BY A BARRELS.
  - CONTRACTOR TO ENSURE TRENCHES TO BE MADE BY APPROVED CONTRACTOR ONLY.
  - CONTRACTOR TO MAKE OPERATIVES AWARE OF ASSOCIATED DANGERS TO HEALTH SUCH AS LIFTING/HEAVY LIFTING, OVERHEATING, AND WEAR AND TEAR. ADEQUATE WELFARE FACILITIES AND PROTECTIVE CLOTHING TO BE PROVIDED AS REQUIRED.
  - UNPAVED MANHOLES MUST BE COVERED WITH LOAD BEARING MATERIALS AND SURROUNDED WITH BARRELS.
  - CONTRACTOR TO OBTAIN ALL SERVICE RECORDS PRIOR TO WORKS COMMENCING.
  - SERVICE RECORDS TO BE REFERRED TO PRIOR TO WORK COMMENCING. CONTRACTOR TO PROCEED WITH CAUTION AND SERVICES TO BE LOCATED BY HAND AND DIG AND PROTECTED ACCORDINGLY.
- ENVIRONMENTAL:**
- CONTRACTOR TO ENSURE RELEVANT MEASURES ARE TAKEN TO KEEP PLANT AND PEOPLE A SAFE DISTANCE FROM STEEP SLOPES DURING THE WORKS.
  - CONTRACTOR TO ENSURE THAT PROCEDURES ARE IN PLACE TO KEEP PEOPLE A SAFE DISTANCE FROM WORKING PLANT WHERE NECESSARY.
  - CONTRACTOR TO REFER TO GROUND INVESTIGATION REPORT FOR CONTAMINATION TESTS AND TO PROVIDE ADEQUATE WELFARE FACILITIES AND PROTECTIVE CLOTHING AS REQUIRED.

- DESIGN NOTES:**
- ALL WORKS TO COMPLY WITH CURRENT VERSION OF THE FOLLOWING DOCUMENTS:
    - DESIGN MANUAL FOR ROADS AND BRIDGES (DMRB)
    - SPECIFICATION FOR HIGHWAY WORKS (SFA)
    - LOCAL AUTHORITY DESIGN GUIDE AND SPECIFICATION
  - PRIOR TO COMMENCING WORKS THE CONTRACTOR SHOULD INVESTIGATE AND LOCATE AS NECESSARY ANY STATUTORY UNDERTAKERS EQUIPMENT WITHIN THE NEW ACCESS AND DISCUSS REQUIREMENTS FOR UNDERGROUND PROTECTION WITH THE RELEVANT UNDERTAKER.
  - ALL WORKS WITHIN THE PUBLIC HIGHWAY TO MEET LOCAL AUTHORITY REQUIREMENTS.
  - CONTRACTOR TO APPLY FOR ROAD OPENING NOTICES ETC AS REQUIRED.
  - OR VALUE NOT AVAILABLE. ROAD CONSTRUCTION DETAIL SUBJECT TO CONFIRMATION OF OR VALUE. CONTRACTOR TO ALLOW FOR LANE TESTS TO BE UNDERTAKEN IN AGREEMENT WITH LOCAL AUTHORITY HIGHWAY ENGINEER PRIOR TO WORKS COMMENCING.
  - PROPOSED LEVELS HAVE BEEN BASED ON THE EXISTING TOPOGRAPHICAL SURVEY BY GSM.
  - PROPOSED DRAWING BASED ON THE LATEST ARCHITECTURAL LAYOUT PROVIDED BY GLEESON.
  - SLOPES GREATER THAN 1 IN 5 REQUIRE STABILISATION. GEOTECHNICAL ENGINEER TO BE CONSULTED TO CONFIRM REQUIREMENTS.
  - GARDENS SET 610M BELOW FFL UNLESS STATED OTHERWISE.

|                            |                           |                   |                                                                                       |             |                  |
|----------------------------|---------------------------|-------------------|---------------------------------------------------------------------------------------|-------------|------------------|
| 12/08/2022                 | FIRST ISSUE               |                   | NN                                                                                    | AE          | 1                |
| Date                       |                           | Revisions         | Drawn                                                                                 | Checked     | Rev              |
| Eng Status                 | INFORMATION               |                   |                                                                                       |             |                  |
| NORTH EAST<br>0191 2556632 |                           |                   |  |             |                  |
| YORKSHIRE<br>0115 330 3300 |                           |                   | WYNN RADCO<br>INFRA GROUP                                                             |             |                  |
| Client                     | GLEESON HOMES             |                   |                                                                                       |             |                  |
| Project                    | WATERS EDGE, WHITEHAVEN   |                   |                                                                                       |             |                  |
| Title                      | FORMATION CUT & FILL PLAN |                   |                                                                                       |             |                  |
| DO NOT SCALE               |                           | Scale @ A2: 1:200 | Drawn: NN                                                                             | Checked: AE | Date: 12/08/2022 |
| Job No                     | 21201                     | Eng No            | D601                                                                                  | Rev         | 1                |



NOTES AND AMENDMENTS

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| REVISIONS |             |       |      |
|-----------|-------------|-------|------|
| Rev       | Description | Drawn | Date |

| House Type | Quantity |
|------------|----------|
| 201        | 3        |
| 212        | 1        |
| 301        | 9        |
| 309        | 5        |
| 307        | 4        |
| 315        | 4        |
| 310        | 6        |
| 435        | 6        |
| 436        | 4        |
| Total#     | 42       |



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Purpose:  
Concept

Client:  
Gleeson Homes

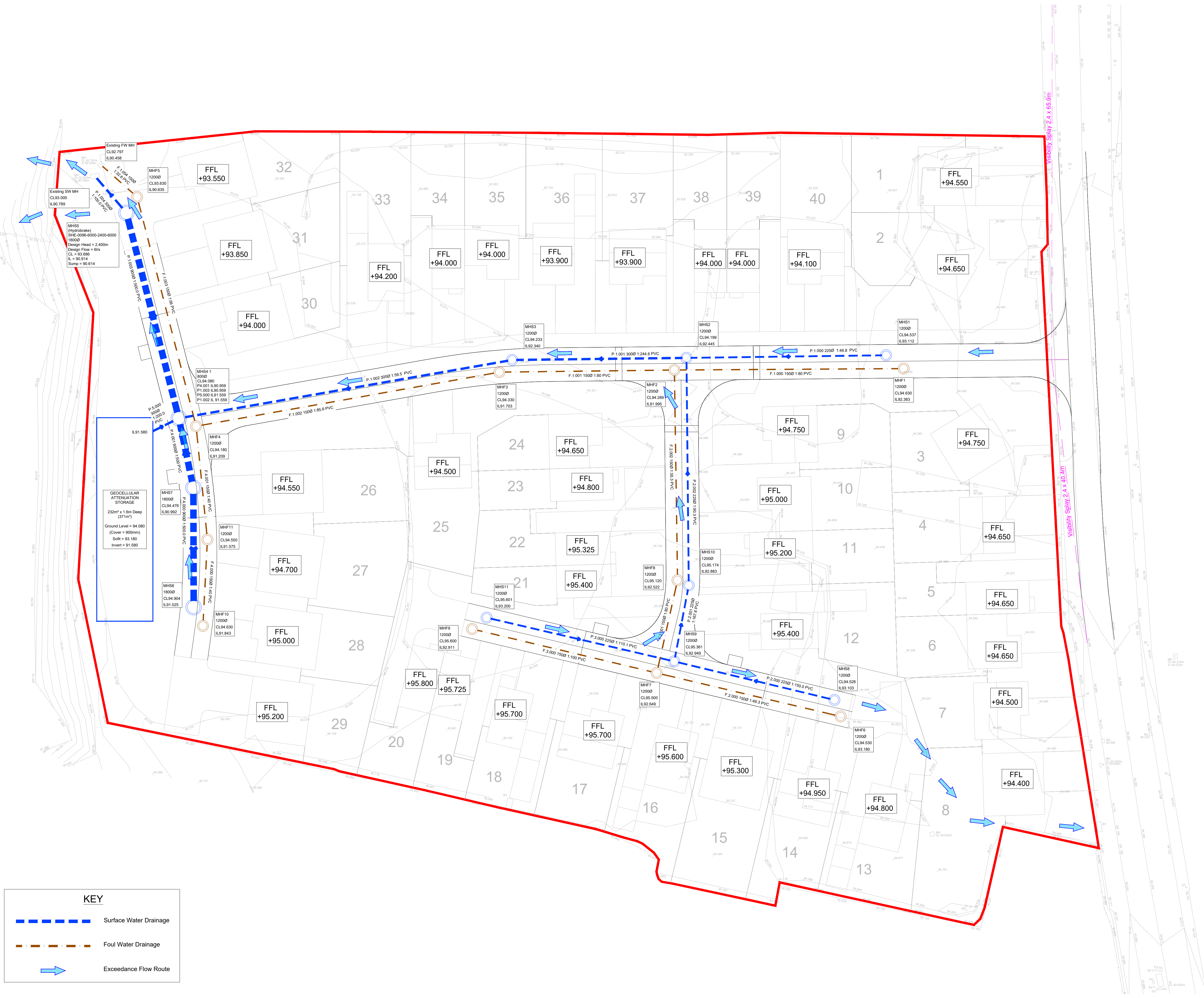
Project:  
Waters Edge

Title:  
Block Plan

|        |             |        |         |
|--------|-------------|--------|---------|
| Scale: | Sheet Size: | Drawn: | Date:   |
| 1:500  | A3          | jc     | 03/2019 |

|             |             |           |
|-------------|-------------|-----------|
| Project No: | Drawing No: | Revision: |
|-------------|-------------|-----------|

1839 BP001 -



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| REVISIONS |          |                                                                  |          |            |
|-----------|----------|------------------------------------------------------------------|----------|------------|
| REV       | DATE     | DESCRIPTION                                                      | DRAWN BY | CHECKED BY |
| A         | 30.09.20 | Planning Issue                                                   | JP       | MJ         |
| B         | 03.03.21 | Drainage amended to allow for 40% Climate Change                 | MJ       | JP         |
| C         | 20.05.21 | Drainage amended to allow for Cv of 1.0. Exceedance flows added. | MJ       | JP         |
| D         | 29.06.21 | Site Plan updated                                                | MJ       | JP         |

DRAWING STATUS:  
FOR BUILDING REGULATION APPROVAL

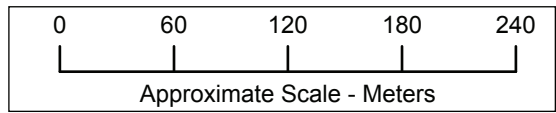
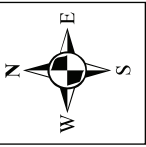
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CLIENT: **gleeson**

PROJECT: **WATERS EDGE WHITEHEAVEN**

DRAWING TITLE: **DRAINAGE LAYOUT PLAN**

|                                     |                      |              |                |                |
|-------------------------------------|----------------------|--------------|----------------|----------------|
| DATE CREATED: 06/03/2020            | DRAWING SCALE: 1:250 | DRAWN BY: JP | CHECKED BY: MJ | QA CATEGORY: 1 |
| DRAWING REF: TC / T19360 / A1 / 100 | REV: D               |              |                |                |



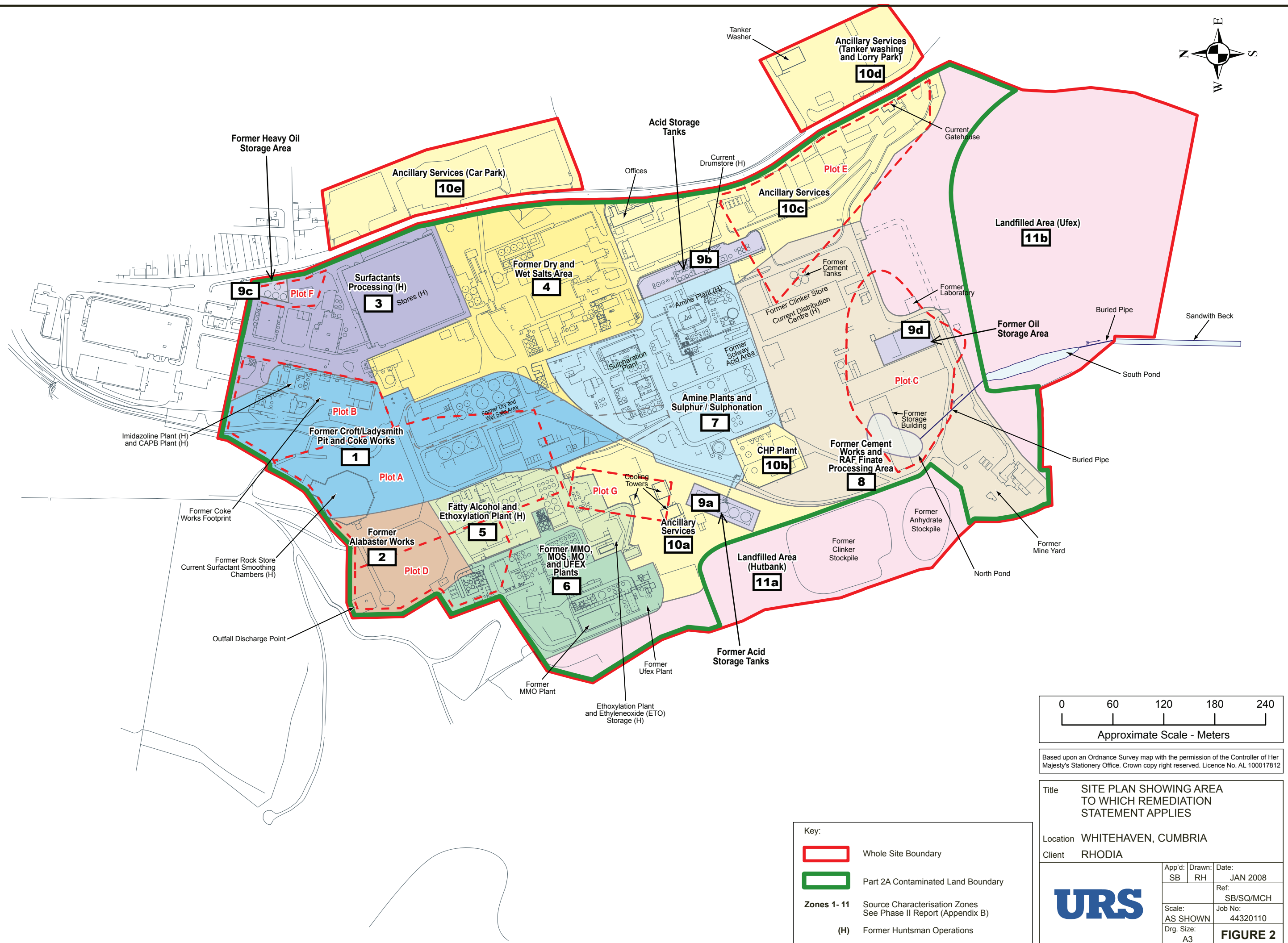
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**Key:**

- Part 2A Contaminated Land Boundary
- PLOT B** Source Characterisation Zones
- Source requiring remediation
- Source requiring assessment

**Note:** The remediation area in Plot C is a voluntary action by Rhodia and is not a requirement of Part 2A

|                                                                                                     |                    |                     |                   |
|-----------------------------------------------------------------------------------------------------|--------------------|---------------------|-------------------|
| Title<br>POTENTIAL SOURCES OF CONTAMINATION<br>REQUIRING FURTHER ASSESSMENT<br>AND / OR REMEDIATION |                    |                     |                   |
| Location<br>WHITEHAVEN, CUMBRIA                                                                     |                    |                     |                   |
| Client<br>RHODIA                                                                                    |                    |                     |                   |
|                                                                                                     | App'd:             | Drawn:              | Date:             |
|                                                                                                     | SB                 | RH                  | JAN 2008          |
|                                                                                                     |                    |                     | Ref:<br>SB/SQ/MCH |
|                                                                                                     | Scale:<br>AS SHOWN | Job No:<br>44320110 |                   |
|                                                                                                     | Drg. Size:<br>A3   | <b>FIGURE 3</b>     |                   |



## **APPENDIX 2**

### **EARTHWORKS SPECIFICATION**

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## 1 APPENDIX 1/5: TESTING TO BE CARRIED OUT BY THE CONTRACTOR

1. The testing, including provision of associated samples scheduled in the following tables shall be undertaken by the Contractor who shall supply to the Resident Engineer within 24 hours of the completion of the test a copy of the results.
2. Materials testing shall be undertaken only by independent testing laboratories accredited by the United Kingdom Accreditation Service (UKAS). Geotechnical testing shall be carried out at UKAS accredited laboratories. (N) indicates that a UKAS sampling and test report or certificate is required.
3. All chemical analysis is to be undertaken by a MCERTS accredited independent chemical testing laboratory. Copies of MCERTS accreditation, QA/QC system, laboratory specified sampling, a brief description of the test method employed for each determinand, bias and precision details for each determinand, sampling preservation procedures, minimum detection levels for all determinands and the results of all tests are to be provided to the Resident Engineer. Unless approved otherwise by the Resident Engineer, laboratory chemical analysis minimum detection levels of no greater than one tenth of the concentrations set out in Tables 6/6, Appendix 6/1 shall be utilised.
4. Tests comparable to those specified will be necessary for any equivalent work, goods or materials proposed by the Contractor.
5. Tests for work, goods or materials as scheduled under any one clause are required for all such work, goods or materials in the Works.
6. Test certificates for work, goods or materials as scheduled under any one clause are required for all such work, goods or materials in the Works.
7. As part of the provision of samples and testing undertaken by the Contractor, the Contractor shall keep a daily record of samples of goods and materials taken by, or on behalf of, the Contractor for testing. Records shall be in sufficient detail to record the nature and the source of goods and materials and shall identify the locations and means of selection and sampling. A copy of the daily record, along with chain of custody records for sample delivery and evidence of receipt by the laboratory shall be provided by the Contractor on the next working day for retention and use by the Resident Engineer.
8. All imported materials, including topsoil (SHW Class 5B) and subsoil (SHW Class 2 or 4) are to be tested for total concentrations of contaminants as given in Table 6/6, Appendix 6/1 at the frequency shown in Table 1/5 where used as a clean cover layer or rooting medium for garden and landscaped areas.
9. All granular and cohesive made ground excavated across the site shall be considered as "contaminated" and shall not be re-used above formation level to clean covers to garden or landscaped areas or within service corridors.
10. All site won materials that are to be re-used as clean Class 1, 2, 4 or 5A materials are to be tested for total concentrations of contaminants as given in Table 6/6, Appendix 6/1 at the

frequency shown in Table 1/5 where used as a clean cover layer or rooting medium for garden and landscaped areas.

11. Where site won granular and cohesive made ground and Glacial Till materials are wet above their optimum moisture contents, then these materials will be classified as Class 6R and 7E to be subsequently placed as either Class 9D/F Selected Fill following modification by lime/cement and will need to be tested for their geotechnical properties as presented in Table 1/5, Appendix 1/5.
12. All site investigation works shall be undertaken in accordance with the Site Investigation Construction Series 2nd Edition, prepared under the guidance of the Site Investigation Steering Group, published by ICE including the Effective Site Investigation, UK Specification for Ground Investigation and Guidance for Safe Investigation of Potentially Contaminated Land 2012.

TABLE 1/5: TESTING TO BE CARRIED OUT BY THE CONTRACTOR

| Series 600                                   |                            |                                                                                          |                                                                                      |                                                  |                  |                                                                                                                                                       |
|----------------------------------------------|----------------------------|------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Clause/s                                     | Acceptability of Materials |                                                                                          |                                                                                      |                                                  |                  |                                                                                                                                                       |
| 601, 613, 615, 631-633, 635-636, 641 and 643 | Class                      | General Description                                                                      | Test                                                                                 | Frequency of Testing#                            | Test Certificate | Comments                                                                                                                                              |
|                                              | 1A-C<br><br>(c)            | Site Won General Granular Fill                                                           | Grading (N)                                                                          | 1 per 1000m <sup>3</sup><br>(min. 3 per source)  | Required         | The frequency of testing for earthworks classification is a minimum requirement.                                                                      |
|                                              |                            |                                                                                          | Uniformity Co-efficient (N)                                                          | 1 per 1000m <sup>3</sup><br>(min. 3 per source)  | Required         |                                                                                                                                                       |
|                                              |                            |                                                                                          | Los Angeles Co-efficient (N) (1C only)                                               | 1 per 1000m <sup>3</sup><br>(min. 3 per source)  | Required         |                                                                                                                                                       |
|                                              |                            | Contaminated                                                                             | OMC (4.5 kg rammer) (N)                                                              | 1 per 1000m <sup>3</sup><br>(min. 3 per source)  | Required         |                                                                                                                                                       |
|                                              |                            |                                                                                          | mc (N)                                                                               | 1 per 250m <sup>3</sup><br>(min. 3 per source)   | Required         |                                                                                                                                                       |
|                                              | 2A-D<br><br>(c)            | Site Won General Cohesive Fill                                                           | Grading (N)                                                                          | 1 per 1000m <sup>3</sup><br>(min. 3 per source)  | Required         | The actual rate of testing required shall be to ensure the correct classification of materials taking into account the variation in their properties. |
|                                              |                            |                                                                                          | Five point MCV (N) Calibration with laboratory vane undrained shear strength         | 1 per 1000m <sup>3</sup><br>(min. 3 per source)  | Required         |                                                                                                                                                       |
|                                              |                            |                                                                                          | mc (N)                                                                               | 1 per 250m <sup>3</sup><br>(min. 3 per source)   | Required         |                                                                                                                                                       |
|                                              |                            | Contaminated                                                                             | Plasticity Index (N)                                                                 | 1 per 1000m <sup>3</sup><br>(min. 3 per source)  | Required         |                                                                                                                                                       |
|                                              |                            |                                                                                          | OMC (4.5 kg rammer) (N)                                                              | 1 per 1000m <sup>3</sup><br>(min. 3 per source)  | Required         |                                                                                                                                                       |
|                                              | 4A-B<br><br>(c)            | Site Won and Imported Landscape Fill                                                     | Grading (N)                                                                          | 1 per 1000m <sup>3</sup><br>(min. 3 per source)  | Required         |                                                                                                                                                       |
|                                              |                            |                                                                                          | mc (N)                                                                               | 1 per 250m <sup>3</sup><br>(min. 3 per source)   | Required         |                                                                                                                                                       |
|                                              |                            |                                                                                          | OMC (4.5 kg rammer) (N)                                                              | 1 per 1000m <sup>3</sup><br>(min. 3 per source)  | Required         |                                                                                                                                                       |
|                                              |                            | Contaminated                                                                             | Five point MCV (N) Calibration                                                       | 1 per 1000m <sup>3</sup><br>(min. 3 per source)  | Required         |                                                                                                                                                       |
|                                              |                            |                                                                                          | Compliance with BS3882                                                               | Not Required                                     | Required         |                                                                                                                                                       |
|                                              |                            |                                                                                          | *Chemical Properties Total Concentrations in Accordance with Table 6/6, Appendix 6/1 | 1 per 250m <sup>3</sup>                          | MCERTS           |                                                                                                                                                       |
|                                              | 5A-B                       | Site won and Imported Topsoil                                                            | Compliance with BS3882                                                               | Not Required                                     | Required         |                                                                                                                                                       |
|                                              |                            |                                                                                          | *Chemical Properties Total Concentrations in Accordance with Table 6/6, Appendix 6/1 | 1 per 250m <sup>3</sup>                          | MCERTS           |                                                                                                                                                       |
|                                              | 6F2                        | Site Won and Imported Selected Granular Material (coarse grading)                        | Grading (N)                                                                          | 1 per 1000m <sup>3</sup><br>(min. 3 per source)  | Required         |                                                                                                                                                       |
|                                              |                            |                                                                                          | Uniformity Co-efficient (N)                                                          | 1 per 1000m <sup>3</sup><br>(min. 3 per source)  | Required         |                                                                                                                                                       |
|                                              |                            |                                                                                          | Los Angeles Co-efficient (N) (1C only)                                               | 1 per 1000m <sup>3</sup><br>(min. 3 per source)  | Required         |                                                                                                                                                       |
|                                              |                            |                                                                                          | OMC (4.5 kg rammer) (N)                                                              | 1 per 1000m <sup>3</sup><br>(min. 3 per source)  | Required         |                                                                                                                                                       |
|                                              |                            |                                                                                          | mc (N)                                                                               | 1 per 250m <sup>3</sup><br>(min. 3 per source)   | Required         |                                                                                                                                                       |
|                                              |                            |                                                                                          | *Chemical Properties Total Concentrations in Accordance with Table 6/6, Appendix 6/1 | 1 per 500m <sup>3</sup>                          | MCERTS           |                                                                                                                                                       |
|                                              | 6R                         | Select Granular Material (for stabilisation with lime / cement to form Class 9F capping) | Grading (N)                                                                          | 1 per 1,000m <sup>3</sup><br>(min. 3 per source) | Required         | *This is required where used as a 'clean' material. The frequency of testing for earthworks                                                           |
|                                              |                            |                                                                                          | mc (N)                                                                               | 1 per 1000m <sup>3</sup><br>(min. 3 per source)  | Required         |                                                                                                                                                       |
|                                              |                            |                                                                                          | Liquid Limit (N), Plasticity Index                                                   | 1 per 1,000m <sup>3</sup><br>(min. 3 per source) | Required         |                                                                                                                                                       |
|                                              |                            |                                                                                          | Organic Matter                                                                       | 3 per source                                     | Required         |                                                                                                                                                       |
|                                              |                            |                                                                                          | Water Soluble (WS) Sulfate Content                                                   | 1 per 1,000m <sup>3</sup><br>(min. 3 per source) | Required         |                                                                                                                                                       |
|                                              |                            |                                                                                          | Oxidisable Sulfides (OS) Content                                                     | 1 per 1,000m <sup>3</sup><br>(min. 3 per source) | Required         |                                                                                                                                                       |
|                                              |                            |                                                                                          | Total Potential Sulfate (TPS) Content                                                | 1 per 1,000m <sup>3</sup><br>(min. 3 per source) | Required         |                                                                                                                                                       |
| 601, 613, 615, 631-                          |                            |                                                                                          |                                                                                      |                                                  |                  |                                                                                                                                                       |

| Series 600                |                            |                                                                                      |                                                                                                                                                                                      |                                             |          |                                                                                                                                                                                                       |
|---------------------------|----------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Clause/s                  | Acceptability of Materials |                                                                                      |                                                                                                                                                                                      |                                             |          |                                                                                                                                                                                                       |
| 633, 635-636, 641 and 643 | 7E                         | Selected Cohesive Materials (for stabilisation with lime to form Class 9D/E capping) | Grading (N)                                                                                                                                                                          | 1 per 500m <sup>3</sup> (min. 3 per source) | Required | classification is a minimum requirement.<br><br>The actual rate of testing required shall be to ensure the correct classification of materials taking into account the variation in their properties. |
|                           |                            |                                                                                      | mc (N)                                                                                                                                                                               | 1 per 250m <sup>3</sup> (min. 3 per source) | Required |                                                                                                                                                                                                       |
|                           |                            |                                                                                      | Plasticity Index                                                                                                                                                                     | 1 per 500m <sup>3</sup> (min. 3 per source) | Required |                                                                                                                                                                                                       |
|                           |                            |                                                                                      | Five-point MCV (N) Calibration                                                                                                                                                       | 1 per 500m <sup>3</sup> (min. 3 per source) | Required |                                                                                                                                                                                                       |
|                           |                            |                                                                                      | Organic Matter                                                                                                                                                                       | 1 per 500m <sup>3</sup> (min. 3 per source) | Required |                                                                                                                                                                                                       |
|                           |                            |                                                                                      | Water Soluble (WS) Sulphate Content                                                                                                                                                  | 1 per 500m <sup>3</sup> (min. 3 per source) | Required |                                                                                                                                                                                                       |
|                           |                            |                                                                                      | Oxidisable Sulfides (OS) Content                                                                                                                                                     | 1 per 500m <sup>3</sup> (min. 3 per source) | Required |                                                                                                                                                                                                       |
|                           |                            |                                                                                      | Total Potential Sulphate (TPS) Content                                                                                                                                               | 1 per 500m <sup>3</sup> (min. 3 per source) | Required |                                                                                                                                                                                                       |
|                           |                            |                                                                                      | Undertake trial testing on acceptable 7E materials as per Appendix 6/13 to determine lime/cement dosing rate and compaction to achieve a Design CBR of 5% and $\phi' = 21^{\circ}$ . |                                             |          |                                                                                                                                                                                                       |
|                           | 9D                         | Lime Stabilised Cohesive Materials (Capping)                                         | Pulverisation                                                                                                                                                                        | 1 per 500m <sup>3</sup> (min. 3 per source) | Required | *This is required where used as a 'clean' material.                                                                                                                                                   |
|                           |                            |                                                                                      | OMC (4.5 kg rammer) (N)                                                                                                                                                              | 1 per 500m <sup>3</sup> (min. 3 per source) | Required |                                                                                                                                                                                                       |
|                           |                            |                                                                                      | Remoulded California Bearing Ratio (N)                                                                                                                                               | 1 per 500m <sup>3</sup> (min. 3 per source) | Required |                                                                                                                                                                                                       |
|                           |                            |                                                                                      | mc (N)                                                                                                                                                                               | 1 per 500m <sup>3</sup> (min. 3 per source) | Required |                                                                                                                                                                                                       |
|                           | 9E                         | Lime/Cement Stabilised Cohesive Materials (Capping)                                  | Pulverisation                                                                                                                                                                        | 1 per 500m <sup>3</sup> (min. 3 per source) | Required |                                                                                                                                                                                                       |
|                           |                            |                                                                                      | OMC (4.5 kg rammer) (N)                                                                                                                                                              | 1 per 500m <sup>3</sup> (min. 3 per source) | Required |                                                                                                                                                                                                       |
|                           |                            |                                                                                      | Remoulded California Bearing Ratio (N)                                                                                                                                               | 1 per 500m <sup>3</sup> (min. 3 per source) | Required |                                                                                                                                                                                                       |
|                           |                            |                                                                                      | mc (N)                                                                                                                                                                               | 1 per 500m <sup>3</sup> (min. 3 per source) | Required |                                                                                                                                                                                                       |
|                           | 9F                         | Lime and Cement Stabilised Well Graded Granular Material (Capping)                   | Pulverisation                                                                                                                                                                        | 1 per 500m <sup>3</sup> (min. 3 per source) | Required |                                                                                                                                                                                                       |
|                           |                            |                                                                                      | OMC (4.5kg rammer) (N)                                                                                                                                                               | 1 per 500m <sup>3</sup> (min. 3 per source) | Required |                                                                                                                                                                                                       |
|                           |                            |                                                                                      | Remoulded California Bearing Ratio (N)                                                                                                                                               | 1 per 500m <sup>3</sup> (min. 3 per source) | Required |                                                                                                                                                                                                       |

|     |                                             |                                                                                                          |                                                                   |                                     |                  |
|-----|---------------------------------------------|----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|-------------------------------------|------------------|
| -   | ALL IMPORTED MATERIALS                      | Chemical Properties Total Concentrations in Accordance with Table 6/6, Appendix 6/1                      | 1 per 250m <sup>3</sup> (min 3 per source)                        | MCERTS                              | See Appendix 6/1 |
| 602 | Surplus material to be disposed of off-site | Chemical properties (Basic Characterisation and Waste Acceptance Criteria for inert and hazardous waste) | As required by regulation and waste handling facility             | BS EN 12457 Part 3                  | See Appendix 6/2 |
| 12  | Compaction of Fills                         |                                                                                                          |                                                                   |                                     |                  |
|     | Method Compaction (Check testing)           |                                                                                                          |                                                                   |                                     |                  |
|     | 1A-C<br>2A-C<br>6F2                         | Granular, Cohesive General Fills and Selected Granular Material                                          | Moisture Content and Field Dry Density (Set of 5 NDG to 1 SRT)(*) | 1 per 500m <sup>3</sup> of material | Required         |

Note: # Frequency of testing to be updated once the earthworks volume balance has been confirmed.

## 2 APPENDIX 6/1: REQUIREMENTS FOR ACCEPTABILITY AND TESTING OF EARTHWORKS MATERIALS

### **Description of the Earthworks Required:**

1. The following provisional earthworks are currently proposed:-

- Excavation of cohesive fill arisings within Stockpiles 1 and 2 and the surplus volume from Stockpile 3 for removal offsite as predominantly Inert wastes. A proportion of Stockpile 3 is to be retained onsite, subject to further characterisation testing, for reuse as part of the proposed clean cover soil layers under a mobile plant licence and recovery operation.
- Site preparation by excavation of surface vegetation and made ground to a depth of 0.2 m (including surface debris, vegetation, fly tipped waste, unsuitable made ground etc for offsite disposal) and existing hardstand areas to a depth of 0.4 m (for reuse in the permanent works following reprocessing, crushing and screening).
- Site turnover and regrade of site levels including a cut of 1,953 m<sup>3</sup> and proposed fill of 3,751 m<sup>3</sup>, with an overall net shortfall of material of ~264 m<sup>3</sup> to achieve the proposed formation level. This will involve the sequential excavation and reinstatement:-
  - Removal of relic structures including all remaining pipework/infrastructure associated with the former tanks, and foundations, drainage and service ducts associated with the former works. Demolition arisings can undergo reprocessing by crushing and screening to generate Class 1 General Fill or Class 6F2 capping materials for re-use beneath buildings, hardstanding and road pavements to achieve the proposed site levels.
  - Excavation of 1,953 m<sup>3</sup> localised contaminated granular made ground (contaminated Class 1 General Fill) and localised contaminated cohesive made ground (contaminated Class 2 General Fill) and of natural clay (Class 2 General Fill or Class 4 Landscape Fill) as part of the site turnover and cut to the proposed sub-formation levels.
  - Reinstatement of 3,751 m<sup>3</sup> Site Won Contaminated Class 1 and 2 General Fill as an engineered fill to achieve the proposed subformation levels beneath carriageways, plots and garden areas.
  - Excavation of localised contaminated granular made ground (contaminated Class 1 General Fill) and localised contaminated cohesive made ground (contaminated Class 2 General Fill) to cut the private drainage (1,534 m<sup>3</sup>) and foundation arisings (Volume TBC). From the earthworks materials balance and proposed phasing, it is anticipated that these arisings will require be reinstated beneath buildings and structures (as part of the construction make-up) and any surplus arisings will then be disposed offsite.
  - Placement of 0.6 m thick anti-dig layer comprising compacted engineered fill and/or a geotextile membrane in the southwest of the site (Drawing 8190OD05, Appendix 1.1).
- Reuse of clean Site Won natural clay (Class 4 Landscape Fill; Volume TBC) and importation of clean Class 4 Landscape Fill (Volume TBC) for placement as a clean cover layer in future gardens and landscaped areas.
- Reuse of 1,015 m<sup>3</sup> Site Won Class 5 Topsoil (Stockpile 3) for placement as a clean cover layer in future gardens and landscaped areas under a mobile plant licence and end of waste recovery operation.

2. All materials excavated as part of the earthworks or generated by foundation, services or roads construction works are to be inspected and selectively stockpiled into materials for on-site processing and recovery, including:-
  - a) granular made ground for re-use as “contaminated” Class 1 material;
  - b) cohesive made ground for re-use as “contaminated” Class 2 material;
  - c) natural Glacial Till for re-use as “clean” and “contaminated” Class 2 or 4A material;
  - d) crushed and screened demolition arisings for reuse as “clean” and “contaminated” Class 6F2 Capping material;
  - e) Class U1 and U2 unacceptable materials for off-site disposal including wood, metal, rebar, plastic etc.
3. Following the selective stockpiling, all materials will require further earthworks and materials classification testing in accordance with the frequencies and requirements stated in this Specification.
4. All Class U1 and U2 unsuitable materials (including wood, timber, plastic, metal and rebar etc.) will be disposed off-site at a suitable waste treatment or disposal facility.

#### **Acceptable Material – Site Won:**

5. The material types to be excavated will be granular and cohesive made ground, natural Glacial Till and stockpiled topsoil. The made ground can contain heavy metals, low concentrations of hydrocarbons / PAHs and localised disseminated asbestos fibres.
6. It is anticipated that granular made ground arisings may be acceptable for re-use as “contaminated” Class 1 General Fill, the cohesive made ground will be acceptable for re-use as “contaminated” Class 2 General Fill, the natural Glacial Till will be acceptable for re-use as “contaminated” and “clean” Class 2 General Fill or “clean” Class 4A Landscape Fill and the Stockpiled topsoil will be acceptable for re-use as “clean” Class 5A Topsoil. Lime/cement modification may be required to reduce in-situ moisture contents to generate Class 9D and 9F materials.
7. All arisings generated from foundation, service trench and road construction excavations are to be classified and re-used in the permanent works, where possible.
8. The Contractor shall be responsible for the management and use of all earthworks materials and for providing materials i.e. selection of acceptable materials excavated on-site and for the sourcing and selection of all imported materials, which are in accordance with the Specification.
9. The permitted classifications of earthworks materials are described in this Specification. Where a particular class of material is specified for a specific location, the Contractor shall not be allowed to use an alternative class of material, unless otherwise agreed with the Engineer.
10. Acceptable limits for the earthworks materials, and the testing required to be undertaken by the Contractor on these materials are presented in Tables 1/5, 6/1 and 6/2 of this Specification.

11. Confirmation of the acceptability of all earthworks materials excavated on-site shall be carried out by the Contractor at the point of excavation and selective stockpiling, with all materials generated requiring further earthworks and materials classification testing in accordance with the frequencies and requirements stated in this Specification.

12. The tables below detail the anticipated classification of site-won materials for re-use.

**TABLE 1: CLASSIFICATION OF SITE WON MATERIAL**

| SHW CLASS | SUBDIVISION | PURPOSE                                     | DEFINITION                                                                          |
|-----------|-------------|---------------------------------------------|-------------------------------------------------------------------------------------|
| 1         | A - C       | Granular Fill                               | Site Won demolition arisings and granular made ground (maybe clean or contaminated) |
| 2         | A - C       | Cohesive Fill                               | Site Won cohesive made ground and cohesive Glacial Till (likely contaminated)       |
| 4         | A           | Cohesive Fill to Garden and Landscape Areas | Site Won cohesive Glacial Till (can only be clean)                                  |
| 5         | A           | Topsoil (Stockpile 3 to be retained)        | Site won Topsoil (maybe clean subject to further characterisation testing)          |
| 6         | F           | Selective Capping Materials                 | Site Won demolition arisings (maybe clean or contaminated)                          |

Notes:- SHW – Specification for Highway Works

| SOURCE                                               | ACCEPTABLE RE-USE                                  | CLASSIFICATION (IN ACCORDANCE WITH SHW) | TESTING REQUIREMENTS                                                                                                                                                                                                                                                                                                                                                      |
|------------------------------------------------------|----------------------------------------------------|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Granular Fill (from regrading of site levels)        | Contaminated and Combustible Granular General Fill | Class 1A/B (c) & Class 6R (c)           | Appendix 2 (Table 1/5 and 6/1 of the Earthworks Specification).<br>To only to be re-used beneath clean cover layers or beneath hardstanding/ buildings.                                                                                                                                                                                                                   |
| Cohesive Fill (from regrading of site levels)        | Contaminated Cohesive Landscape Fill               | Class 2A/B (c) & Class 7E (c)           | Appendix 2 (Table 1/5 and 6/1 of the Earthworks Specification).<br>To only be re-used beneath clean cover layers or beneath hardstanding/buildings.                                                                                                                                                                                                                       |
| Natural Glacial Till (from regrading of site levels) | Contaminated Cohesive General Fill                 | Class 2A/B (c) & Class 7E (c)           | Appendix 2 (Table 1/5 and 6/1 of the Earthworks Specification).<br>Contaminated materials only to be re-used beneath clean cover layers or beneath hardstanding/ buildings.<br>Where used as clean soils in gardens and landscaped areas - Table 6/6 (frequency of sampling: minimum of 3 samples per source or one sample per 250m <sup>3</sup> , whichever is greater). |
|                                                      | Clean Cohesive General Fill                        | Class 2A/B & Class 7E                   |                                                                                                                                                                                                                                                                                                                                                                           |
|                                                      | Clean Cohesive Landscape Fill                      | Class 4A                                |                                                                                                                                                                                                                                                                                                                                                                           |
| Topsoil (Stockpile 3)                                | Clean Topsoil                                      | Class 5A                                | Appendix 2 (Table 1/5 and 6/1 of the Earthworks Specification).<br>Where used as clean soils in gardens and landscaped areas - Table 6/6 (frequency of sampling: minimum of 3 samples per source or one sample per 250m <sup>3</sup> , whichever is greater).                                                                                                             |

### **Materials Designated as Class 3:**

13. No materials are designated as SHW Class 3 under this Contract.

**Acceptable Material – Imported:**

14. Based on the earthworks requirements and development proposals, it is anticipated that there will be a requirement for the importation of clean subsoil and subject to the further characterisation testing of the topsoil (Stockpile 3) potentially further topsoil materials for the soil cover layer in future garden and landscaped areas.
15. The following assessment and testing shall be undertaken by the Contractor prior to importation of any materials to site:-
  - Review of Available Data - desk study and ground investigation information available for the source site shall be provided to the Engineer for review.
  - Source Material Inspection - to confirm that there is no historical or visual evidence of hazardous contamination or materials.
  - Source Material Testing - to confirm that materials are 'clean' and acceptable for incorporation into the earthworks in accordance with Tables 6/6, Appendix 2 to demonstrate compliance with the appropriate chemical Acceptance Criteria.
16. All materials imported for use within the works shall be from uncontaminated sources. Ground investigation and laboratory testing data shall be obtained for all imported materials and a copy provided to the Engineer for review prior to the import of the materials on-site. All imported materials shall be tested at source at the frequencies stated in Table 1/5, prior to importation, to demonstrate compliance with the chemical acceptance criteria presented in Table 6/6, Appendix 6/1 and shall demonstrate compliance with the geotechnical criteria in accordance with Tables 6/1 and 6/2.

**Unacceptable Materials:**

17. Unacceptable materials are those that either do not meet the requirements of Tables 1/5 and 6/1 or contain the following material constituents:-
  - Perishable materials (i.e. wood, straw, sawdust and paper).
  - Materials in a frozen condition.
  - Class U2 materials having hazardous chemical, biological or physical properties.
18. The Contractor shall be responsible for disposing of any on-site materials that are unacceptable for re-use within the works.
19. The Contractor shall, at his own cost be responsible for disposing of any imported materials subsequently found to be unsuitable for use within the works.
20. Where Class 1 and Class 2 materials are found to be unacceptable, and where they meet the requirement of Class 6R/7E, they can be stabilised by treatment with cement/lime and used in the permanent works as stabilised Class 9D/F materials.
21. Where unacceptable materials are identified as Class U2 hazardous by the Contractor, he shall liaise with the Resident Engineer and comply with the requirements of Appendix 6/2.

**Requirements for Groundwater/Surface Water Management:**

22. Temporary stockpile areas constructed to receive earthworks materials should incorporate a Terram membrane basal layer and perimeter bunding to prevent excess sediment and surface water entering the existing onsite drainage and from egressing the site.
23. All necessary permits and discharge consents relating to the enabling and constructions works, including dewatering of deep excavations, shall be obtained by the Contractor prior to commencement of the earthworks programme.

**SHW Classes 9D to F Lime/Cement Stabilised Materials:**

24. Stabilised materials will be considered as acceptable for re-use as general fill (SHW Class 9D/F) provided in-situ testing complies with the requirements of Table 6/1, Appendix 6/1.
25. The Contractor is required to undertake trials (in accordance with Appendix 6/13) to confirm the acceptability of the materials and the method of treatment to achieve the acceptance criteria for Class 9D/F materials.

**Special Requirements for Determining Material Acceptability:**

26. Determination of the suitability of site won general fill, stabilised general fill and imported materials shall be the responsibility of the Contractor. The roles and responsibilities of the Main Contractor Supervisor and the Contractor's Earthworks Engineer are defined below:-

**The Main Contractor**

27. The Main Contractor shall be responsible for the following:-
  - Classification of excavated materials.
  - Undertaking trials to demonstrate the suitability of lime/cement modification to achieve Class 9D/F acceptance criteria.
  - Reports upon all geotechnical and chemical testing required as detailed in the Specification.
  - Reports upon all surveys required by the Specification.
  - Ensuring the Earthworks Audit and Procedures as defined in Appendix 6/3 are undertaken.

**The Earthworks Engineer**

28. The Main Contractor shall be responsible for the classification of all earthwork materials, including performing the testing required for classification. To this purpose the Main Contractor shall use an experienced Geotechnical Engineer to fulfil the following role:-
  - Determining the classification of excavated materials.
  - Arrange, carry out and report upon all geotechnical, chemical and leachate testing required as detailed in the Specification.
  - Arrange, carry out and report upon all surveys required by the Specification.
  - Prepare an Earthworks Audit Report as required in Appendix 6/3.

**Reprocessing Requirements:**

29. The Contractor shall be responsible for the modification of unacceptable Class 1 and 2 general fill materials (granular and cohesive made ground and natural Glacial Till) as SHW Class 6R/7E to produce acceptable earthworks material for re-use as SHW Class 9D/F stabilised general fill in accordance with the requirements of this Appendix and Appendix 6/13.

**TABLE 6/1: ACCEPTABLE EARTHWORKS MATERIALS: CLASSIFICATION AND COMPACTION REQUIREMENTS (SEE FOOTNOTES)**

| Class                 |   |   |   | General Material Description       | Typical Use  | Permitted Constituents<br>(All Subject to Requirements of Clause 601 and Appendix 6/1)                                   | Material Properties Required for Acceptability (In Addition to Requirements on use of Fill Materials in Clause 601 and Testing in Clause 631) |                                        |                           |         | Compaction Requirements in Clause 612                                            | Class |   |   |
|-----------------------|---|---|---|------------------------------------|--------------|--------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|---------------------------|---------|----------------------------------------------------------------------------------|-------|---|---|
|                       |   |   |   |                                    |              |                                                                                                                          | Property (See Exceptions in Previous Column)                                                                                                  | Defined and Tested in Accordance With: | Acceptable Limits Within: |         |                                                                                  |       |   |   |
|                       |   |   |   |                                    |              |                                                                                                                          |                                                                                                                                               |                                        | Lower                     | Upper   |                                                                                  |       |   |   |
| GENERAL GRANULAR FILL | 1 | A | - | Well graded granular material      | General Fill | Any material or combination of materials, other than material designated as Class 3 in the Contract. Recycled aggregate. | (i) Grading                                                                                                                                   | BS 1377: Part 2                        | Tab 6/2                   | Tab 6/2 | Table 6/4 Method 2                                                               | 1     | A | - |
|                       |   |   |   |                                    |              |                                                                                                                          | (ii) Uniformity Co-efficient                                                                                                                  | See Note 5                             | 10                        | -       |                                                                                  |       |   |   |
|                       |   |   |   |                                    |              |                                                                                                                          | (iii) mc                                                                                                                                      | BS 1377: Part 2                        | OMC-4%                    | OMC+4%  |                                                                                  |       |   |   |
|                       |   |   |   |                                    |              |                                                                                                                          | (iv) OMC                                                                                                                                      | BS 1377: Part 4 (4.5kg hammer)         | -                         | -       |                                                                                  |       |   |   |
|                       | 1 | B | - | Uniformly graded granular material | General Fill | Any material or combination of materials, other than chalk. Recycled aggregate.                                          | (i) Grading                                                                                                                                   | BS 1377: Part 2                        | Tab 6/2                   | Tab 6/2 | Table 6/4 Method 3                                                               | 1     | B | - |
|                       |   |   |   |                                    |              |                                                                                                                          | (ii) Uniformity Co-efficient                                                                                                                  | See Note 5                             | 10                        | -       |                                                                                  |       |   |   |
|                       |   |   |   |                                    |              |                                                                                                                          | (iii) mc                                                                                                                                      | BS 1377: Part 2                        | OMC-4%                    | OMC+4%  |                                                                                  |       |   |   |
|                       |   |   |   |                                    |              |                                                                                                                          | (iv) OMC                                                                                                                                      | BS 1377: Part 4 (4.5kg hammer)         | -                         | -       |                                                                                  |       |   |   |
|                       | 1 | C | - | Coarse granular material           | General Fill | Any material or combination of materials, other than material designated as Class 3 in the Contract. Recycled aggregate. | (i) Grading                                                                                                                                   | BS 1377: Part 2                        | Tab 6/2                   | Tab 6/2 | Table 6/4 Method 5<br><br>* Generally not suitable for End Product Specification | 1     | C | - |
|                       |   |   |   |                                    |              |                                                                                                                          | (ii)Uniformity Co-efficient                                                                                                                   | See Note 5                             | -                         | 10      |                                                                                  |       |   |   |
|                       |   |   |   |                                    |              |                                                                                                                          | (iii) LA Co-efficient                                                                                                                         | Clause 635                             | -                         | 50      |                                                                                  |       |   |   |

**TABLE 6/1: ACCEPTABLE EARTHWORKS MATERIALS: CLASSIFICATION AND COMPACTION REQUIREMENTS (SEE FOOTNOTES) (CONTINUED)**

| Class                                                                                               |   |   |   | General<br>Material<br>Description | Typical Use  | Permitted Constituents<br>(All Subject to<br>Requirements of Clause 601<br>and Appendix 6/1)                   | Material Properties Required for Acceptability in Clause 601 and Testing<br>in Clause 631 |                                                 |                              |         | Compaction<br><br>Requirements in<br>Clause 612                                                                                                                                            | Class |   |   |
|-----------------------------------------------------------------------------------------------------|---|---|---|------------------------------------|--------------|----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-------------------------------------------------|------------------------------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|---|---|
|                                                                                                     |   |   |   |                                    |              |                                                                                                                | Property (See Exceptions in<br>Previous Column)                                           | Defined and<br>Tested in<br>Accordance<br>With: | Acceptable Limits<br>Within: |         |                                                                                                                                                                                            |       |   |   |
|                                                                                                     |   |   |   |                                    |              |                                                                                                                |                                                                                           |                                                 | Lower                        | Upper   |                                                                                                                                                                                            |       |   |   |
| G<br>E<br>N<br>E<br>R<br>A<br>L<br><br>C<br>O<br>H<br>E<br>S<br>I<br>V<br>E<br><br>F<br>I<br>L<br>L | 2 | A | - | Wet cohesive<br>material           | General Fill | Any material, or combination of<br>materials, other than material<br>designated as Class 3 in the<br>Contract. | (i) Grading                                                                               | BS 1377: Part 2                                 | Tab 6/2                      | Tab 6/2 | Table 6/4 Method 1;<br>except (i) for<br>materials with liquid<br>limit greater than<br>50, determined by<br>BS 1377; Part 2, only<br>tamping rollers or<br>grid rollers shall be<br>used. | 2     | A | - |
|                                                                                                     |   |   |   |                                    |              |                                                                                                                | (ii) plastic limit (PL)                                                                   | BS 1377: Part 2                                 | -                            | -       |                                                                                                                                                                                            |       |   |   |
|                                                                                                     |   |   |   |                                    |              |                                                                                                                | (iii) mc                                                                                  | BS 1377: Part 2                                 | OMC-2%                       | OMC+2%  |                                                                                                                                                                                            |       |   |   |
|                                                                                                     |   |   |   |                                    |              |                                                                                                                | (iv) MCV                                                                                  | Clause 632                                      | 8                            | 15      |                                                                                                                                                                                            |       |   |   |
|                                                                                                     |   |   |   |                                    |              |                                                                                                                | (v) OMC                                                                                   | BS 1377: Part 4<br>(4.5kg hammer)               | -                            | -       |                                                                                                                                                                                            |       |   |   |
|                                                                                                     | 2 | B | - | Dry cohesive<br>material           | General Fill | Any material or combination of<br>materials, other than chalk.                                                 | (i) Grading                                                                               | BS 1377: Part 2                                 | Tab 6/2                      | Tab 6/2 | Tab 6/4 Method 2                                                                                                                                                                           | 2     | B | - |
|                                                                                                     |   |   |   |                                    |              |                                                                                                                | (ii) Plastic Limit (PL)                                                                   | BS 1377: Part 2                                 | -                            | -       |                                                                                                                                                                                            |       |   |   |
|                                                                                                     |   |   |   |                                    |              |                                                                                                                | (iii) mc                                                                                  | BS 1377: Part 2                                 | OMC-2%                       | OMC+2%  |                                                                                                                                                                                            |       |   |   |
|                                                                                                     |   |   |   |                                    |              |                                                                                                                | (iv) MCV                                                                                  | Clause 632                                      | 8                            | 15      |                                                                                                                                                                                            |       |   |   |
|                                                                                                     |   |   |   |                                    |              |                                                                                                                | (v) OMC                                                                                   | BS 1377: Part 4<br>(4.5kg rammer)               | -                            | -       |                                                                                                                                                                                            |       |   |   |

**TABLE 6/1: ACCEPTABLE EARTHWORKS MATERIALS: CLASSIFICATION AND COMPACTION REQUIREMENTS (SEE FOOTNOTES) (CONTINUED)**

| Class |   |   |   | General<br>Material<br>Description | Typical Use  | Permitted Constituents<br>(All Subject to<br>Requirements of Clause 601<br>and Appendix 6/1)                                  | Material Properties Required for Acceptability in Clause 601 and Testing<br>in Clause 631 |                                                                                                   |                                         |                                          | Compaction<br>Requirements in<br>Clause 612 | Class |   |   |
|-------|---|---|---|------------------------------------|--------------|-------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------|------------------------------------------|---------------------------------------------|-------|---|---|
|       |   |   |   |                                    |              |                                                                                                                               | Property (See Exceptions in<br>Previous Column)                                           | Defined and<br>Tested in<br>Accordance<br>With:                                                   | Acceptable Limits<br>Within:            |                                          |                                             |       |   |   |
|       |   |   |   |                                    |              |                                                                                                                               |                                                                                           |                                                                                                   | Lower                                   | Upper                                    |                                             |       |   |   |
|       | 2 | C | - | Stony cohesive<br>material         | General Fill | Any material, or combination of<br>materials, other than chalk.<br><br>(**) Acceptance based on<br>either test (ii) or (iii). | (i) Grading<br><br>(ii) mc (**)<br><br>(iii) MCV (**)<br><br>(vi) OMC                     | BS 1377: Part 2<br><br>BS 1377: Part 2<br><br>Clause 632<br><br>BS 1377: Part 4<br>(4.5kg rammer) | Tab 6/2<br><br>OMC-2%<br><br>8<br><br>- | Tab 6/2<br><br>OMC+2%<br><br>15<br><br>- | Tab 6/4 Method 2                            | 2     | C | - |

**TABLE 6/1: ACCEPTABLE EARTHWORKS MATERIALS: CLASSIFICATION AND COMPACTION REQUIREMENTS (SEE FOOTNOTES) (CONTINUED)**

| Class             |   |             |   | General<br>Material<br>Description  | Typical Use                                                                                    | Permitted Constituents<br>(All Subject to<br>Requirements of Clause 601 and<br>Appendix 6/1)                                                                                                                                                                                                                   | Material Properties Required for Acceptability in Clause 601 and Testing<br>in Clause 631 |                                                     |                              |           | Compaction<br><br>Requirements in<br>Clause 612 | Class |   |   |
|-------------------|---|-------------|---|-------------------------------------|------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-----------------------------------------------------|------------------------------|-----------|-------------------------------------------------|-------|---|---|
|                   |   |             |   |                                     |                                                                                                |                                                                                                                                                                                                                                                                                                                | Property (See Exceptions<br>in Previous Column)                                           | Defined and<br>Tested in<br>Accordance<br><br>With: | Acceptable Limits<br>Within: |           |                                                 |       |   |   |
|                   |   |             |   |                                     |                                                                                                |                                                                                                                                                                                                                                                                                                                |                                                                                           |                                                     | Lower                        | Upper     |                                                 |       |   |   |
| LANDSCAPE<br>FILL | 4 | A           | - | Various                             | Fill to<br>Landscape<br>Areas and Clean<br>Cover Materials                                     | Any “clean” cohesive materials.                                                                                                                                                                                                                                                                                | (i) Grading                                                                               | Visual Inspection                                   | Tab 6/2                      | Tab 6/2   | Clause 620 (2)                                  | 4     | A | - |
|                   |   |             |   |                                     |                                                                                                |                                                                                                                                                                                                                                                                                                                | (ii) MCV                                                                                  | Clause 632                                          | 6                            | -         |                                                 |       |   |   |
|                   |   |             |   |                                     |                                                                                                |                                                                                                                                                                                                                                                                                                                | (iii) Chemical Properties<br>where Used as Clean Cover                                    | Appendix 6/1<br>(MCERTS)                            | -                            | Table 6/6 |                                                 |       |   |   |
|                   | 4 | B           | - | Various                             | Fill to<br>Landscape<br>Areas and Clean<br>Cover<br>Materials.<br><br>Granular Break<br>Layer. | Any “clean” granular materials.                                                                                                                                                                                                                                                                                | (i) Grading                                                                               | Visual Inspection                                   | Tab 6/2                      | Tab 6/2   | Clause 620 (2)                                  | 4     | B | - |
| (ii) mc           |   |             |   |                                     |                                                                                                |                                                                                                                                                                                                                                                                                                                | BS 1377: Part 2                                                                           | OMC-5%                                              | OMC+5%                       |           |                                                 |       |   |   |
| (iii) OMC         |   |             |   |                                     |                                                                                                |                                                                                                                                                                                                                                                                                                                | BS 1377: Part 4<br>(4.5Kg Rammer)                                                         | -                                                   | -                            |           |                                                 |       |   |   |
| TOPSOIL           | 5 | A<br>&<br>B | - | Site Won and<br>Imported<br>Topsoil | Topsoil                                                                                        | It shall conform to BS 3882<br>(1994) in respect of textural<br>classification, stone content,<br>stone size, nutrient content and<br>exchangeable sodium content for<br>“General Purpose Grade Topsoil”<br>and shall be free of<br>contaminants, weeds and foreign<br>matter as defined by BS 3882<br>(1994). | (i) Chemical Properties<br>where used as Clean Cover                                      | Appendix 6/1<br>(MCERTS)                            | -                            | Tab 6/6   | No requirement                                  | 5     | A | - |
|                   |   |             |   |                                     |                                                                                                |                                                                                                                                                                                                                                                                                                                |                                                                                           |                                                     |                              |           |                                                 |       |   |   |

**TABLE 6/1: ACCEPTABLE EARTHWORKS MATERIALS: CLASSIFICATION AND COMPACTION REQUIREMENTS (SEE FOOTNOTES) (CONTINUED)**

| Class                                                                                                    |   |   |   | General<br>Material<br>Description                   | Typical Use           | Permitted Constituents<br>(All Subject to<br>Requirements of Clause 601 and<br>Appendix 6/1)                                                                                                                        | Material Properties Required for Acceptability (In Addition to<br>Requirements on use of Fill Materials in Clause 601 and Testing in Clause<br>631)       |                                                                                                                                            |                                                 |                                                              | Compaction<br><br>Requirements in<br>Clause 612                                                                                                                                                 | Class |   |   |
|----------------------------------------------------------------------------------------------------------|---|---|---|------------------------------------------------------|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|--------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|---|---|
|                                                                                                          |   |   |   |                                                      |                       |                                                                                                                                                                                                                     | Property (See Exceptions<br>in Previous Column)                                                                                                           | Defined and<br>Tested in<br>Accordance                                                                                                     | Acceptable Limits<br>Within:                    |                                                              |                                                                                                                                                                                                 |       |   |   |
|                                                                                                          |   |   |   |                                                      |                       |                                                                                                                                                                                                                     |                                                                                                                                                           |                                                                                                                                            | With:                                           | Lower                                                        |                                                                                                                                                                                                 |       |   |   |
| S<br>E<br>L<br>E<br>C<br>T<br>E<br>D<br><br>G<br>R<br>A<br>N<br>U<br>L<br>A<br>R<br><br>F<br>I<br>L<br>L | 6 | F | 2 | Selected<br>Granular<br>Material (coarse<br>grading) | Capping (site<br>won) | Any material, or combination of<br>materials, other than unburnt<br>colliery spoil and argillaceous rock.<br>Recycled aggregate.<br><br>(* ) Property (vi) shall not apply if<br>Class A (asphalt content) is <20%. | (i) Grading<br><br>(ii) OMC<br><br>(iii) mc<br><br>(iv) Los Angeles Co-<br>efficient<br><br>(v) Class A (asphalt)<br>content<br><br>(vi) Bitumen content* | BS 1377: Part 2<br><br>BS 1377: Part 4<br>(vibe hammer)<br><br>BS 1377 : Part 2<br><br>Clause 635<br><br>Clause 710<br><br>BS598: Part 102 | Tab 6/2<br><br>-<br><br>OMC-2<br><br>-<br><br>- | Tab 6/2<br><br>-<br><br>OMC+2<br><br>60<br><br>50%<br><br>2% | End Product 95% of<br>maximum dry density<br>of BS1377 Part 4<br>(4.5kg vibrating<br>hammer method) or a<br>dry density<br>corresponding to 5%<br>air voids at field mc,<br>whichever is lower. | 6     | F | 2 |

TABLE 6/1: ACCEPTABLE EARTHWORKS MATERIALS: CLASSIFICATION AND COMPACTION REQUIREMENTS (SEE FOOTNOTES) (CONTINUED)

| Class                                                        |   |   |   | General<br>Material<br>Description | Typical Use                                                     | Permitted Constituents<br>(All Subject to<br>Requirements of Clause 601 and<br>Appendix 6/1)                  | Material Properties Required for Acceptability in Clause 601 and Testing<br>in Clause 631) |                                        |                              |                    | Compaction<br>Requirements in<br>Clause 612 | Class |   |   |
|--------------------------------------------------------------|---|---|---|------------------------------------|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|----------------------------------------|------------------------------|--------------------|---------------------------------------------|-------|---|---|
|                                                              |   |   |   |                                    |                                                                 |                                                                                                               | Property (See Exceptions<br>in Previous Column)                                            | Defined and<br>Tested in<br>Accordance | Acceptable Limits<br>Within: |                    |                                             |       |   |   |
|                                                              |   |   |   |                                    |                                                                 |                                                                                                               |                                                                                            |                                        | With:                        | Lower              |                                             |       |   |   |
| S<br>E<br>L<br>E<br>C<br>T<br>E<br>D<br><br>F<br>I<br>L<br>L | 7 | E | - | Selected<br>Cohesive<br>Material   | For Stabilisation<br>with Lime to<br>Form Class 9D<br>(Capping) | Any material or combination of<br>materials other than materials<br>designated as Class 3 in the<br>Contract. | (i) Grading                                                                                | BS 1377: Part 2                        | Tab 6/2                      | Tab 6/2            | Not Applicable                              | 7     | E | - |
|                                                              |   |   |   |                                    |                                                                 |                                                                                                               | (ii) mc                                                                                    | BS 1377: Part 2                        | -                            | 30%                |                                             |       |   |   |
|                                                              |   |   |   |                                    |                                                                 |                                                                                                               | (iii) Plasticity Index                                                                     | BS 1377: Part 2                        | 10                           | -                  |                                             |       |   |   |
|                                                              |   |   |   |                                    |                                                                 |                                                                                                               | (iii) MCV                                                                                  | Clause 632                             | 8                            | 15                 |                                             |       |   |   |
|                                                              |   |   |   |                                    |                                                                 |                                                                                                               | (vii) OMC                                                                                  | BS1377 : Part 4<br>(vibrate. hammer)   | -                            | -                  |                                             |       |   |   |
|                                                              |   |   |   |                                    |                                                                 |                                                                                                               | (iv) Organic Material                                                                      | BS 1377: Part 3                        | -                            | 2%                 |                                             |       |   |   |
|                                                              |   |   |   |                                    |                                                                 |                                                                                                               | (v) Water Soluble (WS)<br>sulphate content                                                 | TRL Report 447:<br>Test No. 1          | -                            | 3.7g/l (as<br>SO4) |                                             |       |   |   |
|                                                              |   |   |   |                                    |                                                                 |                                                                                                               | (vi) Oxidisable Sulphides<br>(OS) Content                                                  | TRL Report 447:<br>Test No. 2 & 4      | -                            | 0.75% (as<br>SO4)  |                                             |       |   |   |
|                                                              |   |   |   |                                    |                                                                 |                                                                                                               | (vii) Total Potential<br>Sulphate (TPS) Content                                            | TRL Report 447:<br>Test No. 1          | -                            | 1.0% (as<br>SO4)   |                                             |       |   |   |

TABLE 6/1: ACCEPTABLE EARTHWORKS MATERIALS: CLASSIFICATION AND COMPACTION REQUIREMENTS (SEE FOOTNOTES) (CONTINUED)

| Class                                                                  |   |   |   | General<br><br>Material<br>Description            | Typical Use | Permitted Constituents<br><br>(All Subject to<br>Requirements of Clause 601 and<br>Appendix 6/1) | Material Properties Required for Acceptability in Clause 601 and Testing<br>in Clause 631) |                                        |                              |       | Compaction<br><br>Requirements in<br>Clause 612                                                                                                                                                 | Class |   |   |
|------------------------------------------------------------------------|---|---|---|---------------------------------------------------|-------------|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|----------------------------------------|------------------------------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|---|---|
|                                                                        |   |   |   |                                                   |             |                                                                                                  | Property (See Exceptions<br>in Previous Column)                                            | Defined and<br>Tested in<br>Accordance | Acceptable Limits<br>Within: |       |                                                                                                                                                                                                 |       |   |   |
|                                                                        |   |   |   |                                                   |             |                                                                                                  |                                                                                            | With:                                  | Lower                        | Upper |                                                                                                                                                                                                 |       |   |   |
| S<br>T<br>A<br>B<br>I<br>L<br>I<br>S<br>E<br>D<br><br>F<br>I<br>L<br>L | 9 | D | - | Lime Stabilised<br>Cohesive<br>Material           | Capping     | Class 7E with addition of lime<br>(according to Clause 615).                                     | (i) Pulverisation                                                                          | BS 1924: Part 2                        | 30%                          | -     | End Product 95% of<br>maximum dry density<br>of BS1377 Part 4<br>(4.5kg vibrating<br>hammer method) or a<br>dry density<br>corresponding to 5%<br>air voids at field mc,<br>whichever is lower. | 9     | D | - |
|                                                                        |   |   |   |                                                   |             |                                                                                                  | (ii) MVC immediately<br>before completion                                                  | Clause 632                             | 8                            | -     |                                                                                                                                                                                                 |       |   |   |
|                                                                        |   |   |   |                                                   |             |                                                                                                  | (iii) California Bearing<br>Ratio immediately after<br>compaction                          | BS 1924: Part 2                        | 5%<br>(general<br>fill)      | -     |                                                                                                                                                                                                 |       |   |   |
|                                                                        |   |   |   |                                                   |             |                                                                                                  | (iii) OMC                                                                                  | BS 1377: Part 4<br>(4.5kg rammer)      | -                            | -     |                                                                                                                                                                                                 |       |   |   |
|                                                                        |   |   |   |                                                   |             |                                                                                                  | (iv) mc                                                                                    | BS 1377: Part 2                        | Dry<br>Density<br>95%        | -     |                                                                                                                                                                                                 |       |   |   |
|                                                                        | 9 | E | - | Lime/Cement<br>Stabilised<br>Cohesive<br>Material | Capping     | Class 7E with addition of lime and<br>cement (according to Clause<br>643).                       | (i) Pulverisation                                                                          | BS 1924: Part 2                        | 30%                          | -     | End Product 95% of<br>maximum dry density<br>of BS1377 Part 4<br>(4.5kg vibrating<br>hammer method) or a<br>dry density<br>corresponding to 5%<br>air voids at field mc,<br>whichever is lower. | 9     | E | - |
|                                                                        |   |   |   |                                                   |             |                                                                                                  | (ii) MVC immediately<br>before completion                                                  | Clause 632                             | 8                            | -     |                                                                                                                                                                                                 |       |   |   |
|                                                                        |   |   |   |                                                   |             |                                                                                                  | (iii) California Bearing<br>Ratio immediately after<br>compaction                          | BS 1924: Part 2                        | 5%<br>(general<br>fill)      | -     |                                                                                                                                                                                                 |       |   |   |
|                                                                        |   |   |   |                                                   |             |                                                                                                  | (iii) OMC                                                                                  | BS 1377: Part 4<br>(4.5kg rammer)      | -                            | -     |                                                                                                                                                                                                 |       |   |   |
|                                                                        |   |   |   |                                                   |             |                                                                                                  | (iv) mc                                                                                    | BS 1377: Part 2                        | Dry<br>Density<br>95%        | -     |                                                                                                                                                                                                 |       |   |   |

**TABLE 6/1: ACCEPTABLE EARTHWORKS MATERIALS: CLASSIFICATION AND COMPACTION REQUIREMENTS (SEE FOOTNOTES) (CONTINUED)**

| Class                                                                  |  |   |   | General<br>Material<br>Description | Typical Use                                                             | Permitted Constituents<br>(All Subject to<br>Requirements of Clause 601 and<br>Appendix 6/1) | Material Properties Required for Acceptability in Clause 601 and Testing<br>in Clause 631) |                                                                                                                           |                                                                                                        |                                                                          | Compaction<br>Requirements in<br>Clause 612 | Class              |   |   |       |
|------------------------------------------------------------------------|--|---|---|------------------------------------|-------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|---------------------------------------------|--------------------|---|---|-------|
|                                                                        |  |   |   |                                    |                                                                         |                                                                                              | Property (See Exceptions<br>in Previous Column)                                            | Defined and<br>Tested in<br>Accordance                                                                                    | Acceptable Limits<br>Within:                                                                           |                                                                          |                                             |                    |   |   |       |
|                                                                        |  |   |   |                                    |                                                                         |                                                                                              |                                                                                            |                                                                                                                           | With:                                                                                                  | Lower                                                                    |                                             |                    |   |   | Upper |
| S<br>T<br>A<br>B<br>I<br>L<br>I<br>S<br>E<br>D<br><br>F<br>I<br>L<br>L |  | 9 | F | -                                  | Lime and<br>Cement<br>Stabilised Well<br>Graded<br>Granular<br>Material | Capping                                                                                      | Class 6R with addition of lime<br>and cement (according to Clause<br>643)                  | (i) Pulverisation<br><br>(ii) California Bearing Ratio<br>immediately after<br>compaction<br><br>(iii) OMC<br><br>(iv) mc | BS 1924: Part 2<br><br>BS 1924: Part 2<br><br>BS 1377: Part 4<br>(4.5kg rammer)<br><br>BS 1377: Part 2 | 60%<br><br>5%<br>(general<br>fill)<br><br>-<br><br>Dry<br>Density<br>95% | -<br><br>-<br><br>-<br><br>-                | Table 6/4 Method 6 | 9 | F | -     |

Footnotes to Table 6/1:

1 App = Appendix

2 Tab = Table

3 Where in the Acceptable Limits column reference is made to App 6/1, only those properties having limits ascribed to them in Appendix 6/1 shall apply. Where Appendix 6/1 gives limits for other properties not listed in this Table such limits shall also apply.

4 Where BS 1377: Part 2 is specified for mc, this shall mean BS 1377: Part 2 or BS 812: Part 3 as appropriate.

5 Uniformity coefficient is defined as the ratio of the particle diameters D60 to D10 on the particle size distribution curve, where -

D60 = particle diameter at which 60% of the soil weight is finer.

D10 = particle diameter at which 10% of the soil weight is finer.

**TABLE 6/2: GRADING REQUIREMENTS FOR ACCEPTABLE SITE WON EARTHWORKS MATERIALS**

| Percentage by Mass Passing the Test Sieve Shown |           |     |                     |        |        |        |        |    |    |        |     |       |      |        |      |                          |     |     |        |   |       |
|-------------------------------------------------|-----------|-----|---------------------|--------|--------|--------|--------|----|----|--------|-----|-------|------|--------|------|--------------------------|-----|-----|--------|---|-------|
| Class                                           | Size (mm) |     | Size (mm) BS Series |        |        |        |        |    |    |        |     |       |      |        |      | Size (microns) BS Series |     |     |        |   | Class |
|                                                 | 500       | 300 | 125                 | 90     | 75     | 37.5   | 28     | 20 | 14 | 10     | 6.3 | 5     | 3.35 | 2      | 1.18 | 600                      | 300 | 150 | 63     | 2 |       |
| 1A                                              |           | 100 | 95-100              |        |        |        |        |    |    |        |     |       |      |        |      |                          |     |     | <15    |   | 1A    |
| 1B                                              |           |     | 100                 |        |        |        |        |    |    |        |     |       |      |        |      |                          |     |     | <15    |   | 1B    |
| 2A-B                                            |           |     | 100                 |        |        |        |        |    |    |        |     |       |      | 80-100 |      |                          |     |     | 15-100 |   | 2A-B  |
| 2C                                              |           |     | 100                 |        |        |        |        |    |    |        |     |       |      | 15-80  |      |                          |     |     | 15-80  |   | 2C    |
| 4A/B                                            |           |     |                     |        |        |        |        |    |    |        |     |       |      |        |      |                          |     |     |        |   | 4A/B  |
| 5A-B                                            |           |     |                     |        |        |        |        |    |    |        |     |       |      |        |      |                          |     |     |        |   | 5A-B  |
| 6F2                                             |           |     | 100                 | 80-100 | 65-100 | 45-100 |        |    |    | 15-60  |     | 10-45 |      |        |      | 0-25                     |     |     | 0-12   |   | 6F2   |
| 6R                                              |           |     | 100                 | 85-100 |        |        |        |    |    | 25-100 |     |       |      |        |      | 10-100                   |     |     | <15    |   | 6R    |
| 7E                                              |           |     |                     |        | 100    |        | 95-100 |    |    |        |     |       |      |        |      |                          |     |     | 15-100 |   | 7E    |

**TABLE 6/4: METHOD COMPACTION FOR EARTHWORKS MATERIALS: PLANT AND METHODS (METHOD 1 TO METHOD 6)**

(This Table is to be read in conjunction with sub-Clause 612.10)

| Type of Compaction Plant  | Ref No. | Category                                | Method 1   |    | Method 2   |    | Method 3   |     | Method 4   |    | Method 5   |    | Method 6      |               |               |
|---------------------------|---------|-----------------------------------------|------------|----|------------|----|------------|-----|------------|----|------------|----|---------------|---------------|---------------|
|                           |         |                                         | D          | N# | D          | N# | D          | N#  | D          | N# | D          | N# | N for D=110mm | N for D=150mm | N for D=250mm |
| Vibratory Roller          |         | Mass per metre width of vibratory roll: |            |    |            |    |            |     |            |    |            |    |               |               |               |
|                           | 1       | over 270kg up to 450kg                  | unsuitable |    | 75         | 16 | 150        | 16  | unsuitable |    | unsuitable |    | unsuitable    | unsuitable    | unsuitable    |
|                           | 2       | over 450kg up to 700kg                  | unsuitable |    | 75         | 12 | 150        | 12  | unsuitable |    | unsuitable |    | unsuitable    | unsuitable    | unsuitable    |
|                           | 3       | over 700kg up to 1300kg                 | 100        | 12 | 125        | 10 | 150        | 6   | 125        | 10 | unsuitable |    | 16            | unsuitable    | unsuitable    |
|                           | 4       | over 1300kg up to 1800kg                | 125        | 8  | 150        | 8  | 200        | 10* | 175        | 4  | unsuitable |    | 6             | 16            | unsuitable    |
|                           | 5       | over 1800kg up to 2300kg                | 150        | 4  | 150        | 4  | 225        | 12* | unsuitable |    | unsuitable |    | 4             | 6             | 12            |
|                           | 6       | over 2300kg up to 2900kg                | 175        | 4  | 175        | 4  | 250        | 10* | unsuitable |    | 400        | 5  | 3             | 5             | 11            |
|                           | 7       | over 2900kg up to 3600kg                | 200        | 4  | 200        | 4  | 275        | 8*  | unsuitable |    | 500        | 5  | 3             | 5             | 10            |
|                           | 8       | over 3600kg up to 4300kg                | 225        | 4  | 225        | 4  | 300        | 8*  | unsuitable |    | 600        | 5  | 2             | 4             | 8             |
|                           | 9       | over 4300kg up to 5000kg                | 250        | 4  | 250        | 4  | 300        | 6*  | unsuitable |    | 700        | 5  | 2             | 4             | 7             |
|                           | 10      | over 5000kg                             | 275        | 4  | 275        | 4  | 300        | 4*  | unsuitable |    | 800        | 5  | 2             | 3             | 6             |
| Vibrating Plate Compactor |         | Mass per m2 of base plate:              |            |    |            |    |            |     |            |    |            |    |               |               |               |
|                           | 1       | over 880 kg up to 1100 kg               | unsuitable |    | unsuitable |    | 75         | 6   | unsuitable |    | unsuitable |    | unsuitable    | unsuitable    | unsuitable    |
|                           | 2       | over 1100 kg up to 1200 kg              | unsuitable |    | 75         | 10 | 100        | 6   | 75         | 10 | unsuitable |    | unsuitable    | unsuitable    | unsuitable    |
|                           | 3       | over 1200 kg up to 1400 kg              | unsuitable |    | 75         | 6  | 150        | 6   | 150        | 8  | unsuitable |    | unsuitable    | unsuitable    | unsuitable    |
|                           | 4       | over 1400 kg up to 1800 kg              | 100        | 6  | 125        | 6  | 150        | 4   | unsuitable |    | unsuitable |    | 8             | unsuitable    | unsuitable    |
|                           | 5       | over 1800 kg up to 2100 kg              | 150        | 6  | 150        | 5  | 200        | 4   | unsuitable |    | unsuitable |    | 5             | 8             | unsuitable    |
| Vibro-tamper              |         | Mass:                                   |            |    |            |    |            |     |            |    |            |    |               |               |               |
|                           | 1       | over 50 kg up to 65 kg                  | 100        | 3  | 100        | 3  | 150        | 3   | 125        | 3  | unsuitable |    | 4             | 8             | unsuitable    |
|                           | 2       | over 65 kg up to 75 kg                  | 125        | 3  | 125        | 3  | 200        | 3   | 150        | 3  | unsuitable |    | 3             | 6             | 12            |
|                           | 3       | over 75 kg up to 100 kg                 | 150        | 3  | 150        | 3  | 225        | 3   | 175        | 3  | unsuitable |    | 2             | 4             | 10            |
| Power Rammer              |         | Mass:                                   |            |    |            |    |            |     |            |    |            |    |               |               |               |
|                           | 1       | 100 kg up to 500 kg                     | 150        | 4  | 150        | 6  | unsuitable |     | 200        | 4  | unsuitable |    | 5             | 8             | unsuitable    |
| Dropping-weight Compactor |         | Mass of rammer over 500kg               |            |    |            |    |            |     |            |    |            |    |               |               |               |
|                           | 1       | weight drop:                            |            |    |            |    |            |     |            |    |            |    |               |               |               |
|                           | 2       | over 1 m up to 2 m                      | 600        | 4  | 600        | 8  | 450        | 8   | unsuitable |    | unsuitable |    | unsuitable    | unsuitable    | unsuitable    |
|                           |         | over 2 m                                | 600        | 2  | 600        | 8  | unsuitable |     | unsuitable |    | unsuitable |    | unsuitable    | unsuitable    | unsuitable    |

**TABLE 6/5: METHOD COMPACTION FOR EARTHWORKS MATERIALS: PLANT AND METHOD (METHOD 7)**

(This Table is to be read in conjunction with sub-Clause 612.10)

| Type of Compaction Plant                                                | Ref No. | Category                                     | Method 7      |                 |
|-------------------------------------------------------------------------|---------|----------------------------------------------|---------------|-----------------|
|                                                                         |         |                                              | N for D=150mm | N for D = 250mm |
| Smooth Wheeled Roller (or vibratory roller operating without vibration) | 1       | Mass per metre width of roll:                | unsuitable    | unsuitable      |
|                                                                         | 2       | over 2100 kg up to 2700 kg                   | unsuitable    | unsuitable      |
|                                                                         | 3       | over 2700 kg up to 5400 kg<br>over 5400 kg   | 12            | unsuitable      |
| Grid Roller                                                             | 1       | Mass per metre width of roll:                | unsuitable    | unsuitable      |
|                                                                         | 2       | over 2700 kg up to 5400 kg                   | 16            | unsuitable      |
|                                                                         | 3       | over 5400 kg up to 8000 kg<br>over 8000 kg   | 8             | unsuitable      |
| Deadweight tamping roller                                               | 1       | Mass per metre width of roll:                | 4             | 8               |
|                                                                         | 2       | over 4000 kg up to 6000 kg<br>over 6000 kg   | 3             | 6               |
| Pneumatic-tyred roller                                                  | 1       | Mass per wheel:                              | unsuitable    | unsuitable      |
|                                                                         | 2       | over 1000 kg up to 1500 kg                   | 12            | unsuitable      |
|                                                                         | 3       | over 1500 kg up to 2000 kg                   | 6             | unsuitable      |
|                                                                         | 4       | over 2000 kg up to 2500 kg                   | 5             | unsuitable      |
|                                                                         | 5       | over 2500 kg up to 4000 kg                   | 4             | 16              |
|                                                                         | 6       | over 4000 kg up to 6000 kg                   | unsuitable    | 8               |
|                                                                         | 7       | over 6000 kg up to 8000 kg                   | unsuitable    | 4               |
|                                                                         | 8       | over 8000 kg up to 12000 kg<br>over 12000 kg | unsuitable    | 4               |
| Vibratory tamping roller                                                | 1       | Mass per metre width of vibrating roll:      | unsuitable    | unsuitable      |
|                                                                         | 2       | over 700 kg up to 1300 kg                    | unsuitable    | unsuitable      |
|                                                                         | 3       | over 1300 kg up to 1800 kg                   | 16            | unsuitable      |
|                                                                         | 4       | over 1800 kg up to 2300 kg                   | 12            | unsuitable      |
|                                                                         | 5       | over 2300 kg up to 2900 kg                   | 10            | unsuitable      |
|                                                                         | 6       | over 2900 kg up to 3600 kg                   | 8             | 16              |
|                                                                         | 7       | over 3600 kg up to 4300 kg                   | 7             | 14              |
|                                                                         | 8       | over 4300 kg up to 5000 kg<br>over 5000 kg   | 6             | 12              |
| Vibratory roller                                                        | 1       | Mass per metre width of vibrating roll:      | unsuitable    | unsuitable      |
|                                                                         | 2       | over 270 kg up to 450 kg                     | unsuitable    | unsuitable      |
|                                                                         | 3       | over 450 kg up to 700 kg                     | unsuitable    | unsuitable      |
|                                                                         | 4       | over 700 kg up to 1300 kg                    | unsuitable    | unsuitable      |
|                                                                         | 5       | over 1300 kg up to 1800 kg                   | 12            | unsuitable      |
|                                                                         | 6       | over 1800 kg up to 2300 kg                   | 10            | unsuitable      |
|                                                                         | 7       | over 2300 kg up to 2900 kg                   | 10            | unsuitable      |
|                                                                         | 8       | over 2900 kg up to 3600 kg                   | 8             | unsuitable      |
|                                                                         | 9       | over 3600 kg up to 4300 kg                   | 8             | unsuitable      |
|                                                                         | 10      | over 4300 kg up to 5000 kg<br>over 5000 kg   | 6             | 12              |
| Vibratory Plate compactor                                               | 1       | Mass per m2 of base plate:                   | unsuitable    | unsuitable      |
|                                                                         | 2       | over 880 kg up to 1100 kg                    | unsuitable    | unsuitable      |
|                                                                         | 3       | over 1100 kg up to 1200 kg                   | unsuitable    | unsuitable      |
|                                                                         | 4       | over 1200 kg up to 1400 kg                   | 10            | unsuitable      |
|                                                                         | 5       | over 1400 kg up to 1800 kg                   | 8             | unsuitable      |
|                                                                         | 6       | over 1800 kg up to 2100 kg<br>over 2100 kg   | 6             | unsuitable      |
| Vibro-tamper                                                            | 1       | Mass:                                        | unsuitable    | unsuitable      |
|                                                                         | 2       | over 50 kg up to 65 kg                       | unsuitable    | unsuitable      |
|                                                                         | 3       | over 65 kg up to 75 kg                       | unsuitable    | unsuitable      |
|                                                                         | 4       | over 75 kg up to 100 kg<br>over 100 kg       | 8             | unsuitable      |
| Power rammer                                                            | 1       | Mass:                                        | 8             | unsuitable      |
|                                                                         | 2       | 100 kg up to 500 kg<br>over 500 kg           | 6             | 10              |
| Dropping weight compactor                                               | 1       | Mass of rammer over 500 kg height drop:      | unsuitable    | unsuitable      |
|                                                                         | 2       | over 1 m up to 2 m<br>over 2 m               | unsuitable    | unsuitable      |

**TABLE 6/6: ACCEPTANCE CRITERIA FOR ALL CLEAN FILL MATERIAL (TOTAL CONCENTRATIONS)**

| Determinand            | Acceptance Criteria for CLEAN Materials<br>Concentration mg/kg |
|------------------------|----------------------------------------------------------------|
| Inorganic Arsenic      | 37                                                             |
| Boron                  | 30                                                             |
| Cadmium                | 11                                                             |
| Chromium (III)         | 910                                                            |
| Chromium (VI)          | 6                                                              |
| Copper                 | 600                                                            |
| Lead                   | 200                                                            |
| Mercury (elemental)    | 1.2                                                            |
| Nickel                 | 180                                                            |
| Selenium               | 50                                                             |
| Zinc                   | 3000                                                           |
| Inorganic cyanide      | 26.8                                                           |
| Sulphate water soluble | 500 mg/l                                                       |
| pH                     | > 5                                                            |
| Benzene                | 0.087                                                          |
| Ethylbenzene           | 47                                                             |
| Toluene                | 130                                                            |
| P-xylene               | 56                                                             |
| Aliphatic 5-6          | 42                                                             |
| Aliphatic 6-8          | 100                                                            |
| Aliphatic 8-10         | 27                                                             |
| Aliphatic 10-12        | 130 <sup>Vap(48)</sup>                                         |
| Aliphatic 12-16        | 1100 <sup>Sol(24)</sup>                                        |
| Aliphatic 16-35        | 65000 <sup>Sol(8.48)</sup>                                     |
| Aliphatic 35-44        | 65000 <sup>Sol(8.48)</sup>                                     |
| Aromatic 5-7           | 70                                                             |
| Aromatic 7-8           | 130                                                            |
| Aromatic 8-10          | 34                                                             |
| Aromatic 10-12         | 74                                                             |
| Aromatic 12-16         | 140                                                            |
| Aromatic 16-21         | 260                                                            |
| Aromatic 21-35         | 1100                                                           |
| Aromatic 35-44         | 1100                                                           |
| Acenaphthene           | 210                                                            |
| Acenaphthylene         | 170                                                            |
| Anthracene             | 2400                                                           |
| Benz(a)anthracene      | 7.2                                                            |
| Benzo(a)pyrene         | 2.2                                                            |
| Benzo(b)fluoranthene   | 2.6                                                            |
| Benzo(k)fluoranthene   | 77                                                             |
| Benzo(ghi)perylene     | 320                                                            |
| Indeno(123-cd)pyrene   | 27                                                             |
| Chrysene               | 15                                                             |
| Dibenzo(ah)anthracene  | 0.24                                                           |
| Fluoranthene           | 280                                                            |
| Fluorene               | 170                                                            |
| Naphthalene            | 2.3                                                            |
| Phenanthrene           | 95                                                             |
| Pyrene                 | 620                                                            |
| Phenol                 | 120                                                            |
| Asbestos               | None                                                           |

Values for Clean (Site Won and Imported) Materials are based on:-

- Equivalent to Residential with gardens.
- Relate to 1% Soil Organic Matter.

### 3 APPENDIX 6/2: REQUIREMENTS FOR DEALING WITH UNACCEPTABLE MATERIALS

#### **Occurrence of U1 and U2 Materials:**

1. Class U1 and U2 materials are defined as excavated materials that are unacceptable for re-use within the permanent works as Class 1 or 2 Engineering Fill, Class 4A/B Landscape Fill, Class 5A Topsoil, Class 6F2 or 6R/7E materials for cement/lime modification in accordance with Tables 6/1 and 6/2 of the specification.
2. Should significant visual / olfactory evidence of contamination be encountered during any of the earthworks, the Contractor shall notify and consult with the Resident Engineer. The Resident Engineer shall direct any testing required in accordance with current published guidance, subject to the material meeting the geotechnical requirements of Appendix 6/1.

#### 4 APPENDIX 6/3: REQUIREMENTS FOR EXCAVATION, DEPOSITION, COMPACTION (OTHER THAN DYNAMIC COMPACTION)

##### **Drawings:**

1. The residential development is to comprise 40no detached and semi-detached properties as shown in Drawing 21201-D001-Rev2, Appendix 1.2, with finished floor levels between 93.65 m AOD (northwest) to 96.125 m AOD (southern boundary) are currently proposed.
2. Construction of the carriageways and hardstand areas is expected to be undertaken within 0.85 m of the proposed finished floor levels of adjacent structures. There will be public green space with new planting of trees and all properties will have domestic gardens. At this stage, an area of proposed offline cellular storage (1.2 m deep with minimum of 0.5 m cover and volume of up to 240 m<sup>3</sup>) is proposed in the POS area in the southwestern part of the site.
3. To prepare the site and provide a suitable working platform across the development, it is currently proposed to regrade the entire site as shown in Drawing 21201-D601-Rev1, Appendix 1.2.

##### **Blasting:**

4. Blasting shall not be permitted.

##### **Site Preparation:**

5. The site shall be closed to the general public. The Contractor shall repair, renew or construct a perimeter fence, as necessary, to secure the site and works from unauthorised access.
6. Site clearance of surface detritus, such as timber and scrap materials including fly tipping shall be undertaken and appropriately disposed of. Vegetation (trees, shrubs, stumps, roots etc.) excavated as part of the site clearance shall be disposed off-site as non-hazardous waste. The proposed development will also include the removal of surface hardstanding (redundant access roads and floor slabs etc).

##### **Temporary Works:**

7. The Contractor is required to design all temporary works necessary during excavation and filling operations. The Contractor shall amend temporary slopes to reflect the conditions encountered.
8. The Contractor is required to prepare an Earthworks Method Statement detailing all temporary works and excavation and filling methodology for approval by the Engineer.
9. The Contractor shall provide, in a Dust Management Plan, details of the risk assessment undertaken and the health and safety precautions to be adopted to ensure dust presents no adverse risk to human health or nuisance to adjacent properties.
10. The Contractor is to prepare a Surface Water Management Plan to demonstrate how surface runoff across the site during construction will be managed.

**General Earthworks Proposals:**

11. As part of the project requirements, earthworks form an integral part of the development, which entails the cutting/filling and re-use of on-site materials to generate the required final formation levels across the site. The Client is to provide details of the finished site levels prior to construction.
12. A provisional earthworks volumes are shown in Drawing 21201-D601-Rev1, Appendix 1.2
13. It is currently proposed to regrade the entire site that results in a cut of 1,953 m<sup>3</sup> and fill of 3,751 m<sup>3</sup>, with net shortfall of material of ~1,800 m<sup>3</sup> to achieve the proposed formation level. During the construction phase of works a further 1,534 m<sup>3</sup> of materials is expected to be generated from drainage excavations to make up the majority of the shortfall and at this stage no allowance for foundation or highways construction excavations have been included.
14. It is proposed (following consultation and agreement with the Environment Agency) to utilise 1,015 m<sup>3</sup> of the topsoil materials in Stockpile 3 under a mobile plant licence and end of waste recovery operation as clean cover soils within garden and landscaped areas.

**Works:**

15. The Contractor shall classify excavated materials in accordance with the requirements stated in Table 1/5, 6/1 and 6/2 and select suitable materials for re-use as SHW Classes 1A-C, 2A-C, 4A-B, 5A, 6F2, 6R and 7E.
16. The Contractor shall only excavate within the site boundary.
17. No discharges shall be made to Controlled Waters or drains without the consent/permit/licence of the appropriate bodies. The Contractor shall undertake chemical testing, and any water treatment, required in accordance with the discharge consent obtained. The Contractor shall be responsible for obtaining and implementing all necessary discharge consents.
18. All excavation works shall be supervised and coordinated by the Earthworks Engineer appointed by the Contractor.
19. The Earthworks Engineer shall determine the nature of excavated material and direct it to an appropriate location for either temporary stockpiling or deposition in the permanent works. Should the Contractor require stockpiling of excavated materials, suitable areas shall first be agreed with the Resident Engineer. The procedures and in-situ testing required for determining the re-use of excavated materials shall be clearly described in a Construction Method Statement prepared by the Contractor and shall be in accordance with the requirements of Appendices 1/5, 6/1 and 6/2.
20. The Contractor shall supply a surveyor, approved by the Resident Engineer to undertake the following surveys:-
  - Daily cut and fill areas and levels.
  - Daily sampling and in-situ testing locations.

- Final cut and fill formation levels.

21. Survey drawings shall be provided to the Resident Engineer within 48 hours of substantial completion of the Works.

22. The Contractor shall be responsible for maintaining stable temporary slopes during the earthworks. The temporary slopes are considered to be temporary works and the design of these slopes is the responsibility of the Contractor.

#### **Sub-formation:**

23. All sub-formation levels are to be subjected to rolling dynamic compaction.

#### **Development of Formation Levels:**

24. The Contractor shall be responsible for identifying any soft spots. Proof rolling shall be undertaken as defined in SHW Clause 616. Where soft spots are encountered, the Contractor shall inform the Resident Engineer. The Contractor shall remove all soft spots at formation level and replace them with well compacted granular fill to the satisfaction of the Resident Engineer.

#### **Filling Works:**

25. It is anticipated that to achieve the designed levels, the following use of site won and imported materials will be necessary within the proposed filling operations.

| LOCATION/PURPOSE                                                                                                      | SHW CLASS                                                                                                           | SOURCE                                                                         | COMMENTS                                                                                                                                                                                                                        |
|-----------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topsoil for garden and landscaped areas across                                                                        | Class 5A and B                                                                                                      | Site won topsoil from Stockpile 3 and imported topsoil materials, if necessary | Materials shall not contain contaminants in excess of acceptance criteria.                                                                                                                                                      |
| Subsoil for clean covers in garden and landscaped areas                                                               | Class 4                                                                                                             | Site won natural Glacial Till from excavations and imported subsoil materials  | Materials shall not contain contaminants in excess of acceptance criteria.                                                                                                                                                      |
| Inert insulation/break layer for clean covers in garden and landscaped areas                                          | Class 4                                                                                                             | Site won natural Glacial Till from excavations and imported subsoil materials  | Materials shall not contain contaminants in excess of acceptance criteria.                                                                                                                                                      |
| General Fill materials to be placed beneath properties and highways to achieve the proposed finished formation levels | Class 1 (c)<br>Class 2 (c)<br><br>Where wet of optimum moisture<br>Class 6R and 7E (to be stabilised as Class 9D/F) | Site Won made ground and natural Glacial Till from excavations.                | Maybe clean or contaminated, depending on final destination within the permanent works. However, where materials are to be re-used as “clean” fill – materials shall not contain contaminants in excess of acceptance criteria. |

Notes: - (c) – Contaminated

**Compaction:**

26. The Contractor shall undertake method compaction as per the requirements detailed in Table 6/1, 6/4 and 6/5. Acceptance and check testing shall be carried out at the minimum frequencies outlined in Appendix 1/5.
27. Prior to the placement of all fill materials, except Class 5, the Contractor shall proof roll the existing sub-formation with a minimum of one pass of a 1300 kg/m width vibratory roller and visually inspect and remove any soft or loose materials to the satisfaction of the Resident Engineer as detailed in this Specification and Appendix 6/6. Soft spots shall be removed below formation level and replaced with well-compacted granular fill as directed by the Engineer.
28. The Contractor shall undertake 'check' performance testing on each compacted layer as per the requirements detailed in the sections below:

**Method Compaction:**

29. The Contractor shall undertake on-site compaction trials of Class 1 and 2 general fill materials to verify that the generic SHW specified Method Compaction will achieve the necessary performance requirements in accordance with Table 6/1, Appendix 6/1. The Contractor shall undertake sufficient acceptance testing to demonstrate that the proposed methods of compaction achieve the required performance. If the tests indicate the requirements of Table 6/1, Appendix 6/1 have not been achieved the Contractor shall modify the compaction method and conduct further trials until the required performance of compacted fills is achieved.
30. The Contractor shall undertake performance testing on each compacted layer as per the requirements detailed in SHW Clause 612 and at the designated testing rate given in Appendix 1/5. The Contractor shall provide the Resident Engineer with test results a maximum of 24 hours after completion and shall obtain the Resident Engineer's certification prior to the placement of the following layers of fill material.
31. A nuclear density gauge (NDG) is permitted for checking field densities of general fill materials, with the exception of SHW Class 9D/E stabilised general fill materials. The NDG shall be used together with the sand replacement test (BS 1377: Part 9) at a ratio not exceeding 5 NDG to 1 sand replacement test. The Contractor shall provide the Resident Engineer with full details of the equipment and its calibration against measurements determined using Test 3.7 of BS 1377: Part 4 on materials to be compacted. The equipment must be operated and stored in accordance with the manufacturer's recommendations and current safety legislation and must be used only by personnel fully trained in its operation.
32. Sand replacement testing or, where appropriate, water replacement testing shall be undertaken to check field dry densities for all general fill materials, to the frequency given in Table 1/5, Appendix 1/5.
33. The results of the NDG and SRT 'check testing' shall be used as a guide only to confirming that all general fill materials have generally achieved an adequate degree of compaction, assessed

by comparison to 95% of the maximum dry density from a 4.5 kg rammer or less than 5% air voids.

**Benching into Existing Soils:**

34. Where fill materials are to be placed against existing soils, each new sloping layer shall be benched into the existing soils. The detail for these works shall be provided by the Contractor.
35. The benching in existing cohesive soils shall be cut with vertical faces and have level horizontal surfaces. Each bench shall have a vertical face cut to a height equal to 2 No. compacted/consolidated layer thicknesses for the fill material being placed. The horizontal surface shall be no less than 600 mm wide.
36. Benching in existing granular deposits shall have a vertical face cut to the steepest angle which is stable and a level horizontal face. Each bench shall have a vertical face cut to a height equal to 2 No. compacted/consolidated layer thicknesses for the fill material being placed. The horizontal surface shall be no less than 600 mm wide.
37. Fill materials shall be thoroughly compacted/consolidated up to the vertical face of each bench.

**Records and Reporting Requirements:**

38. The Contractor shall keep a daily diary of the works undertaken comprising:-
  - Areas of cut.
  - Areas of fill.
  - Stability of cut slopes.
  - Location of testing and results.
  - Compaction method utilised (including layer thickness, plant used and number of passes).
  - Material types excavated and location.
  - Material types placed and location.
  - Weather conditions.
  - Stockpiled material details.
  - Type and quantities of materials sent to/held in quarantine, if any.
  - Quantities of materials undergoing treatment/remediation, if any.
  - Quantities of materials removed from site and to where, if any.
  - Quantities of untreated and treated water discharged from the site, if any.
  - Pollution incidents and near misses.
  - Plant and labour returns (weekly).
39. The Contractor shall undertake the following surveys:-
  - Survey of the sub-formation level of the site following completion of excavation.
  - Surveys detailing the locations of where different classes of fill materials have been deposited within the works.
  - Surveys of the locations of acceptability test locations.

- A survey of the site following earthworks completion.
40. These surveys shall be on a minimum 25 m grid to OS National Grid. The surveys shall be carried out to an accuracy of  $\pm 100$  mm horizontally and  $\pm 5$  mm vertically. Plans of the survey at appropriate scales shall be provided to the Resident Engineer in hard copy and electronic format.

**Clean Soil Covers:**

41. Future garden and landscaped areas should incorporate a designed soil cover system in accordance with BRE 465 to isolate future end users from localised hydrocarbon contamination and disseminated asbestos fibres within made ground onsite. As a minimum the clean cover soil layer should be a minimum 0.6 m thick in garden areas and comprise 0.35 m thick subsoil and 0.25 m thick topsoil and within public open space areas should be a minimum 0.45 m thick comprising 0.2 m thick subsoil and 0.25 m thick topsoil. In the southwestern part of the site (Drawing 8190OD05, Appendix 1.1) the clean cover layer to gardens and landscaped areas should also incorporate an inert 'insulation' layer and / or geotextile barrier membrane where localised asbestos contaminated made ground is present.
42. All site won materials utilised as part of the landscaping shall be tested, prior to re-use, at a minimum frequency of 3 samples per source or 1 test per 250m<sup>3</sup> for the suite of determinands detailed in Table 6/6, Appendix 2.
43. The Contractor shall appoint an independent surveyor, approved by the Resident Engineer, to undertake the following surveys of clean cover layers:-
- Formation below clean cover.
  - Final surface of landscaping / garden areas.
44. The survey shall be on a frequency equivalent to a 5m grid, with a minimum of three points per landscaped area, to an accuracy of  $\pm 100$ mm horizontally and  $\pm 5$ mm vertically.
45. Plans of the surveys (1:500 scale) and digital data are to be provided to the Resident Engineer and Earthworks Engineer annotated as appropriate by the Contractor to demonstrate that the required thickness, as described above, of engineered soil cover subsoil and topsoil has been placed (thickness tolerance  $\pm 30$  mm).
46. Validation of the thickness and chemical quality of the as placed subsoil and topsoil materials placed to form the clean cover in garden areas will be verified by undertaking hand excavated trial pits through the clean cover in each plot. A sample of the topsoil and subsoil material will be obtained and tested for the suite of determinands and acceptability criteria detailed in Table 6/6, Appendix 2 at a frequency of 1 pit per 3 plots.
47. These areas shall be completed, seeded and vegetated on substantial completion of the earthworks and shall include a minimum depth of 150mm topsoil (SHW Class 5B).

**Earthworks Report:**

48. The Contractor is required to provide an 'As Built' Earthworks Report to be completed within four weeks of substantial completion of the earthworks. The report shall include:-

- Names and addresses of all contacts used for works including dates and activities undertaken on-site.
- Site diary of the works.
- Dates for each set of works.
- Confirmation of compliance with the Regulators, Statutory Authorities/Service Providers.
- Documentary evidence including desk study and source sampling of all imported materials used on-site, delivery dates, quantities, delivery tickets, placement location details and compaction details, as necessary.
- Details of noise/dust control measures undertaken.
- Confirmation or otherwise that no potential contamination was observed during the site strip and earthworks.
- Plans and records of the lateral extent and thicknesses of the materials utilised within the earthworks. This is to include a pre and post cover placement survey indicating the location of each different material used on-site.
- Tabulated geotechnical, chemical and in-situ density test results, detailing location (co-ordinates and levels) of test, along with result, compliance value and whether or not the test result passes or fails.
- Details of any remedial works undertaken.
- Documentation for all wastes disposed of off-site (soils and groundwaters) including details of removed soils/groundwaters, locations of where material was taken from site, quantities, waste transfer notes, landfill details, license and tickets and waste carrier certificate, if required.
- If waters were disposed of off-site via a sewer or discharged back to surface water or groundwater, details of the Discharge Consent or the letter of confirmation from the Drainage Authority/Environment Agency.
- Details of unexpected materials encountered.
- Results of all chemical tests undertaken, including the locations of the tests (co-ordinates and levels) both tabulated and on a plan.
- Details of permits obtained during the works.

## 5 APPENDIX 6/4: REQUIREMENTS FOR CLASS 3 MATERIAL

1. Not used.

## 6 APPENDIX 6/5: GEOTEXTILES USED TO SEPARATE EARTHWORKS MATERIALS

1. The warning tape / barrier will comprise a Terram Hi-Vis Orange Geotextile, or equivalent.

## **7 APPENDIX 6/6: FILL TO STRUCTURES AND FILL ABOVE STRUCTURAL FOUNDATIONS**

1. Not Used

## 8 APPENDIX 6/7: SUB-FORMATION AND CAPPING AND PREPARATION AND SURFACE TREATMENT OF FORMATION

### **Sub-formation:**

1. Prior to the placement of any fill materials the Contractor shall undertake the following works:-
  - The Contractor shall remove all of surface detritus/vegetation prior to raising site levels with engineered fill.
  - The Contractor shall carry out rolling dynamic compaction of the sub-formation prior to up filling to formation level.
  - The Contractor shall proof roll the existing formation with a minimum of one pass of a 1,300 kg/m width vibratory roller and visually inspect and remove any soft or loose materials to the satisfaction of the Resident Engineer. Soft spots shall be removed below formation level and replaced with a well compacted granular fill as directed by the Resident Engineer.
  - The Contractor shall undertake performance testing as detailed in Appendix 6/1 and at the designated testing rate given in Appendix 1/5.

## 9 APPENDIX 6/8: TOPSOILING

### **Site Preparation:**

1. Prior to commencement of excavations, the Contractor shall remove all of the surface detritus/vegetation.

### **General:**

2. Topsoil storage mounds shall not exceed 2 m in height, with slopes not exceeding a gradient of 1 in 2. The Contractor shall ensure the stockpiles are maintained in a weed-free condition.
3. Topsoil materials are anticipated to be required as part of the earthworks as part of the clean cover layer.

### **Site Won Subsoil:**

4. Subsoil (SHW Class 4A) that is generated from site turnover and the excavation of the drainage and foundations shall be tested to confirm it is acceptable for re-use in future garden and landscaped areas.
5. Site won subsoil shall be tested as required in Appendices 1/5 and 6/1 to confirm its geotechnical and chemical suitability for use as Class 4 fill.
6. Site won subsoil shall not contain:-
  - Material susceptible to spontaneous combustion.
  - Material in a frozen condition.
  - Rubble or clay lumps etc.

### **Site Won Topsoil:**

7. Site Won topsoil shall be generated by the Main contractor via a SR2010No5 Mobile Plant Permit from the existing onsite Stockpile 3 and will be subject to further characterisation testing to demonstrate conformance with BS3882 and the acceptance criteria detailed in Table 6/6 to meet end of waste criteria (chemical suitability) prior to use within the permanent works.

**10 APPENDIX 6/9: EARTHWORK ENVIRONMENTAL BUNDS, LANDSCAPE AREAS,  
STRENGTHENED EMBANKMENTS**

1. Not used.

## 11 APPENDIX 6/10: ANCHORAGES, CRIB WALLING AND GABIONS

1. Not used.

**12 APPENDIX 6/11: SWALLOW HOLES AND OTHER NATURALLY OCCURRING CAVITIES  
AND DISUSED MINE WORKINGS**

1. Not used.

## 13 APPENDIX 6/12: INSTRUMENTATION AND MONITORING

1. Not used.

## 14 APPENDIX 6/13: GROUND IMPROVEMENT

1. Ground improvement works may be required to improve the bearing properties of soils prior to their incorporation into the main earthworks.
2. Ground improvement shall be carried out using lime and/or cement modified techniques and rolling dynamic compaction.
3. The Contractor shall be responsible for the identification of acceptable SHW Class 6R and 7E materials for treatment and the design of the stabilisation techniques to ensure the end product requirements as described in this Appendix are achieved.
4. The Contractor shall obtain all permits and licences required for his proposed method of modification.
5. The Contractor shall undertake on-site field trials to verify that the generic SHW specified Method Compaction will achieve the necessary performance requirements in accordance with Table 6/1, Appendix 6/1. The Contractor shall construct trial pads with an area no less than 20m by 20m and carry out sufficient performance testing to demonstrate that the proposed dosing rates and mixing technique will achieve the required end product CBR values as required in this Appendix and the minimum effective stress parameters detailed in Table 6/1, Appendix 6/1.
6. If the bearing properties of the trial pads do not meet the requirements of this Appendix the Contractor shall adjust his design, dosing rate and/or mixing technique to ensure that the Specification requirements are achieved. The contractor shall construct, at his own cost, a new trial pad and carry out performance testing to demonstrate that the revised design meets the requirements of the Specification.
7. The Contractor shall undertake additional testing as deemed necessary to optimise the modification process. The cost of this testing shall be considered to be included in the Tender Price.
8. If any layer of stabilised material placed in the permanent works fails to achieve the target compaction/CBR as specified in this Appendix, the Contractor shall remove the affected layer and add additional lime to achieve the specification requirements.

## **APPENDIX 3**

### **NOTES ON LIMITATIONS**

## NOTES ON LIMITATIONS

- 1 FWS Consultants Ltd (“FWS”) has prepared this report solely for the use of the client and/or his agent (the “Client”) on the basis of exchange(s) of written proposals and instructions, and FWS accepts no responsibility or liability:-
  - a) for use of this report by any party other than the person for whom it was commissioned, or;
  - b) for the consequences of the report being used for any purpose other than that for which FWS was instructed to prepare it.

Should any third party wish to use or rely upon the contents of the report, written approval from FWS must be sought.

- 2 All information supplied by the Client, the Client’s staff and professional advisers, local authorities, other statutory bodies, investigation agencies and publicly accessible databases, shall be provided to FWS in writing, and is accepted as being correct unless otherwise specified in writing by the discloser of the information.
- 3 The conclusions and recommendations in this report represent the professional opinions of FWS derived from currently accepted industry practices, and through the exercising of reasonable skill and care to be expected of a professional geosciences and environmental consultancy of similar size and experience. The assessments and judgments given in this report are directed by and limited to both the finite data on which they are based and the proposed works to which they are addressed.
- 4 Environmental and geotechnical desk studies comprise a study of available information obtained from various identified sources, authorities and parties. The information reviewed cannot be exhaustive and has been accepted in good faith as providing representative and true data pertaining to site conditions. For clarity, no independent verification of this data is carried out by FWS and it is accepted at face value. Any identified risks in desk study reports are perceived risks based on the information available at the time. Actual risks can only be assessed after carrying out a thorough physical investigation of the site that serves to validate such identified risks.
- 5 Data acquisition during site investigations is subject to the limitations of the methods of investigation used, site conditions and access constraints. Exploratory holes undertaken during fieldwork, particularly boreholes and/or trial pits, investigate a small volume of ground in relation to the size of the site and thus can only provide an indication of site conditions. The opinions provided and recommendations given in this report are based on the desk study information and ground conditions apparent at the site of each of the exploratory holes. There may be ground conditions elsewhere onsite that have not been disclosed by the investigation and which therefore have not been taken into account in this report. FWS will take all due care and make commentary on the adequacy of data collection and therefore the ability to highlight the presence or otherwise of exceptional conditions.
- 6 Owing to the natural variation of the systems that are being investigated, and the anthropological impact similarly changing through time, the findings and opinions in this report are relevant to the dates of the site works and should not be relied upon to represent conditions after a reasonable passing of time. Site conditions will change over time due to natural variations and human activities. The comments made on groundwater, surface water and soil gas conditions are based on observations made at the time that the site work was carried out. It should be noted that these conditions will vary owing to seasonal, tidal and meteorological effects. Variation in the types and concentrations of contaminants and variations in their flow paths may occur due to seasonal water table fluctuations, past disposal practices, the passage of time, or subsequent developments or activities on the site or adjacent area.
- 7 The scope of the investigation, as agreed between FWS and the Client, was undertaken based on the specific development proposals of the Client and may be inappropriate to another form of development or scheme.
- 8 The opinions expressed in this report regarding contamination, geotechnical and/or waste assessments are based on simple statistical analysis and comparison with available guidance values. No liability can be accepted for the retrospective effects of any changes or amendments to these values.