

MONITORING PLAN

Waste Recovery Permit - Deposit for Recovery

Reclamation of the former British Sugar Refinery Site, York

SEPTEMBER 2022



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APPENDIX A

Requirements for Acceptability and Testing of Earthworks Materials

Monitoring Plan

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1 Introduction

Arcadis UK Ltd (Arcadis) has prepared this Monitoring Plan in order to support a bespoke Waste Recovery Permit application ('deposit for recovery') related to the recovery and permanent deposit of recovered waste derived from and placed entirely within the Former British Sugar Factory, Millfield Lane, York, YO26 6AY (the 'site'). A site location plan is presented as Figure 1.

Waste material is currently located within the current Environmental Permit (EP) (EPR/QP3593NF) boundary shown on the site layout plan presented as Figure 2.

An Environmental Sensitivity and Site Design (ESSD) Report has also been produced to support the Waste Recovery Permit application (Arcadis Report Ref: 10024487-AUK-XX-XX-RP-GE-0058-03, September 2022) which identified potential Source-Pathway-Receptor linkages which may present a risk to human health, buildings and/or the environment and thus require monitoring and management.

Therefore the objective of this report is to detail the monitoring procedures to be undertaken in relation to potential emissions to the wider environment associated with the proposed waste recovery operation and thus support ensuring any potential emissions and potential risks to human health, buildings and the environment are effectively managed. Reference has been made to the Guidance for the Recovery and Disposal of Hazardous and Non Hazardous Waste, S5.06, Environment Agency (EA), 2004.

A Waste Recovery Plan (WRP) (Arcadis Report Ref: 10024487-AUK-XX-XX-RP-GE-0034-P6-Waste Recovery Plan, September 2022) has been prepared to support an application to recover the waste as part of a reclamation process for the purpose of enabling residential development in accordance with the conditions of planning permissions granted in relation to the site.

The reclamation works incorporating the waste recovery process are supported by an approved Remediation and Reclamation Strategy (URS, 2015) for which an addendum has been produced to incorporate the latest site data (Arcadis, 2020).

2 Remediation Criteria

2.1 Remediation Criteria for Soils

The remediation criteria for soils remains in accordance with those defined within the 2015 RRS and accepted as part of the full planning permission granted for the proposed redevelopment (14/02798/FULM granted 15 September 2017). These remediation criteria are reproduced below for ease of reference.

The geochemical suitability of all earthworks materials to be used in the development within 1m of the anticipated formation level including garden areas and the footprint of buildings are to be assessed against site specific soil Remedial Target Values (RTVs) derived for risks to human health for a Residential with Plant Uptake End use as detailed in Table 1. Where soil materials are identified as having elevated concentrations of non-volatile hydrocarbons, in respect to the RTVs, they are to be placed below to top 1m of the development platform to break direct contact and plant uptake exposure pathways. Table 2 classifies the main contaminants as either volatile or negligible / non-volatile.

The soil RTV for means of assessing human health risk from soils within 1m of the formation level at the site have been selected based on AECOM in-house Generic Assessment Criteria (GAC) derived using the CLEA v1.06 software (utilising toxicological and chemical parameter information from various sources including the EA, LQM/CIH and CL:AIRE). The GAC provide a conservative Tier 1 screening assessment against which to compare the levels of contaminants recorded.

Determinant	Units	Residential with Plant Uptake End Use*		
Metals and Metalloids				
Arsenic	mg/kg	31		
Boron (water soluble)	mg/kg	291**		
Cadmium	mg/kg	11		
Chromium (III)	mg/kg	627		
Chromium (VI)	mg/kg	4.3		
Copper	mg/kg	2327**		
Lead	mg/kg	450		
Mercury (inorganic)	mg/kg	169		
Nickel	mg/kg	127		
Zinc	mg/kg	351		
Selenium	mg/kg	3750		
Cyanide (free)	mg/kg	1.2**		
At Organic Matter				
PAHS	Content	1%	2.5%	6%
Acenaphthene	mg/kg	210	480	1000
Acenaphthylene	mg/kg	170	400	850
Anthracene	mg/kg	2300	4,900	9,200
Benzo(a)anthracene	mg/kg	3.1	4.7	5.9
Benzo(b)fluoranthene	mg/kg	5.6	6.5	7
Benzo(k)fluoranthene	mg/kg	8.5	9.6	10
Benzo(ghi)perylene	mg/kg	44	46	47
Benzo(a)pyrene	mg/kg	0.83	0.94	1
Chrysene	mg/kg	6	8	9.3
Dibenzo(ah)anthracene	mg/kg	0.76	0.86	0.9
Fluoranthene	mg/kg	260	460	670
Fluorene	mg/kg	160	380	780

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Determinant	Units	Residential with Plant Uptake End Use*		
Indeno (123cd) pyrene	mg/kg	3.2	3.8	4.2
Naphthalene	mg/kg	1.5	3.7	8.7
Phenanthrene	mg/kg	92	200	380
Pyrene	mg/kg	560	1,000	1,600
TPH (Speciated)	At Organic Matter Content	1%	2.5%	6%
Aliphatic > C5-C6	mg/kg	30	55	110
Aliphatic > C6-C8	mg/kg	73	160	370
Aliphatic > C8-C10	mg/kg	19	46	110
Aliphatic > C10-C12	mg/kg	93 (48)#	230 (116)	540 (282)
Aliphatic > C12-C16	mg/kg	740 (24)#	1,700 (59)	3000 (142)
Aliphatic > C16-C21	mg/kg	45,000 (8.5)#	64,000 (21)	76000
Aliphatic > C21-C35	mg/kg	45,000 (8.5)#	64,000	76000
Aromatic > C5-C7	mg/kg	65#	130	280
Aromatic > C7-C8	mg/kg	120#	270	611
Aromatic > C8-C10	mg/kg	27	65	151
Aromatic > C10-C12	mg/kg	69#	160	346
Aromatic > C12-C16	mg/kg	140#	310	593
Aromatic > C16-C21	mg/kg	250#	480	770
Aromatic > C21-C35	mg/kg	890#	1100	1230
BTEX				
Benzene	mg/kg			0.33
Ethylbenzene	mg/kg			350
Toluene	mg/kg			610
Xylene (m)	mg/kg			250
Xylene (p)	mg/kg			240
Xylene (o)	mg/kg			230
OTHER				
Dioxins and Furans	µg/kg	8.5**		
Phenol	mg/kg	210	390	780
Asbestos	-	Presence not detected		

* These are values based on published SGVs or GACs derived using CLEA model based on a sandy loam soil

** URS derived GACs for residential with plant uptake end use

Note - Theoretical soil saturation limit given in brackets

Table 1 Soil Remedial Target Values (RTV) for Bulk Earthwork Material

The soil RTV are to be used as both 'suitable for reuse' criteria for soils located outside the EP boundary, which are proposed to be reused under the CLAiRE Definition of Waste Code of Practice (DoW CoP), as well as soil Compliance Criteria supporting the bespoke waste recovery permit in relation to waste deposited within the EP boundary (as part of the recovery of these wastes in line with a Deposit for Recovery Permit). Therefore, while different regulatory regimes are required to enable the recovery and reuse of material present on-site to create the development platform, the 2020 RRSA aims to align the scope of works and remediation criteria

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such that the protection of human health and environmental receptors is ensured. See Section 2.1.2 for the re-use of soil at depths greater than 1 m below the formation level.

Determinant	Nature of Contaminant Volatile / Non Volatile	
Arsenic (inorganic form)	Anthracene	
Boron	Benzo(a)anthracene	
Cadmium	Benzo(b)fluoranthene	
Chromium	Benzo(k)fluoranthene	
Copper	Benzo(ghi)perylene	
Lead	Benzo(a)pyrene	Negligibly / Non Volatile
Mercury (inorganic)	Chrysene	
Nickel	Dibenzo(ah)anthracene	
Zinc	Fluoranthene	
Mercury (inorganic form)	Indeno (123cd) pyrene	
pH	Naphthalene	
TPH Carbons Bands >C16	Phenanthrene	
Ammonia, Ammoniacal Nitrogen	Naphthalene	
Cyanide (free)	Fluorene	
Total Phenols	Acenaphthylene	
Benzene	Acenaphthene	Volatile*
Ethylbenzene		
Toluene		
Xylene		
Formaldehyde		
TPH Carbon Bands <C16		

* Generally exhibits a Henrys Law Constant (dimensionless) $> 2.5 \times 10^{-3}$

Table 2 Nature of Contaminant Volatility / Non-Volatility

2.1.1 Non-Aqueous Phase Liquids

Where specific organic determinants are recorded at concentrations below the RTV but above the theoretical soil saturation limit (see Table 1) then assessment shall be made as to the presence of Non-Aqueous Phase Liquid (NAPL) within the soil matrix.

No site won materials and/or imported soils or materials shall be used within the bulk earthworks, where NAPL is identified.

2.1.2 Contaminant Odour & Volatility

Materials exhibiting exceedances of metal / inorganic or non/negligibly volatile organic RTV for residential with gardens end use shall be deemed geochemically suitable for use at depths greater than 1m below the formation level. Materials containing potential volatile contaminants exceeding the relevant RTV may not be present at any depth within the development platform unless subject to further site specific risk assessment indicating that the potential risk is acceptable. Any change to the RTV must be agreed with the client or the client's representative and the EA.

Table 2 classifies the main contaminants as either volatile or negligible / non volatile. The list of determinants in the table is not exhaustive and where exceedances of organic determinants not included in the table are identified during geochemical testing an assessment as to their potential volatility shall be made before determining final placement or disposal options for the material in question.

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No material shall be used in the works within 1 m of the formation level, irrespective of whether the concentrations of organic determinants are within the RTV, should this material have the potential to give rise to odour nuisance.

2.1.3 Material Reuse as Plant Growth Media

During the remediation and reclamation works, excavated material which is considered potentially suitable for reuse as plant growth media (topsoil type material) within future residential gardens and/or within Public Open Space (POS) will be identified, segregated and assessed in order to maximise the reuse of this material and minimise off-site disposal.

The overall approach in reusing material currently on site within the proposed development footprint as plant growth media is intended to be in accordance with the Waste Strategy for England 2007 (Defra, 2007) as well as the strategic objectives outlined in the Construction Code of Practice for the Sustainable Use of Soils on construction sites (Defra, September 2009) to 'increase diversion of non-municipal waste (including soil) from landfill and to secure better integration of treatment processes with the aim of reducing waste by making products with fewer natural resources'.

An initial survey of potentially suitable material has been undertaken by Arcadis (Ground Investigation Factual Report, Arcadis, August 2019) with laboratory analysis undertaken on 9 soil samples (collected from the top 0.6m bgl) for comparison with the specifications detailed within British Standards Institution (BS) Specification for Topsoil (BS 3882:2015).

It is noted that BS 3882:2015 specifies requirements for natural and manufactured topsoils that are moved or traded for creating soil profiles intended to support plant growth. The standard is not applicable to subsoil, or to topsoil that is to remain in situ, such as potentially suitable material currently present on site. BS 3882:2015 is not intended to preclude the use of topsoil that is already on site and suitable for its intended purpose. This standard specifies requirements for multipurpose topsoil, which is fit for the majority of needs.

Therefore, the specifications for multipurpose topsoil within BS 3882:2015 will be used as an initial screen to inform the suitability of site soils for reuse as plant growth media. However, the specific end use and location for deposit of plant growth media will also be considered with a view to maximising reuse of material which may fail some of the BS 3882:2015 specifications, this will ensure suitable topsoil material on site can be classified as suitable for a specific purpose.

Table 3 below summarises the results of the topsoil analysis undertaken and the strategy employed to facilitate on site reuse.

Soil Sample ID	BS 3882:2015 Pass / Fail?	Reason for Fail	Strategy to Facilitate Reuse
AUK-TP-27 (0.0-0.6m bgl)	Fail	Texture Organic Silty Clay	Likely suitable in areas with low footfall such as sloped banking with trees or shrubbery
AUK-TP-28 (0.2m bgl)			
AUK-TP-23 (0.2m bgl)	Pass Multipurpose	-	Suitable for general purpose use
AUK-TP-08 (0.0-0.1m bgl)	Fail	pH, K and Mg	Likely suitable in grassed areas of Public Open Space and/or in areas with specific species of trees and shrubs
AUK-TP-32 (0.0-0.3m bgl)		K and Mg	
AUK-TP-03		K and Mg	

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Soil Sample ID	BS 3882:2015 Pass / Fail?	Reason for Fail	Strategy to Facilitate Reuse
(0.0-0.3m bgl)			
AUK-TP-04 (0.0-0.3m bgl)	Pass Specific Purpose: Low Fertility	-	
AUK-TP-01 (0.0-0.3m bgl)			

Table 3 Summary of Topsoil Analysis and Reuse Approach

The results of the ground investigation works, initial soil survey and the strategy outlined here in relation to plant growth media will be incorporated into the Materials Management Plan (MMP) and it is recommended that a Soil Resource Plan be developed as part of the works implementation (either as a standalone document or as an update to the MMP) showing the areas and type of topsoil and subsoil to be stripped, haul routes, the methods to be used, and the location, type and management of each soil stockpile

2.2 Remediation Criteria for Soil Leachates

The chemical suitability of soil leachate (solute from soil pore water) concentrations is to be assessed against the Tier 3 criteria for ammoniacal nitrogen (representative of ammonia and ammonium) detailed in Table 4 below.

Averaging Area	RTV for Leachate* (mg / l)
AA1a	46
AA1b	12
AA2	3
AA3a	5
AA3b	2
AA4a	2
AA4b	26

* the variation in RTV values is due to the differing distances to the receptor (River Ouse) and the variation in the length of each area.

Table 4 Soil Pore Water (Leachate) Remedial Target Values for Ammoniacal Nitrogen

Review of the RTV calculated for ammoniacal nitrogen in soil pore water (URS 2015) was undertaken by Arcadis (Updated Hydrogeological Risk Assessment (HRA), January 2020), to confirm that the RTV will support the SSACs (Site Specific Assessment Criteria derived for the protection of groundwater. The RTV were derived by AECOM (formerly URS) using the EA's Remedial Target Worksheet (RTW,) in line with the Arcadis assessment of groundwater, and included Level 1 soil (predicted pore water concentration resulting from a soil source), Level 2 soil (dilution of pore water concentrations within the underlying aquifer) and Level 3 soil (lateral migration within the underlying aquifer). It is noted that Level 3 soil is equivalent to Level 3

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groundwater within RTW (i.e. both sheets derive an attenuation factor associated with lateral migration in the dissolved phase).

To review the RTV in the context of the Arcadis groundwater model; the attenuation factor calculated in the most conservative groundwater model (Source 1 with an aquifer compliance point of 250m) has been multiplied by the compliance criteria (0.5 mg/l) and by the dilution factor calculated in the RTW Level 2 soil model (URS 2015) for each averaging area. The range in acceptable pore water concentrations calculated in the context of the revised groundwater model is 269 mg/l to 545 mg/l.

Given that the acceptable pore water concentration calculated in the context of the groundwater model are one to two orders of magnitude higher than the existing RTVs within the 2015 RRS, the existing RTVs are considered to be supportive of achieving the SSAC for the protection of groundwater.

It is noted that while the soil RTV comprises a single criteria value for each parameter across the entire site, the soil pore water RTV for ammoniacal nitrogen varies according to the Averaging Areas. Therefore, excavated material will be sentenced for remediation based on comparison of the concentration of ammoniacal nitrogen in soil leachate with the RTV of the Averaging Area from which the material was excavated. In addition, prior to placement and/or following any remediation or soil stabilisation, further soil leachate testing must be undertaken, as required, to demonstrate compliance with the RTV of the destination Averaging Area. This is to ensure material is not merely moved from one area to another but that genuine source reduction is achieved across the site as a whole. It is noted that the Green Infrastructure and areas of POS, where Organic Rich Material is to be primary placed, are located within and across multiple Averaging Areas.

2.3 Remediation Criteria for Ground Gas

The focus of the remediation works in relation to ground gas will concern Organic Rich Material located within Historic Pond 7 where two Amber 2 classifications are observed.

Therefore, the remediation criteria to manage potential ground gas risks at the site are as follows:

- Ground gas monitoring will be undertaken across the development platform following the remediation works to confirm that ground gas conditions are appropriate to Amber 1 and at most is not greater than Amber 2 (NHBC Traffic Light System).
- Ground gas monitoring following remediation works will also be used to demonstrate that where methane and carbon dioxide concentrations exceed 1.5%v/v and 5%v/v respectively (Scenario 1, EPR 5.02, EA Guidance) hazardous gas flow rates (Qhgs) will be calculated in line with Scenario 2 (EPR 5.02) in accordance with the required permit surrender Completion Criteria provided by the EA in Pre-Advice Letter (EAWML68681, EA, 28th August 2015 provided in Appendix B).
- Organic Rich Material within Historic Pond 7 will be targeted for ex situ aerobic bioremediation to reduce the readily degradable organic matter content. This will be demonstrated through carbon dioxide and methane concentrations recorded during bioremediation as well as other parameters (as detailed in Table 12, Section 5.1) which will provide lines of evidence to allow validation of the bioremediation works. Reductions in the TOC content, as well as forensic organic matter testing of the material may also be used as a line of evidence to support the reduction in readily degradable organic matter content.

The NHBC traffic light classification system is summarised and applied in the 2020 RRSA in accordance with the NHBC "Guidance on Evaluation of Development Proposals on Sites where Methane and Carbon Dioxide are Present" 2007. The EP Scenario 1 and Scenario 2 completion criteria for ground gas are outlined below and detailed within the 'Landfill (EPR 5.02) and other permanent deposits of waste, How to surrender your environmental permit' (EA additional guidance, LIT 5144 / 1056_12, Version 2, Issued 13/12/2012).

Scenario 1 Completion criteria

Gas concentration

Maximum methane concentration is less than 1.5%v/v

Maximum carbon dioxide concentration is less than 5%v/v

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Scenario 2 Completion criteria

Gas concentration

Maximum methane concentration is less than 5%v/v and

Maximum carbon dioxide concentration is less than 10%v/v

Flow rate

Qhgs is less than 0.7l/h

Maximum flow in any borehole is less than 70l/hr

As described in Section 3.2, ground gas monitoring will be undertaken at monthly intervals post works completion for a period of 24 months. Should 12 consecutive monthly monitoring visits indicate ground gas compliance criteria have been met then it is understood that this will be accepted by the EA (Pre-application Advice, August 2015) with no further ground gas monitoring required.

2.4 Assessment Criteria for Groundwater

The updated HRA concluded measured concentrations of ammoniacal nitrogen were not considered to represent a significant risk to water resources and no active remediation of groundwater is considered required.

Therefore, the objective of the works in relation to groundwater will be to minimise any temporary adverse effects to groundwater during the works, ensure there is no significant deterioration in groundwater quality following remediation, and to reduce ammoniacal nitrogen leachability to the groundwater.

To support this objective, groundwater assessment criteria will focus on groundwater quality trend analysis with reference to pre remediation concentrations to demonstrate there has been no significant deterioration in groundwater quality following remediation and thus there remains no significant risks to identified water resource receptors. Groundwater assessment criteria will also attempt to align as far as practicable with the provisions of the EP Variation (EPR/QP3593NF/V002) and the updated EP Variation Working Plan (URS, October 2015).

Groundwater assessment criteria may include assessment of trends or statistics, in combination with comparison with set values, and are as follows:

- **During remediation** - to assess the groundwater quality in existing groundwater monitoring wells (defined in Section 3.3) against Control Levels defined within the updated EP Variation Working Plan (URS, October 2015) to determine whether the results are indicative of the prevailing groundwater conditions or whether the remediation and reclamation works have impacted the groundwater regime as a result of mobilisation of contamination. These control levels are based on the upper 95th percentile of monitoring data collected between 2010 and 2014, therefore, data collected subsequent to this period will also be considered. This could include assessment of the groundwater quality observed during the 3 individual monthly visits undertaken immediately prior to commencing remediation works to update this 'baseline';
 - Should this assessment conclude that the results are potentially indicative of a mobilisation of contaminants then the frequency of monitoring will be increased, and a repeat monitoring round shall be undertaken. It is anticipated that disturbance of the sub surface during remediation may result in short term changes in groundwater conditions, such as a one-off "pulse" of mobilised contaminants. However, where the results consistently indicate elevated concentrations of determinants then additional mitigation measures may be required to limit the potential risks to groundwater arising from the works.
- **Post remediation** – to assess groundwater quality trends within replacement monitoring wells (defined in Section 3.3) following remediation works to demonstrate there are no significant sustained increases in concentrations of ammoniacal nitrogen and other metal or metalloids contaminants listed in the EP Variation. Assessment of trends may include statistical analysis where appropriate, or comparison with simple descriptive statistics.
 - For replacement monitoring wells which are direct replacements for existing monitoring wells (listed within the EP Variation working Plan (URS, February 2015)) and for which representative

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data is likely available for pre remediation conditions, then reference will also be made to these pre remediation concentrations (including Control Levels) to demonstrate there is no significant deterioration in groundwater quality following remediation;

- For replacement monitoring wells which are not direct replacements for existing monitoring wells and for which representative data is not likely available for pre remediation conditions then, if a sustained increasing trend is observed, reference will also be made to the updated SSAC (Updated HRA, Arcadis, 2020) provided these replacement wells are associated with identified Sources (Updated HRA, Arcadis, 2020). Where these wells are not associated with a Source, then further risk assessment may be undertaken if deemed required, including reference to EQS and/or DWS standards, if relevant.

The Updated SSAC for Groundwater derived as part of the updated HRA (Arcadis, 2020) are shown below. Source 1 and Source 2 referenced within the table below are shown in Figure 3 of the Update HRA (Arcadis, 2020).

Contaminant of Concern	Updated Water Resources SSAC (mg/l)			
	Source 1 - Aquifer	Source 1 - Surface Water	Source 2 - Aquifer	Source 2 - Surface Water
	250m Compliance Point	400m Compliance Point	250m Compliance Point	250m Compliance Point
Ammoniacal Nitrogen	256	3520	308	370

Table 5 Update Site Specific Assessment Critries (SSAC) for Groundwater (mg/L) (Updated HRA, Arcadis 2020)

As described in Section 3.3, groundwater monitoring will be undertaken at monthly intervals during the works, then at post completion for a period of 24 months within a network of replacement wells installed across the site. Should 12 consecutive monthly monitoring visits (post completion) indicate ground monitoring compliance criteria have been met then it is proposed that this will be accepted by the EA and no further monitoring required.

2.5 Criteria for Off Site Disposal

In accordance with the 2015 RRS, materials displaying characteristics that render them unsuitable for use in the development platform shall be segregated and sentenced for off-site disposal. It is envisaged that the volume of such material will be relatively small, and all excavated material will be recovered / remediated and reused on site wherever possible.

Prior to the off-site disposal of material, the concentrations of the contaminants in the material shall be reviewed to determine whether the material would be classified as Hazardous Waste in accordance with the Hazardous Waste Regulations (England & Wales) Regulations, 2005 and associated guidance. Note that this determination is relevant only where it is intended to discard material as waste. It is not relevant to materials, including waste material within the EP boundary, undergoing recovery and remediation processes which will be reused to construct the development platform.

All wastes to be disposed of off-site shall be subject to basic waste characterisation (e.g. source and origin of waste, composition of the waste, and the relevant European Waste Code (EWC)) and classified as being potentially inert, non-hazardous or potentially hazardous. Following this characterisation should the waste be potentially hazardous (or inert) then waste acceptance criteria (WAC) testing will also be undertaken to determine the suitability of the material for disposal to either an inert or hazardous landfill facility. The required testing will be carried out at the frequencies given in Table 9 (Section 3.1) in accordance with the Environmental Permitting (England & Wales) Regulations (2010), the List of Wastes (LoW) (England) Regulations (2005) and the Technical Guidance (WM3) on the classification and assessment of waste (Version 1.1, 2018).

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The following EWC / LoW codes have been identified for waste currently deposited within the EP boundary which are considered likely relevant for soils located outside the EP boundary should these not be suitable or required for reuse within the development platform.

General Description	EWC Waste Code	EWC Description	Comments
Granular Made Ground	17 05 (03 / 04)	Soil and stones	Asbestos has been identified in 6 soil samples across the site
Cohesive Made Ground			
Organic Rich Material	02 04 01	Soil from cleaning and washing beet	Includes current and historic lagoon sediments. Plant remains observed historically in some locations.
Sugar Factory Lime Material	02 04 02	Off-specification calcium carbonate	
Oversized Material	17 01 07	mixtures of, or separate fractions of concrete, bricks, tiles and ceramics	
Recovered Material	19 13 02	solid wastes from soil remediation	soils subject to a remediation process, meeting risk-based criteria and then suitable for re-use in the works, and generated entirely from within the site

Table 6 European Waste Catalogue (EWC) Codes for Waste Currently Deposited within the EP Boundary

The statutory limits that apply to the waste acceptance criteria are presented in Table 7 below (transposed from Council Decision annex 2003/33/EC). Waste materials shall only be disposed of at the appropriate classification of landfill for that type of waste. The landfill operator shall be issued with the basic characterisation and WAC testing results for review prior to disposal.

Parameter	Inert waste landfill	Stable non-reactive	Hazardous waste landfill
Parameters determined on the waste - total concentration			
Total organic carbon (% w/w)	3%	5%	6%*
Loss on ignition (% w/w)			10%*
BTEX (mg/kg)	6		
PCBs (7 congeners) (mg/kg)	1		
Mineral oil C10-C40 (mg/kg)	500		
PAHs (mg/kg)	100		
pH		>6	
Acid neutralisation capacity		To be evaluated	To be evaluated
Limit values (mg/kg) for compliance leaching test using BS EN 1247 at L/S 10 l/kg			
As (arsenic)	0.5	2	25
Ba (barium)	20	100	300
Cd (cadmium)	0.04	1	5
Cr (chromium (total))	0.5	10	70
Cu (copper)	2	50	100

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Parameter	Inert waste landfill	Stable non-reactive	Hazardous waste landfill
Hg (mercury)	0.01	0.2	2
Mo (molybdenum)	0.5	10	30
Ni (nickel)	0.4	10	40
Pb (lead)	0.5	10	50
Sb (antimony)	0.06	0.7	5
Se (selenium)	0.1	0.5	7
Zn (zinc)	4	50	200
Cl (chloride)	800	15,000	25,000
F (fluoride)	10	150	50
SO ₄ (sulphate)	1000	20,000	50,000
Total dissolved solids (TDS)	4,000	60,000	100,000
Phenol index	1		
Dissolved organic carbon at own pH or pH7.5-8.0	500	800	1,000

* Either loss on ignition or total organic carbon testing must be used for Hazardous Wastes

Table 7 Waste Acceptance Criteria (WAC)

2.6 Earthworks Criteria

The proposed performance criteria are summarised as follows.

Materials placed as compacted fill should comply with the properties of Class 2A/B/C and / or Class 1A/B/C.

- It is intended that the density for compacted material should be a specified minimum of 95% of the maximum dry density (4.5 kg test); and should be a specified maximum of 5% air voids where the particle density has been measured.
- Extraneous non-mineral materials such as fragments of plastic, wood and textile fragments and the like should be removed from the material before compaction as far as practicable. Durable materials including brick, concrete and masonry may be retained within the fill provided their largest particle dimension is no greater than two-thirds of the layer thickness being compacted and in any case no greater than 200 mm. Particles larger than 200 mm will be segregated, crushed and used in the fill.
- Plate bearing tests on the completed formation using the 600mm diameter plate should be considered acceptable where settlement under a sustained load equivalent to 100 kN/m² is less than 25 mm.
- Hand shear vane tests shall be undertaken at formation level and at the bases of excavations in cohesive materials. Soils used for fill should reach at least firm consistency with a minimum undrained strength Cu of 60 kN/m² if cohesive and/or be engineered to a relative density of at least medium dense if granular (may require stabilisation / modification; the extent of this will depend on the condition of the fill).
- Where the natural formation is found to consist of compressible or highly plastic soils, additional earthworks, modification, or an alternate foundation solution will be adopted.

All specified geotechnical tests would be undertaken to the proposed frequencies referred to in Table 1/5a and to satisfy any requirements for the classification of materials in accordance with Series 600 earthworks specifications. Classification of material will comprise both geotechnical and geochemical references.

The type and frequency of testing detailed in Table 8, has been determined on the basis of past experience of earthwork schemes in a variety of conditions. The frequency is sufficient to ensure that the characteristics and

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acceptability of the fill materials are confirmed with a reasonable degree of confidence relative to the proposed volume of fill to be placed.

The frequency of testing should not be considered exhaustive; additional testing may be necessary where materials are shown to be marginal, or where localised pockets of unsuitable material are encountered.

The geotechnical acceptability criteria, for compacted material to be used in the development, are set out in Table 8.

Accurate records will be kept of materials encountered, general locations (i.e. grid cells and depth) and approximate volumes throughout the excavation phase of works operations.

All earthworks materials will be classified in accordance with the Specification for Highways Works as detailed in Appendix A.

Where required in Appendix A unacceptable material will be processed by mechanical, chemical or other means to render the material acceptable for use in the works as per the requirements of Table 6/1 and Appendix A or sent for disposal off-site.

All earthworks materials shall be subject to classification and geochemical testing from stockpiles following excavation and segregation according to material type as well as from stockpiles of remediated or imported material prior to placement. Accurate records will be kept of materials encountered, locations and approximate volumes throughout the excavation phase of earthworks operations.

Any sampling locations required for classification purposes will need to be established in advance of works commencing. The rate of testing required will be sufficient to ensure the correct classification of materials, taking specific account of the variability of materials properties.

Potentially geotechnically marginally unsuitable materials, such as may occur through moisture content higher than the range specified for compaction, may be rendered suitable through stabilisation, blending with suitable material, and/or by placing the material in discrete layers (300mm maximum) towards the base of the filled area. All such materials stabilized and / or blended would require testing to ensure compliance with the earthworks specification, in particular the end-product compaction criteria.

Extraneous non-mineral materials will be removed from the material before compaction as far is practicable. Durable materials including brick, concrete and masonry may be retained within the fill provided their largest particle dimension is no greater than two-thirds of the layer thickness being compacted and in any case no greater than 200 mm. Particles larger than 200 mm will be segregated, crushed and used in the fill.

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Clause	Work, Goods or Material		Test	Frequency of Testing	Test Certificate	Comments	
Series 600							
601, 631 to 637 & 640	Acceptable material		For site-won aggregate, see sub-clauses 601.12 and 601.18. Cross-reference should be made to any requirements in Appendix 6/1				
	Class	General Description					
	1	General granular fill	Grading / uniformity coefficient	Twice a week	Required		
			MC (N)	1 per 250m ³			
			OMC, Max DD and particle density (N)	1 per 2,000m ³			
		1C only	Los Angeles coefficient (N)	Weekly			
	2	General cohesive fill	Grading	Twice a week per source	Required		
			MC (N)	1 per field hand shear vane determination [see below]			
			MC/PL/LL (N)	From 10 locations in planted areas: each sampled and tested at 0.25m, 0.5m and 1.0m depth			To assess desiccation and heave potential
			OMC, max DD and particle density (N)	1 per 2,000m ³			
Field undrained shear strength of remoulded material (N)			Minimum of 5 determinations [sets of 3no readings] per day			[Field Hand Shear Vane] See Notes 8 & 9 to Table 6/1	
		Laboratory undrained shear strength of remoulded material (N)	1 per 250m ³ (with a minimum of 2 tests per week)		[Laboratory multistage Triaxial] See Note 9 to Table 6/1		
4	Fill to Landscape Areas	Grading	Daily	Required			
		MCN (V)	Daily				
5	Topsoil	Grading	Daily	Required			
6 (except 6F4, 6F5)	Selected granular fill	Grading/ uniformity coefficient	1 per 250m ³	Required			
		PL/LL (N)	Daily				
		Los Angeles coefficient (N)	Weekly (on-site source); Monthly (imported)				
		OMC/MC (N)	1 per week per source	Required			
		Bitumen content	Weekly				
Class A (asphalt) content	Weekly						
612	Compaction of fills				Required	See Note 12 to Table 6/1	
		Method compaction	Field dry density (N)	Frequency as required in compaction trial.			
-	All Classifications of Material		BRE/TRL Sulphate Analysis Suite	1 per 2500m ³	Required	See Note g)	

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Work, Goods or Material	Test	Frequency of Testing
Point of Placement Geotechnical Tests on CLASS 1 and CLASS 2 Materials		
Compacted Fill (including Blended and/or stabilised Fill)	Nuclear Density Gauge Tests to BS1377 (1990) part 9 (including confirmatory laboratory mc for each NDG test).	6no. tests per 1000m ³
Compacted Fill (including Blended and / or stabilised Fill)	Sand Replacement Density tests	1 no. test per 12 no. Nuclear Density Gauge tests
Compacted Fill (including Blended and /or stabilised Fill)	Particle Density test	1 no. test per Sand Replacement test
Compacted Fill (including Blended and / or stabilised Fill)	Grading MC (N) PL/LL (N) OMC, max DD and particle density (N)	1 no. test per 900 m ² @ Formation Level and Formation Level -1m (see note h)
Development Platform	Plate bearing tests on a 30m grid positions varies with successive layers. All tests to be conducted using 600mm diameter plate, at a test load equivalent to 100kN/m ²	1 test per 900m ² @ Formation Level, Formation Level -1m and formation level -2m
Road Corridors	CBR testing	Allow for 15no. CBR tests @ Formation Level along anticipated road corridors across development
Fill Areas subject to prior excavation and compaction	Rod - & - plate settlement monitoring with base plate set at base of excavated sub-formation	Allow for 20no R&Ps, locations to be confirmed on inspection of sub-formation, to be monitored commencing with base readings and continuing weekly for minimum 3months then monthly until 6 months after reaching formation level

Notes applying to the Table 1/5a

- (N) indicates that a UKAS accredited laboratory sampling and test report or certificate is required.
- Unless otherwise shown in this Table test certificates for work, goods or materials are required for all such work, goods or materials in the Works.
- Testing specified in this Table is to be undertaken on all relevant materials.
- Testing to be carried out will be undertaken in accordance with the Specification for Highways Works, 600 Series.
- All geotechnical testing to be carried out by a NAMAS accredited laboratory. All chemical analysis will be UKAS and MCERTS accredited as appropriate.
- All sampling will be carried out in accordance with the 'Specification for Ground Investigation' (Publication No 3 in the site investigation in construction series) published by Thomas Telford Ltd, 1993. Reporting will be in digital form in addition to paper records as specified in Appendix III of the aforementioned documents.
- Sulphate testing suite to be performed according to BRE Special Digest 1 (SD1:2005) as well as to any TRL report recommendations for brownfield land that may contain pyrite.
- Inclusion of geotechnical testing of all hard material encountered and crushed to ensure materials suitability for future inclusion in works.
- Data to be used to assess desiccation and heave potential of cohesive materials placed as fill

Table 8 Geotechnical Testing to be Carried out on all Earthworks Materials and Wastes

2.7 Slope Stability

Slopes have been designed based on RRa maximum gradient of 1 vertical to 3 horizontal. Detailed slope stability calculation is being carried out to confirm the suitability of the design in the permanent condition.

Temporary slopes on site will be no steeper than 1 vertical to 2 horizontal. Such slopes will be subject to regular inspection by a competent person.

A Stability Risk Assessment (SRA) Report has been produced to support the Waste Recovery Permit application (Arcadis Report Ref: 10024487-AUK-XX-XX-RP-GE-0074-03, September 2022).

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2.8 Validation of Compaction

Confirmation that adequate compaction has been achieved (95% of MDD, $\leq 5\%$ air voids) will be demonstrated by undertaking nuclear density testing and sand replacement density or core cutter testing (subject to material type).

3 Testing and Monitoring

3.1 Geochemical Testing of Materials

Testing of all earthwork materials shall be undertaken at a minimum frequency listed in Table 9 below.

All earthworks materials shall be subject to geochemical testing from stockpiles following excavation and segregation according to material type as well as from stockpiles of remediated material prior to placement. Additional testing is to be undertaken on materials undergoing treatment via aerobic bioremediation. Geotechnical testing shall be done on a volumetric basis, rather than on a site area basis, to reflect the varying thicknesses of deposited material requiring placement in different areas.

Materials will be sentenced for remediation and other material handling processes based on the material types identified and the results of geochemical testing, set out in Table 9 below, which will be assessed against the Remediation Criteria detailed in Section 2.

Where concentrations of contaminants are measured above the respective RTV and/or are from the specific locations, hotspots or material types defined within the Remediation Criteria these will be sentenced to remediation. Additional stockpile sampling may be undertaken where considered appropriate to reflect the heterogeneity of the material within a particular stockpile in order to assist in obtaining a representative average (mean) result for all samples collected from that stockpile which can be then compared with Remediation Criteria.

Work, Goods or Material	Test	Frequency of Testing
Chemical Control Testing (Notes a, b, c, d, and g)		
All material requiring excavation (excluding potential Plant Growth Media / Topsoil)	Soil Analysis Suite (Note d) and soil Leachability Suite (Note e)	1 test per 2,000 m ³ (including a minimum of three samples where potential contamination is suspected)
	Screening test for asbestos	
All potential Plant Growth Media / Topsoil material requiring stripping	Soil Analysis Suite (Note f)	1 test per 500 m ³ (with minimum of 3 samples per source)
All material, as required, to demonstrate compliance with soil pore water RTV of destination Averaging Area prior to placement	Leachability Suite (Note e)	1 test per 2,000 m ³
Additional Chemical Control Testing (Note a, b, c, d and g)		
All imported materials for each individual source and type	Soil Analysis Suite (Note d) and soil Leachability Suite (Note e)	1 test per 500 m ³ with minimum 12 tests per material source
Imported landscape fill (topsoil/subsoil) for each individual source and type	Soil Analysis Suite (Note d) and soil Leachability Suite (Note e)	2 tests per 500 m ³ with minimum 12 tests per material source
All materials sentenced for remediation within biopiles	Soil Analysis Suite (Note d), Soil Leachability Suite (Note e) and Biopile Physical Characterisation Laboratory Suite, Biopile Chemical Characterisation Laboratory Suite (Note h).	1 test per 300 m ³
All materials undergoing treatment within Biopiles	Soil Analysis suite (Note h) (including Organic matter content, moisture content, and Phosphorous as Orthophosphate)	Fortnightly

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Work, Goods or Material	Test	Frequency of Testing
	Temperature °C (Biopile and Air) Carbon dioxide concentrations (% v/v) Methane concentration (% v/v) Oxygen concentrations (% v/v) pH, Weather conditions	Daily (minimum five points across the biopile/window)
All materials having undergone successful treatment within biopiles	Soil Analysis suite (Note d) and soil Leachability Suite (Note e) and Biopile Physical Characterisation Laboratory suite (Note h).	1 test per 300 m ³
All materials sentenced for remediation by stabilisation/solidification	Soil Analysis Suite (Note d), Soil Leachability Suite (Note e) (additional testing to be determined following laboratory trials)	1 test per 300 m ³
All materials having undergone treatment by stabilisation/solidification following maturation of a minimum of 7 days	Soil Analysis Suite (Note d), Soil Leachability Suite (Note e) (Additional testing to be determined following laboratory trials)	1 test per 500 m ³ of material placed into permanent works
All materials sentenced for off-site disposal	WAC testing Suite	1 test per 100 m ³ with minimum of 3 test per batch of material

Notes:

- a) Testing specified in this table is to be undertaken on all materials.
- b) All chemical analysis shall be UKAS and MCERTS accredited as appropriate.
- c) All sampling shall be carried out in accordance with the BS 5930:2015, the code of practice for site investigations. Reporting shall be in digital form, which is compatible with Microsoft Excel, Esdat or Access, in addition to paper records.
- d) Soil analysis suite to include the following determinants:

Polycyclic Aromatic Hydrocarbons (speciated USEPA 16)
 Total Petroleum Hydrocarbons Criteria Working Group (TPH CWG)
 Ammoniacal Nitrogen
 Total Organic Carbon
 Asbestos Screen
 Asbestos Identification and Quantification (if asbestos screen proves positive)

- e) Leachate analysis suite to include the following determinants:

Ammoniacal Nitrogen

- f) Analysis to enable Topsoil classification in accordance within (BS 3882:2015) to include the following determinants:

Texture Class (clay, silt, sand)	Carbonate	Carbon: Nitrogen Ratio
Organic Matter Content	Nitrogen	Exchangeable Sodium Percentage
Particle Size Distribution (>2mm, >20mm, >50mm)	Phosphorus	Zinc

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Soil pH	Potassium Magnesium Available sodium Available Calcium	Copper Nickel Visible Contaminants

- g) The limits of detection for the analyses shall be as specified within the 2015 RRS or lower;
h) Materials sentenced for treatment within biopiles shall be subjected to testing of the following additional determinants as well as those detailed in Note d): Soils Analysis Suite:

Particle Size Distribution (Dry or wet sieving – dependant on silt/clay content) BS1377-2:1990
Determination of permeability (constant head method) BS1377-5:1990
Compaction Test 2.5kg ('Proctor' Test) BS1377-4:1990
Moisture content
Total Organic Carbon
Soil Organic Matter content
Ammoniacal nitrogen
Phosphorous as Orthophosphate

Table 9 Schedule of Geochemical Testing of Materials

3.2 Ground Gas Monitoring

A programme of ground gas monitoring shall be carried out prior to the commencement of the remediation and reclamation works, during those works and post completion at the frequencies given in Table 10 below.

Scope of Monitoring	Test	Frequency of Testing
<u>GROUND GAS MONITORING</u>		
<p>Ground gas monitoring prior to and during works will be taken from 36 wells currently monitored as part of the EP monitoring programme (tables S3.1 and S3.3 within the EP Variation (EPR/QP3593NF/V002). This includes 11 wells located within the EP boundary and 25 wells located outside the EP boundary. Locations shown on Figure 3.</p> <p>Ground gas monitoring following works will be taken from 36 replacement wells located within the EP boundary (listed within tables S3.2 and S3.4 in the EP (EPR/QP3593NF/V002). This includes 11 wells located within the EP boundary and 25 wells located outside the EP boundary. Locations shown on Figure 4.</p>	<p>Including peak and field stable measurements of carbon dioxide, carbon monoxide and methane concentrations, total gas flow, atmospheric pressure and conditions during monitoring.</p>	<p>Standpipe installations located around the site to be sampled prior to the works (3 monthly visits), then at monthly intervals during the works, then at monthly intervals post works completion for a period of 24 months.</p> <p>Post completion should 12 consecutive monthly monitoring visits indicate ground gas compliance criteria have been met then it is understood that this will be accepted by the EA (Pre-application Advice, August 2015) with no further ground gas monitoring required.</p>

Table 10 Ground Gas Monitoring Schedule

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Where the concentrations of ground gases (and flow rates) recorded during the programme of monitoring are substantially elevated above levels previously recorded additional monitoring / increased frequency may be required at selected locations. However, the Remediation and Reclamation Strategy is intended to mitigate the ground gas risk to Amber 1, with the proviso that it is no greater than Amber 2. Where monitoring locations are within areas of the development that will be subject to earthworks excavations, placement of materials or construction, the monitoring locations shall be preserved and monitored for as long as reasonably practicable.

3.3 Water Monitoring

A programme of groundwater, surface water and water arisings monitoring shall be carried out prior to commencement of the remediation and reclamation works, during those works and post completion for the suite of determinants and frequencies given in Table 11 below.

Scope of Monitoring	Test	Frequency of Testing
<u>GROUNDWATER MONITORING</u>		
<p>Groundwater monitoring prior to and during works will be taken from 23 wells currently monitored as part of the EP monitoring programme (table S3.5 within the EP Variation (EPR/QP3593NF/V002). This includes 11 wells located within the EP boundary and 12 wells located outside the EP boundary. Locations shown on Figure 3.</p> <p>Groundwater monitoring following works will be taken from 14 replacement wells located within the EP boundary (listed within tables S3.6 in the EP (EPR/QP3593NF/V002). This includes 4 wells located within the EP boundary and 10 wells located outside the EP boundary. Locations shown on Figure 4.</p>	<p>Representative samples of groundwater submitted for laboratory analysis of parameters required by the EP (EPR/QP3593NF/V002) which are listed in Note b.</p>	<p>From 23 existing monitoring wells located around the site to be sampled on 3No (monthly) occasions prior to the works, then at monthly intervals during the works, then from 14 replacement wells post completion for a period of 24 months.</p> <p>Should 12 consecutive monthly monitoring visits, post remediation, indicate groundwater assessment criteria (Section 4.3.4) have been met then it is proposed that this will be accepted by the EA and no further monitoring required.</p>
<u>SURFACE WATER MONITORING</u>		
<p>Surface water monitoring (sampling and laboratory testing) shall be undertaken from the River Ouse including at a minimum, upstream and downstream locations, and one intermediate location along the length of the River opposite the site. Proposed surface water monitoring locations are shown on Figure 4</p>	<p>Representative samples of surface water submitted for laboratory analysis of parameters listed in Note b.</p>	<p>Samples to be obtained on 1No occasion prior to the works, then at monthly intervals during the works, then at monthly intervals during and post completion for a period of 12-months</p>
<u>ANY HOLDING TANK/ LAGOON FOR INCIDENTAL ARISINGS OF WATER (PRE & POST TREATMENT)</u>		
<p>Holding tank/ lagoon water (where site waters have been collected) prior to treatment and discharge</p>	<p>Representative samples of holding tank / lagoon water submitted for laboratory analysis of parameters listed in Note b plus any other parameters required to demonstrate compliance with a discharge consent including those listed in Tables 2.12</p>	<p>Samples to be taken before and post treatment on a monthly basis during the works or at the frequency required in the water discharge activity environmental permit (WDA-EP) and/or trade effluent consent.</p>

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Scope of Monitoring	Test	Frequency of Testing
	and 2.13 of the Guidance for the Recovery and Disposal of Hazardous and Non Hazardous Waste, S5.06, EA, 2004.	

Notes:

- a) All chemical analysis shall be UKAS and MCERTS accredited as appropriate
- b) Water analysis suite to include the following determinants:

Arsenic	Ammoniacal Nitrogen	pH	Total Petroleum Hydrocarbons (carbon banded C5 – C40)
Cadmium	Sulphate	Temperature	Phenols
Nickel	Nitrate	Electrical Conductivity	Polycyclic Hydrocarbons (USEPA 16)
	Nitrite	Dissolved Oxygen	Aromatic (speciated)
		Redox Potential	

Table 11 Groundwater, Surface Water and Holding Tank / Lagoon Water Monitoring Schedule

3.4 Additional Notes on Monitoring

The following additional notes and requirements are provided in relation to monitoring activities.

- Samples of material will be taken which are representative of the material encountered and the stockpile in which material is placed;
- Samples of groundwater shall be taken from each exploratory hole in which groundwater is found and collected from a depth and in a manner which obtains samples representative of groundwater within the appropriate adjacent geological strata. Representative sub-samples of water shall be used for the on-site measurements and the remaining sample shall be filtered and preserved in line with best practice and as required by an accredited laboratory for each test;
- Additional samples may be taken where colour, odour or consistency indicates a change in the nature of the samples.
- The size of each sample taken shall be sufficient to enable all specified laboratory analyses to be carried out, including subsequent dependent testing such as leachate preparation, to the specified detection limits. Minimum advisable sample quantities are one kilogramme for solid and three litres for water. Where more than one container is used for sampling from the same location the samples shall have the same sample number.
- Containers for samples shall be in accordance with the requirements of the analytical laboratory, such that specified levels of detection can be accomplished and sample contamination is avoided, subject to the particular requirements outlined. All solid and water samples shall be placed in rigid air-tight containers filled to capacity and labelled to indicate the location and time of sampling and hazardous nature, if applicable. For soils, these containers shall be made either of PVC, polyethylene or borosilicate glass. Containers for water samples should comply with the laboratory certification requirements. The samples shall be placed immediately in the container ensuring there is no air space at the top of the container.
- Soil samples shall be stored in an appropriate manner so as to maintain their physical integrity and their chemical stability while they are on site. The type of storage facility required will vary depending upon the type of sample, and the stability of the analytes of interest. All samples shall be protected from extreme fluctuations in temperature and shall be kept in a dark container to protect them from direct sunlight. Soil samples containing biodegradable determinands shall be stored at a temperature below 4°C. Such samples may be temporarily stored in insulated cooler

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boxes with pre-frozen ice packs during the course of the working shift. For extended periods of storage, they should be kept in a refrigerator. Procedures will be implemented to maintain security of samples in accordance with the laboratory certification requirements. Water samples should not be stored on site but shall be dispatched to the laboratory at the earliest opportunity, preferably on the day of collection, so as to minimise the time between collection and analysis.

- Samples of soil or water should be stored in cool boxes containing pre-frozen icepacks during transport and kept in a refrigerated room at the laboratory at a temperature of <4°C.
- Changes to best practice sampling, storage, preservation and transport of samples as required by the analytical laboratory will supersede any previous requirements;
- A quality control and quality assurance programme for chemical analysis will be developed.
- The location and depth of all samples will be recorded. Samples shall be dispatched to the analytical laboratory within 24 hours of sampling. All samples shall be kept for a period of not less than one month after submission of the approved report.
- Where leachate analysis is specified, a sample of leachate shall be prepared from a soil sample following the procedure set out in British Standard (BS, 2002) BS 12457 Part 1 – one stage test using a liquid to solid ratio of 2:1 l/kg, unless otherwise stated. This is considered a pragmatic and robust, initial assessment of potential contaminant leachability which may be sufficient in many cases.
- It is recommended that, where appropriate, semi dynamic tank testing be undertaken on suitable samples of stabilised and compacted soil monoliths (cured for at least 14 days) to assess long term leaching in a more representative manner than the one stage, 2:1 British standard leach test. This requires suitable samples to be collected and prepared at the time of stabilisation and be appropriately stored prior to leaching. It must be ensured that any prepared monoliths are representative of the relevant material stabilised on site.

3.5 Airborne Dust Monitoring

The provisions for odour monitoring, default criteria and complaints management are outlined within the 2015 RRS and with wider control measures and management procedures outlined in the CEMP (Version 1.1), submitted as part of the granted planning permission (14/02798/FULM, September 2017). This section describes the monitoring requirements outlined in these two documents which are to be employed during the waste recovery operation.

The dust monitoring procedures detailed below will be undertaken during all phases of operation (i.e. commissioning, start-up, normal operation and shutting-down) unless the Regulator agrees that it is inappropriate.

3.5.1 Monitoring of Meteorological Conditions

The Site Manager will make reasonable efforts to foresee adverse weather conditions by accessing an appropriate source of weather forecast data. A weekly forecast will be made available for the weekly liaison meetings with relevant receptors to aid with planning of activities. This information should be used to schedule appropriate preventative action at times when there is an increased risk that site operations will give rise to significant off-site impacts. Alternatively, activities with the potential to generate significant amounts of dust will be postponed, if necessary, until there are more favourable meteorological conditions.

In addition to the forecasting of meteorological conditions, meteorological data that is representative of conditions at the site will also be required to substantiate potential complaints. This will be gathered by a meteorological station positioned at a suitable area within the site (possibly fixed to the site office) and will measure and electronically log parameters including wind speed, wind direction and precipitation.

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3.5.2 Regular Inspection - Visible Dust Monitoring

Regular (minimum daily) inspections of the site in the vicinity of the current area of working and the nearest site boundary will be undertaken. The purpose of the inspection is to identify any unacceptable or unexpected sources of visible dust and to determine if it is likely to result in an exceedance of the limits presented in section 3.5.4.

If the inspection identifies any unacceptable or unexpected dust source, remedial action to reduce levels will be taken as soon as reasonably practicable and additional measurements using the handheld monitor should also be considered.

Details of inspections which identify anything unusual or result in remedial action being taken shall be recorded in the site log book.

3.5.3 Quantitative Dust Monitoring

3.5.3.1 Locations and Frequency

Based on the boundary of the remediation works within the site and the proposed location for remediation plant, a continuous programme of passive sampling of dust deposition is proposed at the locations shown on Figure 5.

Passive dust deposition gauge samples should be collected over a 4-week period. Sticky pad samples should be collected over a 1-week period.

Monitoring of PM₁₀ using a handheld monitor, will be undertaken in the event of a source of visible dust being identified during visual inspections or if a potentially valid complaint is received directly from nearby residents or via the local Environmental Health Department. PM₁₀ concentrations should be measured as 15-minute mean values.

Monitoring will also be undertaken in the event of a potentially valid complaint received directly from nearby residents or via the local Environmental Health Department.

3.5.3.2 Dust Sampling Regime for Dust Deposition

At each location the gauge will be sited in a location that is clear of sheltering structures.

There is no British Standard for the measurement of dust deposition rates using a Frisbee type deposition gauge or a sticky pad sampler.

Frisbee type gauges should be used with a foam insert in place.

Water used during sample collection must be de-ionised water. Following gravimetric analysis at an accredited laboratory, samples should be stored for 6 months in case further analysis of dust composition is required.

Deposition rates to be reported for the undissolved fraction as mg/m²/day.

The use of a directional sticky pad at each Frisbee deposition gauge site is required. The directional sticky pads should be changed weekly and coverage reported as %Effective Area Coverage (EAC) by direction. The corresponding Absolute Area Coverage (AAC) classifications should also be reported.

The using of sticky pads instead of a dust deposition gauge is not considered appropriate as options for follow on analysis of samples to establish the composition of the dust are too restricted.

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3.5.3.3 PM₁₀ Measurement Using a Handheld Monitor

A baseline survey should be undertaken to establish the typical range of PM₁₀ concentrations experienced at each of the fixed monitoring locations. The survey should be undertaken using the same type of monitor as will be used during the ongoing works. A valid calibration certificate should be held for the monitor and the monitor should be serviced and calibrated in line with the manufacturer's recommendations. The device must be capable of reporting concentrations of PM₁₀, and ideally should also be able to report concentrations of PM₁, PM_{2.5} and Total Suspended Particulate matter (TSP) size fractions, as this information is useful when investigating the source of a complaint of a dust event.

The purpose of the baseline survey is to provide an evidence base for the frequency and magnitude of elevated PM₁₀ concentrations that are already experienced at the boundary of the site. This data should be used to confirm the appropriateness of the default threshold value of 250 µg/m³ as a 15 minute mean concentration and to establish an action trigger level to be used to inform the management of the dust generation from the site. The action trigger level should be set, at a value below the threshold value that is not usually experienced at the site boundary as an aide to monitoring the effectiveness of abatement measures prior to concentrations reaching the threshold criteria.

3.5.4 Limits

Default criteria at the site boundary will be applied, unless the baseline survey demonstrates that baseline conditions are such that a higher value would be more appropriate. Any change from the default criteria would require the written agreement of the local authority pollution control officer.

Dust Deposition default criteria at the site boundary:

- 200 mg/m²/day for dust deposition sampled using a frisbee type deposition gauge; or'
- 2 - 5% EAC/day, AAC category of 'High' for dust deposition sampled using sticky pad gauges.

Airborne dust default criteria at the site boundary:

- A 15-minute mean concentration of PM₁₀ of 250 µg/m³ for measurements with a handheld monitor.

3.5.5 Dust Complaint Management

The aim is to deliver a scheme of works that proactively identifies and minimises the risk of adverse dust impacts on the amenity of offsite receptors. However, there is the potential for occasional dust episodes to occur even on well managed sites and such episodes may result in members of the local community raising a complaint to the site operator, the local authority or the Environment Agency. For any complaint of an offsite dust issue the following actions would be undertaken:

- The site manager will record the complaint details, including the time and the location that the dust episode was experienced at and the time of the complaint.
- The site manager or their delegate will investigate the activities ongoing at the time of the complaint and in the event of a complaint relating to an ongoing event apply mitigation as appropriate to minimise the generation of the emission at source.
- For complaints relating to an ongoing event monitoring should be undertaken using the methods described in sections 3.5.1 - 3.5.3
- For complaints of dust episodes, lessons learnt from the investigation should be shared with the site management team, the holder and regulator of the Environmental Permit and the knowledge used to inform future works so that the potential for a similar event in the future is minimised.
- If unacceptable dust episodes are identified as being likely to reoccur under particular weather conditions or at particular locations, then consideration will be given to the restriction of remediation

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British Sugar, York

works or alternative methods of working, specifically to mitigate dust emissions and associated offsite impacts.

3.6 Odour Monitoring

The provisions for odour monitoring, criteria and complaints management are outlined within the 2015 RRS and with wider control measures and management procedures outlined in the CEMP (Version 1.1), submitted as part of the granted planning permission (14/02798/FULM, September 2017). This section describes the monitoring requirements outlined in these two documents which are to be employed during the waste recovery operation.

Chemical and ammoniacal odours have been noted associated with Organic Rich Material during previous phases of investigation and so will require careful management during handling and remediation of this material. It is noted that at the elevated pH associated with lime stabilisation deprotonation of ammonium to ammonia gas can occur, which may further contribute to potential odour and gas issues requiring management. Drying of Organic Rich Material is required prior to soil stabilisation which may also be advantageous to reduce ammoniacal nitrogen concentrations (via nitrification) and thus reduce potential odour generation during soil stabilisation. Aeration of ammoniacal nitrogen impacted material should therefore be considered as an additional means of odour control as required, provided this is effectively managed.

3.6.1 Locations and Frequency

Based on the boundary of the remediation works within the site and the proposed location for remediation plant, odour monitoring should be undertaken as required at the site boundary (minimum twice daily) including areas downwind of ongoing activities and the following locations shown on Figure 5.

Monitoring will also be undertaken in the event of a potentially valid complaint received directly from nearby residents or via the local Environmental Health Department.

3.6.2 Meteorological Conditions

Monitoring of forecast meteorological conditions will be undertaken daily, with reference to publicly available weather forecast information. Real-time meteorological data will be gathered automatically, with average hourly measurements from a site-based meteorological station, to allow the identification of any unfavourable meteorological conditions that could exaggerate or cause odour issues, and to assist with the substantiation of complaints. The data gathered by the meteorological station will be stored electronically and made available as and when required.

3.6.3 Odour Sampling Regime

The regular locations for sniff tests will be the same as the locations selected for dust deposition gauges (shown on Figure 5) in line with the EA's H4 Odour Management (2011) guidance. Additional sites at the site boundary or outside the boundary may be used as required to determine the conditions experienced at receptor locations.

An example record sheet is include as Table 12. This table illustrates the parameters that should be recorded for each sniff test undertaken.

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Odour Screening Location ID	Distance from source	Intensity (1-5)	Extent (0-5)	Location sensitivity (0-5)	Offensiveness (0-3)	Description of odour
General Meteorological Conditions						
General Meteorological Conditions						
General Air Quality Conditions						
Temperature (deg. C)						
Wind (Strength and Direction)						
Air Stability A-E (very unstable-very stable)						
Cloud Cover Type (octaves)						

Table 12 Example Odour Record Sheet

3.6.4 Limits

There is no definitive criterion for odour screening, as odour is largely subjective and can be largely periodic in nature (Environment Agency, 2011). The purpose of the screening is to provide an indication of typical odour concentrations on the site.

After each odour screening test, the odour should be described using the following criteria described in Table 13.

Monitoring Plan

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Score	Description
Odour Intensity	
1	No detectable odour
2	Faint odour (barely detectable, need to stand still and inhale facing the wind)
3	Moderate odour (odour easily detected while walking and breathing normally, possibly offensive)
4	Strong odour (just bearable, but offensive odour)
5	Very strong odour (very offensive odour, you feel compelled to leave the area)
Extent of Odour (assuming odour is detectable, if not then 0)	
1	Local and impersistent (only detected during brief periods when wind drops or blows)
2	Impersistent as above, but detected away from the site boundary
3	Persistent, but fairly localised
4	Persistent and pervasive up to 50 m from site boundary
5	Persistent and widespread (Odour detected >50 m from site boundary)
Location Sensitivity (assuming odour is detectable, if not then 0)	
1	Remote (no housing, commercial/industrial premises or public area within 500 m)
2	Low sensitivity (no housing, etc. within 100 m of area affected by odour)
3	Moderate sensitivity (housing, etc. within 100 m of area affected by odour)
4	High sensitivity (housing, etc. within area affected by odour)
5	Extra sensitive (complaints arising from residents within area affected by odour)

Table 13 Olfactory Screening Monitoring – Describing Odour

3.6.5 Odour Complaint Management

The aim is to deliver a scheme of works that proactively identifies and minimises the risk of adverse odour impacts on the amenity of offsite receptors. However, there is the potential for occasional odour episodes to occur even on well managed sites and such episodes may result in members of the local community raising a complaint to the site operator, the local authority or the Environment Agency. For any complaint of an offsite dust issue the following actions would be undertaken:

- The site manager will record the complaint details, including the time and the location that the odour episode was experienced at and the time of the complaint. Additional descriptive information should also be logged on the nature of the odour as described by the complainant.
- The site manager or their delegate will investigate the activities ongoing at the time of the complaint and in the event of a complaint relating to an ongoing event apply mitigation as appropriate to minimise the generation of the emission at source.
- For complaints relating to an ongoing event monitoring should be undertaken using the methods described in sections 3.6.1-3.6.3 at predetermined monitoring locations and if appropriate at the complaint location.
- For complaints of odour episodes, lessons learnt from the investigation should be shared with the site management team and the holder and regulator of the Environmental Permit and the knowledge used to inform future works so that the potential for a similar event in the future is minimised.
- If unacceptable odour episodes are identified as being likely to reoccur under particular weather conditions or at particular locations, then consideration will be given to the restriction of remediation

Monitoring Plan

British Sugar, York

works or alternative methods of working, specifically to mitigate odour emissions and associated offsite impacts.

3.7 Additional Air Monitoring

In addition to the dust and odour monitoring detailed in the preceding sections, periodic visual and olfactory assessment of emissions will be undertaken to ensure that all final releases to air should be essentially colourless, free from persistent trailing mist or fume and free from droplets.

3.8 Noise and Vibration Locations and Specification

The provisions for noise and vibration monitoring, criteria and complaints management are outlined within the 2015 RRS and with wider control measures and management procedures outlined in the CEMP (Version 1.1), submitted as part of the granted planning permission (14/02798/FULM, September 2017). This section describes the monitoring requirements outlined in these two documents which are to be employed during the waste recovery operation.

3.8.1 Regular Inspection / Monitoring

Regular (minimum daily) inspections of the site in the vicinity of the current area of working and the nearest site boundary will be undertaken. The purpose of the inspection is to identify any unacceptable or unexpected sources of noise/vibration and to determine if it is likely to result in an exceedance of the limits presented in section 3.8.5.

If the inspection identifies any unacceptable or unexpected noise/vibration sources, remedial action to reduce levels will be taken as soon as reasonably practicable.

Details of inspections which identify anything unusual or result in remedial action being taken shall be recorded in the site log book.

3.8.2 Quantitative Monitoring

3.8.2.1 Locations and Frequency

Based on the boundary of the remediation works within the site and the proposed location for remediation plant, routine monthly noise and vibration monitoring is proposed at the locations shown on Figure 5.

Monitoring will also be undertaken in the event of a potentially valid complaint received directly from nearby residents or via the local Environmental Health Department.

3.8.3 Noise Monitoring Regime

At each location the monitoring will be carried out using a suitable sound level meter and field calibrator which have been calibrated by the manufacturer or at an accredited laboratory to the relevant standards within the previous 2 years. Sound level meters shall conform to BS EN 61672-1:2003 class 1, and calibrators to BS EN 60942:2003 class 1.

All noise monitoring must be carried out by suitably qualified/experienced personnel. Details of the qualifications and experience of personnel to be recorded as part of the monitoring regime.

Monitoring shall be carried out in a 'free-field' position a minimum of 3.5m away from any vertical reflective surface, and at a height of between 1.2 and 1.5m. The microphone shall be protected by a wind shield at all times during the monitoring.

Monitoring at each location shall be carried out for a minimum of 1 hour when the site is operating normally, in order to obtain an estimate of the $L_{eq,1hour}$ reading.

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Before and after each monitoring session a field calibration test shall be carried out using a hand held calibrator and the result recorded. If a significant change in the calibration level is noted between the beginning and end of a monitoring session, greater than 0.5dB(A), then the results should be considered suspect and the monitoring repeated, ideally using an alternative noise meter.

During the monitoring the prevailing weather conditions, in particular wind speed and direction, shall be noted. Monitoring must not be carried out during wet and/or windy weather (wind speeds greater than 5 ms⁻¹). The dominant noise sources observed during the monitoring shall also be noted.

If the site is audible but monitored noise levels are dominated by other sources e.g. road/rail traffic, then an attempt shall be made to estimate the level of the site noise during 'gaps' in the dominant noise source by watching the second to second display on the meter. This will aid in determining if any exceedances of the noise limits are due to site operations, and therefore remedial action needs to be taken.

3.8.4 Vibration Monitoring Regime

At each location the monitoring will be carried out using suitable vibration monitoring equipment as specified in BS EN ISO 8041:2005, which has been calibrated by the manufacturer or at an accredited laboratory to the relevant standards within the previous 2 years.

All vibration monitoring must be carried out by suitably qualified/experienced personnel. Details of the qualifications and experience of personnel to be recorded as part of the monitoring regime.

Monitoring shall be carried out in a 'free-field' position away from any supporting structures. Transducers shall be bonded to the ground using a method suitable for the transducer in use. Monitoring at each location shall be carried out for a minimum of 15 minutes when the site is operating normally, in order to obtain an estimate of the peak component particle velocity.

The dominant vibration sources observed during the monitoring shall also be noted. This will aid in determining if any exceedances of the vibration limits are due to site operations, and therefore, if remedial action needs to be taken.

3.8.5 Noise and Vibration Proposed Limits

The following are the noise and vibration proposed limits for the duration of the works:

- Noise – a trigger level of 75dB (LAeq,t) at the site boundary. Any further suitable noise limits will be agreed with the Environment Agency e.g. a temporary limit for short term works required in close proximity to the site boundary with residential properties.
- Vibration – peak component particle velocity of 3 mms⁻¹ at the site boundary

The limits apply to normal daytime working hours of 08:00-19:00 Monday to Friday and 09:00 to 13:00 Saturday, subject to agreement from the City of York Council. No works outside of these hours are proposed.

3.8.6 Action Following Receipt of a Complaint

Should complaints arise from nearby residents regarding noise/vibration from site activities a log of the complaint will be made, including:

- the date and time that the complaint was received by the site;
- the nature of the complaint; and
- the name, address and telephone number of the complainant.

The site manager (or other designated personnel) shall be notified as soon as possible that a complaint has been received, and if required, contact the complainant to obtain further details.

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If the complaint relates to an event in the past then the likely cause of the complaint will be investigated as soon as possible via records of site activities and prevailing weather conditions. The complainant will be advised of the results of the investigation and any remedial action taken as a result of the complaint.

If the source of the complaint is still ongoing it will be investigated as soon as reasonably practicable. If initial investigations identify that the noise/vibration levels are unusual or the site noise/vibration limits may be being breached then remedial action will be taken to reduce noise levels. If the source of the complaint relates to normal day to day activities noise/vibration monitoring will be undertaken to determine if such works are likely to result in a breach in the future. The results will be discussed with the complainant and explained with regard to the noise/vibration limits imposed by the permit, and the influence of other noise sources outside the site. If the noise/vibration monitoring results indicate that normal day to day activities are likely to result in a breach then adjustments to the working methods will be undertaken to reduce noise/vibration levels.

The Environment Agency shall be informed of all noise/vibration complaints, including the results of the investigation and any action taken as a result.

3.9 Managing Public Highway

In order to reduce the deposit of mud and grit on the public highway, hard standing surfaces will be provided within the site, especially where deliveries are going to be taking place. The developers will take reasonable steps to ensure that the deposit of mud and dirt on the highway is kept to a minimum.

Wheel washing facilities will be provided on the site at all times through each phase of the development.

A pressure washer, with manual brushing facilities will be provided on site and used as frequently as deemed necessary by the condition of the road adjacent to the operational site accesses, as determined by the site manager as part of the daily visual dust inspection regime, and in consultation with the local authority's highways department as necessary.

A road sweeper will be utilised on the surrounding highway as required should mud or debris be noted to have accumulated in roads adjacent to the site.

4 Validation / Verification Strategy

4.1 Demonstrating Effective Removal of Contamination

Contaminated materials will be identified through excavation of identified hotspots, visual segregation of materials according to specific material types and the material testing regime specified in Table 9. The sampling and testing is required to confirm that the underlying materials comply with the RTVs for the residential development and associated uses of the site.

All earthworks materials shall be subject to geochemical testing from stockpiles following excavation and segregation according to material type as well as from stockpiles of remediated material prior to placement. Where the materials comply with the RTVs at point of excavation then the material may be used within the works. However, the materials must also comply with the geotechnical acceptability criteria. Where at point of excavation the materials do not meet the RTVs then the material will be segregated and sentenced to bioremediation, stabilisation/solidification or off-site disposal. Additional stockpile sampling may be undertaken where considered appropriate to reflect the heterogeneity of the material within a particular stockpile in order to assist obtaining a representative average (mean) result for all samples collected from that stockpile which can be then compared with Remediation Criteria.

The method(s) for validating treated materials is presented in Sections 2 and 3. Materials which fail the acceptability testing for use within 1m depth of the formation level can be used at depths greater than 1m below the formation level, where failure is due to non-volatile or negligibly volatile determinants. This includes materials where free asbestos fibres have been identified noting that visible ACM material will be identified and segregated by handpicking for off-site disposal as far as practicable. For volatile contaminants and material where residual free phase product is identified the material will be subject to ex situ bioremediation.

During excavation visual inspections of the cut areas will be undertaken and any observations of areas of contamination and any odours, such as hydrocarbon odours, indicating the presence of potential contamination will also be recorded.

Unacceptable materials will be segregated and stored in a dedicated stockpile for remediation or disposal. Confirmatory sampling and chemical testing will be undertaken from stockpiles of remediated material prior to placement. Where failures in comparison to the RTVs are identified the soil materials will be removed and sentenced to either further remediation for volatile substances or to placement at depths greater than 1m below formation level for non-volatile and negligibly volatile substances or to off-site disposal.

4.2 Demonstrating Effective Treatment of Contamination

Where excavated materials contain volatile hydrocarbons at concentrations exceeding the soil RTVs and/or ammoniacal nitrogen at concentrations exceeding the soil leachate RTVs and/or comprise Organic Rich Material from Historic Pond 7 they shall be recovered / rendered suitable for use by remediation within biopiles and/or windrows.

During the bioremediation process monitoring via field measurements and laboratory sampling of the materials within the biopile/windrow shall be undertaken as described in Table 9. During treatment testing will be undertaken at approximately fortnightly intervals and at a rate of 1 set of results per 300 m³ of material in treatment; field measurements will be taken on a daily basis from a minimum of five points across the biopile/windrow.

Weather conditions will also be recorded on a daily basis.

The results of the laboratory testing and field measurements will provide lines of evidence to allow validation of the bioremediation works in addition to comparison of contaminant concentrations against the RTVs. The metal determinants are required in the fortnightly testing schedule as a control to provide evidence that the concentration of biodegradable contaminants have been reduced by bioremediation and not through dilution. The validation of the materials treated within each biopile/windrow batch will be undertaken before the treated

Monitoring Plan

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material can be used in the development. Where materials cannot be validated as having been treated to the required standard they will either be sentenced for further treatment within the biopile/windrow or if this is considered to be impractical the material will be sentenced for offsite disposal.

It is noted that while soil RTVs comprise a single criteria value for each parameter across the entire boundary, soil pore water RTV for ammoniacal nitrogen vary according to the Averaging Areas. Therefore, excavated material will be sentenced for remediation based on comparison of the concentration of ammoniacal nitrogen in soil leachate with the RTV of the Averaging Area from which the material was excavated. In addition, prior to placement and/or following any remediation or soil stabilisation, further soil leachate testing must be undertaken, as required, to demonstrate compliance with the RTV of the destination Averaging Area. This is to ensure material is not merely moved from one area to another but that genuine source reduction is achieved across the site as a whole. It is noted that the Green Infrastructure and areas of POS, where Organic Rich Material is to be primarily placed, are located within and across multiple Averaging Areas.

4.3 Demonstrating Effective Treatment of Ground Gas

Data on the chemical and geotechnical composition of the excavated and placed materials, collected via the testing requirements specified in Tables 9, will be used to increase the confidence of the engineering ground model and conceptual site model.

The specific remediation objectives with regarding to ground gas include excavating any significant Organic Rich Material encountered within Made Ground present within Historic Pond 7 and subjecting this material to ex situ aerobic bioremediation in order to reduce the gassing potential of this material prior to placement (following any stabilisation required).

As well as the lines of evidence collected during bioremediation described in the previous Section, reductions in the TOC content, as well as forensic organic matter testing of the material, may also be used as a line of evidence to support the reduction in readily degradable organic matter content and hence demonstrate a reduction in ground gas generating potential.

It is intended that the excavated Made Ground materials which are acceptable for use will be placed and compacted as bulk fill to formation level. The material is intended to be compacted to 95% MDD and 5% air voids. Gas monitoring (detailed in Section 3.2) will be undertaken across the site, before, during and after the works. Before and during the works selected existing monitoring wells will be used. New monitoring wells will be installed during the works as the original set of monitoring wells are destroyed by the progress of the works. The new monitoring wells will continue to be monitored following completion of the works.

The information from the testing and gas monitoring undertaken during excavation and placement of works materials and the data from the remedial treatment will be used to confirm that the ground gas remediation and reclamation objectives have been achieved.

Ground gas data will be used to demonstrate that ground gas conditions following remediation are appropriate to Amber 1 and at most is not greater than Amber 2 (NHBC Traffic Light System). In addition, where methane and carbon dioxide concentrations exceed 1.5%v/v and 5%v/v respectively (Scenario 1, EPR 5.02, EA Guidance) hazardous gas flow rates (Qhgs) will be calculated in line with Scenario 2 (EPR 5.02) in accordance with the required permit surrender Completion Criteria provided by the EA in Pre-Advice Letter (EAWML68681, EA, 28th August 2015). Assessment of hazardous gas flows rates based on geographical zoning of the site will be undertaken where appropriate and with agreement of the EA.

An assessment of the ground gas regime will inform the level of gas protection measures required for the new properties to be built on the residential development platforms.

4.4 Assessment of Groundwater Quality Post Remediation

As described in Section 2.4, ground water assessment post remediation may include assessment of trends or statistics, in combination with comparison with set values, and are as follows:

Monitoring Plan

British Sugar, York

- Post remediation – to assess groundwater quality trends within replacement monitoring wells (defined in Section 3.3) following remediation works to demonstrate there are no significant sustained increases in concentrations of ammoniacal nitrogen and other metal or metalloids contaminants listed in the EP Variation. Assessment of trends may include statistical analysis where appropriate, or comparison with simple descriptive statistics.
 - For replacement monitoring wells which are direct replacements for existing monitoring wells (listed within the EP Variation working Plan (URS, February 2015)) and for which representative data is likely available for pre remediation conditions, then reference will also be made to these pre remediation concentrations (including Control Levels) to demonstrate there is no significant deterioration in groundwater quality following remediation;
 - For replacement monitoring wells which are not direct replacements for existing monitoring wells and for which representative data is not likely available for pre remediation conditions then, if sustained increasing trend is observed, reference will also be made to the (SSAC (Updated HRA, Arcadis, 2020) provided these replacement wells are associated with identified Sources (Updated HRA, Arcadis, 2020). Where these wells are not associated with a Source, then further risk assessment may be undertaken if deemed required, including reference to EQS and/or DWS standards, if relevant.

4.5 Monitoring

As described in Section 3.2, ground gas monitoring will be undertaken at monthly intervals post works completion and for a period of 24 months. Should 12 consecutive monthly monitoring visits indicate ground gas compliance criteria have been met then it is understood that this will be accepted by the EA (Pre-application Advice, August 2015) with no further ground gas monitoring required.

As described in Section 3.3, groundwater monitoring will be undertaken at monthly intervals during the works, then at post completion for a period of 24 months within a network of replacement wells installed across the site. Should 12 consecutive monthly monitoring visits (post completion) indicate ground monitoring compliance criteria have been met then it is proposed that this will be accepted by the EA and no further monitoring required.

4.6 Validation / Verification Reporting

The Validation Report for the British Sugar Former Factory Site Remediation and Reclamation Works shall include the following.

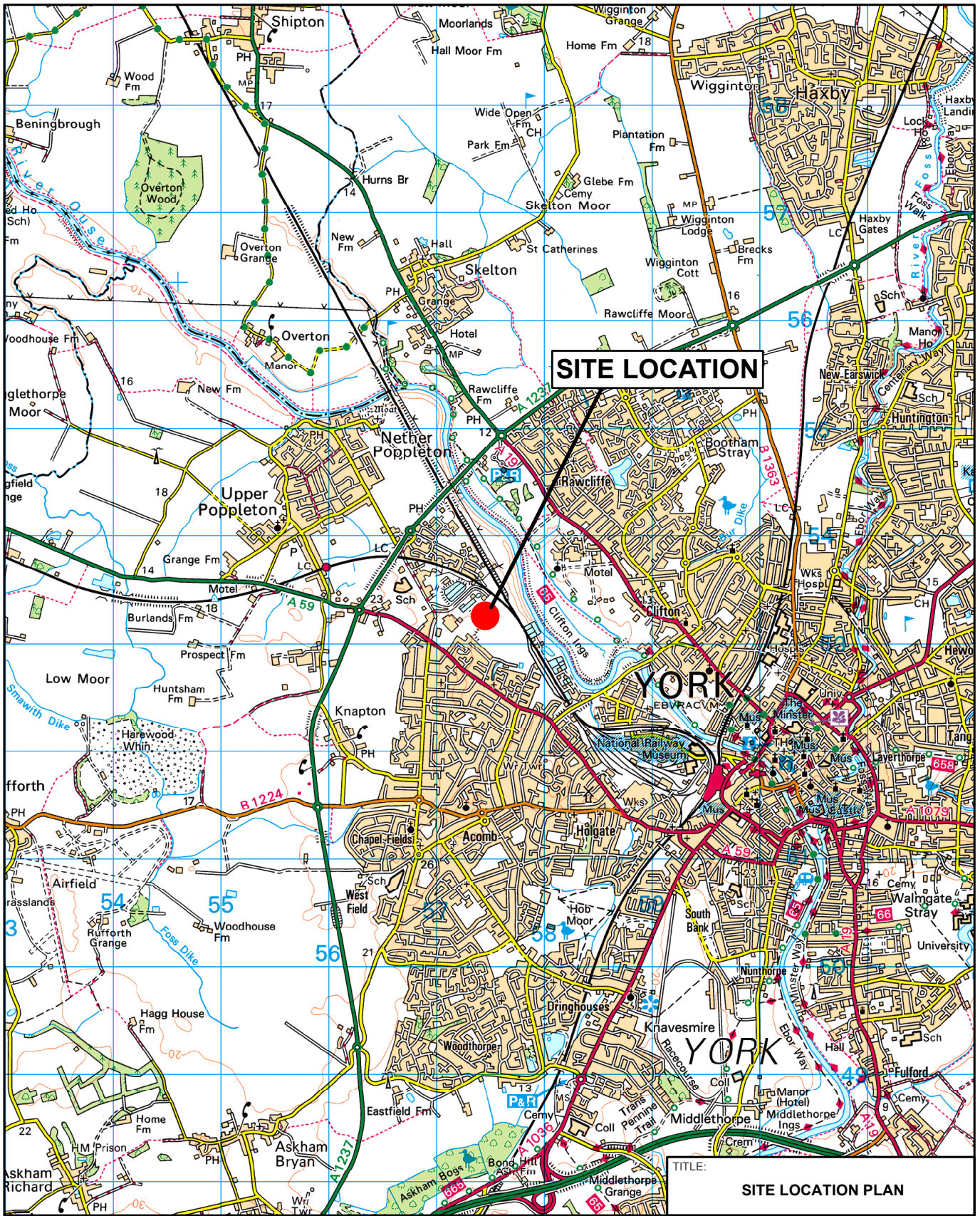
- A general description of the remediation and reclamation works.
- Details of all excavated material classifications including site location references and volumes.
- Details of all imported material classifications and volumes.
- Details of bioremediation works, laboratory testing results, field measurement data, the assessment of remediation of each biopile batch and sentencing of materials for use as fill within the residential development.
- Results of all geochemical and geotechnical testing relating to all imported and treated materials.
- Results of compaction trials.
- The results of the assessments of material acceptability.
- Details of all geotechnical and geochemical remedial treatment undertaken (including process details, volumes, specific materials undergoing treatment, results of the treated material).
- Details of the final placement of excavated, treated and imported materials (linked to the assessment of material acceptability).
- Details of the materials sentenced for off-site disposal; including waste classification, volumes and disposal location.
- Results of all waste acceptance criteria (WAC) testing.

Monitoring Plan


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- All waste transfer documentation for the materials disposed of off-site.
- Details of any WDA-EP or trade effluent consents required as part of the works.
- The Environmental Permit details as applicable relating to (i) any on-site remedial treatment processes and (ii) any landfill operators accepting wastes from site.
- The monitoring records and laboratory analysis results for all the ground gas, groundwater and surface water monitoring.
- Details of any alterations / amendments made to the Remediation and Reclamation Strategy.
- Details of any contingencies undertaken during the works.
- Details of all correspondence with the regulatory authorities during the works.
- As-built drawings showing surveyed levels of base of temporary excavations, temporary side slopes of excavations, positions of samples and tests carried out, and the MPM grid system.
- As-built drawings showing surveyed formation ground levels and positions of point-of placement samples and tests carried out.


FIGURES

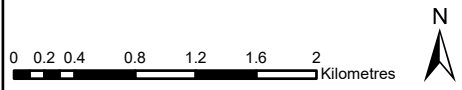


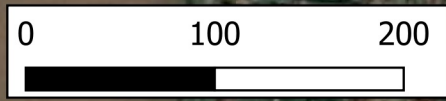
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 CONTACT ARCADIS UK IN CASE ANY QUERY

LEGEND	
	SITE LOCATION

NOTES
SYMBOLS FOR BOREHOLES, TRIAL PITS AND OTHER SPECIFIC FEATURES ARE REPRESENTATIONS OF LOCATION ONLY AND UNLESS OTHERWISE SPECIFIED, DO NOT REPRESENT THE TRUE SIZE OF THE FEATURE.

TITLE: SITE LOCATION PLAN	
SITE: BRITISH SUGAR YORK	
CLIENT: BRITISH SUGAR	
PROJECT: 10024487	FIGURE 1
DATE: 30/07/19	DRAWN BY: AP
DRG No. : 10024487-AUK-XX-XX-DR-ZZ-0002-P1.GIS	
SCALE: 1: 50,000	PRINT: A4
 Design & Consultancy for natural and built assets	





- Legend**
- Former Water Treatment Area
 - Former Factory Area
 - Historic Ponds and Soil Conditioning Area
 - Site Boundary
 - Current Ponds on Site
 - Permit Boundary
 - Site-wide Topo Contours



Issued for Information			
Design	S.Sohni	5-6-2020	
Drawn	S.Sohni	5-6-2020	
Checked	J.Hurst	5-6-2020	
Approved	C.Piddington	5-6-2020	
Scale	1:4000	Datum	AOD
Original Size	A3	Grid	OS
Suitability Code:		Project Number	10024487

Client - British Sugar Plc



Figure 2

PROJECT	British Sugar, York
TITLE	Site Layout Plan

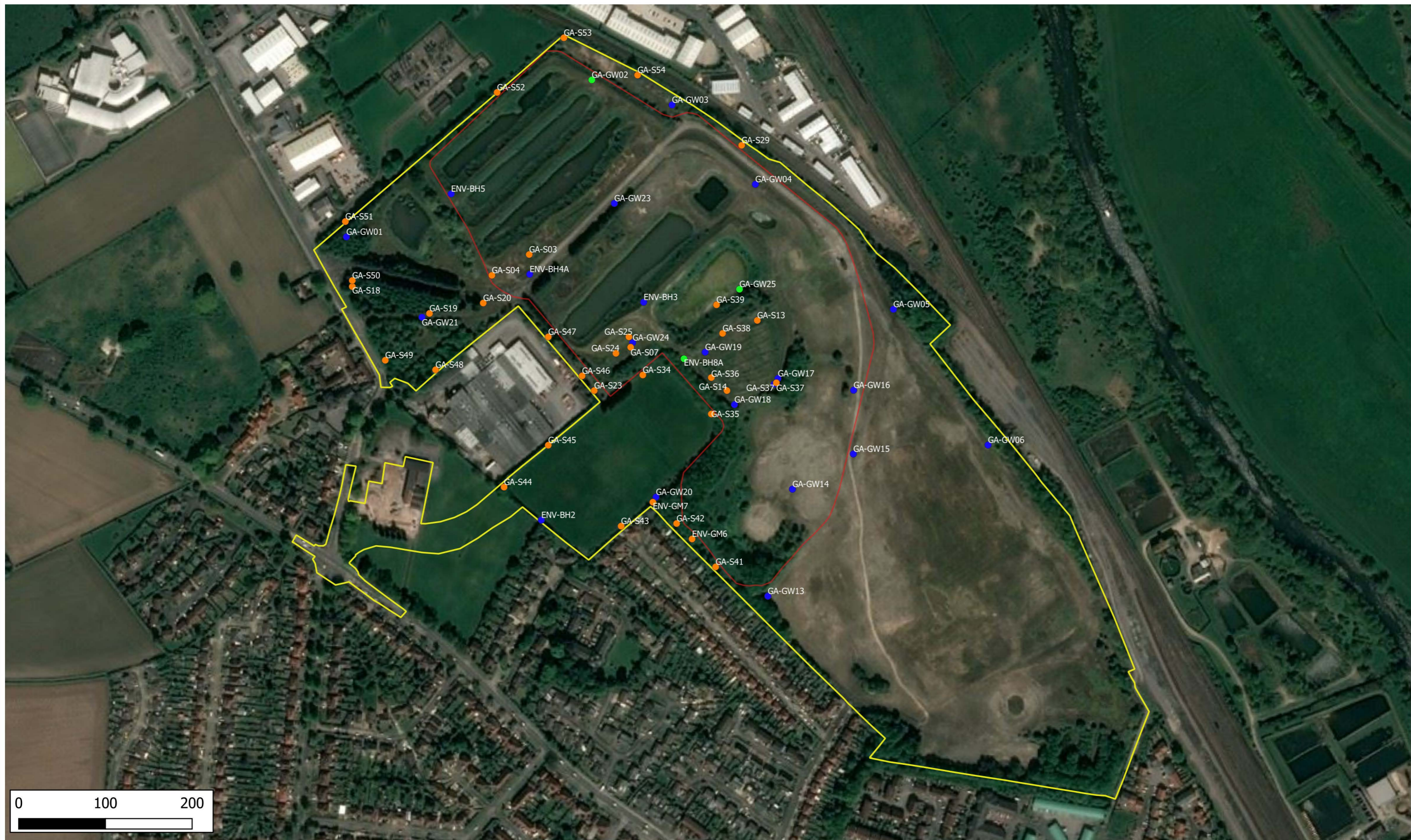


Registered office: Arcadis House, 34 York Way, London N1 9AB

Co-Ordinating office: 1 Whitehall Riverside, Leeds LS1 4BN, United Kingdom, T: +44 (0)113 284 5300

Drawing Number: 10024487-AUK-XX-XX-DR-ZZ-0047-P1-Site layout Plan

Under the Microsoft® BingTM Maps



- Legend**
- Monitoring Locations**
- Ground gas Monitoring Locations
 - Groundwater and Groundgas Monitoring Well
 - Groundwater Monitoring

- Site Boundary
- Permit Boundary



Issued for Information			
Design	S.Sohni	16-4-2020	
Drawn	S.Sohni	16-4-2020	
Checked	J.Hurst	16-4-2020	
Approved	C.Phillington	16-4-2020	
Scale	1:4000	Datum	ADD
Original Size	A3	Grid	OS
Suitability Code		Project Number	10024487

Client - British Sugar Plc




Figure 3

PROJECT

British Sugar, York

TITLE

Existing Ground Gas and Groundwater Monitoring Well Location Plan

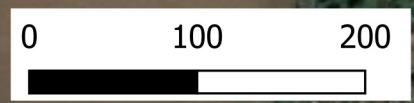


Registered office: Arcadis House, 34 York Way, London N1 9AB

Co-Ordinating office: 1 Whitehall Riverside, Leeds LS1 4BN, United Kingdom, T: +44 (0)113 284 5300

Drawing Number: 10024487-AUK-XXXX-DR-ZZ-0043-P1-Groundgas and Groundwater monitoring Location Map

Under the Microsoft® BingTM Maps



- Legend**
- Proposed Ground Gas and Groundwater Monitoring Locations
 - Proposed Ground Gas Monitoring Location
 - Proposed Groundwater Monitoring Location
 - Surface Water Monitoring Wells
 - Proposed Ground Gas Monitoring Location in Natural Strata
 - Site Boundary



Issued for Information			
Design	S.Sohni	5-6-2020	
Drawn	S.Sohni	5-6-2020	
Checked	J.Hurst	5-6-2020	
Approved	C.Piddington	5-6-2020	
Scale	1:4500	Datum	AOD
Original Size	A3	Grid	OS
Suitability Code:		Project Number	10024487

Client - British Sugar Plc





Figure 4

PROJECT	British Sugar, York
TITLE	Proposed Surface Water Monitoring Locations and Replacement Ground Gas and Groundwater Monitoring Wells

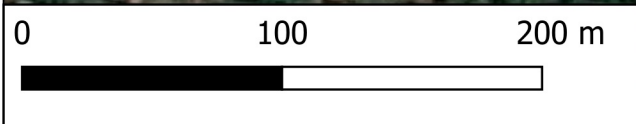


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Drawing Number: 10024487-AUK-XX-DR-ZZ-0054-P1-Proposed Ground gas and Groundwater Monitoring Locations

Under the Microsoft® BingTM Maps



- Legend**
- Proposed Dust, Noise and Vibration Monitoring Locations
 - Proposed Odour Monitoring Locations
 - Site Boundary



Issued for Information			
Design	Arya M S	2-6-2020	
Drawn	Arya M S	2-6-2020	
Checked	J.Hurst	2-6-2020	
Approved	C. Piddington	2-6-2020	
Scale	1:4000	Datum	AOD
Original Size	A3	Grid	OS
Suitability Code:		Project Number	10024487

Client - British Sugar Plc



Figure 5

PROJECT	British Sugar, York
TITLE	Proposed Dust, Noise, Vibration and Odour Monitoring Locations

ARCADIS Design & Consultancy for natural and built assets

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Drawing Number: 10024487-AUK-XX-XX-DR-ZZ-0066-P1-Proposed Dust, Noise, Vibration and Odour Monitoring Locations

APPENDIX A

Requirements for Acceptability and Testing of Earthworks Materials

Monitoring Plan

British Sugar, York

CLASS	GENERAL MATERIAL DESCRIPTION	TYPICAL USE	PERMITTED CONSTITUENTS (All subject to requirements of Clause 601 (SHW) and Appendix 6/1)	MATERIAL PROPERTIES REQUIRED FOR ACCEPTABILITY (in addition to requirements on use of fill materials in Clause 601 (SHW) and testing in Clause 631 (SHW))				COMPACTION REQUIREMENTS IN CLAUSE 612 (SHW)
				PROPERTY (See exception in previous column)	DEFINED AND TESTED IN ACCORDANCE WITH:-	ACCEPTABLE LIMITS WITHIN:		
						Lower	Upper	
1A	Well graded granular material	General fill	Any material, or combination of materials. Site-won aggregate.	(i) grading	BS 1377 Part 2	Tab 6/2	Tab 6/2	End product min 95% MDD and max 5% air voids
				(ii) uniformity coefficient	See Note 5	10	-	
				(iii) mc	BS 1377 Part 2			
1B	Uniformly graded granular material	General fill	Any material, or combination of materials. Site-won aggregate	(i) grading	BS 1377 Part 2	Tab 6/2	Tab 6/2	End product min 95% MDD and max 5% air voids
				(ii) uniformity coefficient	See Note 5	-	10	
				(iii) mc	BS 1377 Part 2			
1C	Coarse granular material	General fill	Any material or combination of materials Site-won aggregate	(i) grading	BS 1377 Part 2	Tab 6/2	Tab 6/2	End product min 95% MDD and max 5% air voids
				(ii) uniformity coefficient	See Note 5	5	-	
				(iii) Los Angeles coefficient	Clause 635	-	50	
2A	Wet Cohesive material	General fill	Any material, or combination of materials.	(i) grading	BS 1377 Part 2	Tab 6/2	Tab 6/2	End product min 95% MDD and max 5% air voids
				(ii) plastic limit (PL)	BS 1377 Part 2	-	-	
				(iii) mc	BS 1377 Part 2	PL-4%	PL x 1.3	
				(v) Undrained shear strength of remoulded material	Clause 633	60 kN/m ²	100 kN/m ²	

Monitoring Plan

British Sugar, York

CLASS	GENERAL MATERIAL DESCRIPTION	TYPICAL USE	PERMITTED CONSTITUENTS (All subject to requirements of Clause 601 (SHW) and Appendix 6/1)	MATERIAL PROPERTIES REQUIRED FOR ACCEPTABILITY (in addition to requirements on use of fill materials in Clause 601 (SHW) and testing in Clause 631 (SHW))				COMPACTION REQUIREMENTS IN CLAUSE 612 (SHW)
				PROPERTY (See exception in previous column)	DEFINED AND TESTED IN ACCORDANCE WITH:-	ACCEPTABLE LIMITS WITHIN:		
						Lower	Upper	
2B	Dry Cohesive material	General Fill	Any material, or combination of materials.	(i) grading	BS 1377 Part 2	Tab 6/2	Tab 6/2	End product min 95% MDD and max 5% air voids
				(ii) plastic limit (PL)	BS 1377 Part 2	-	-	
				(iii) mc	BS 1377 Part 2	App 6/1	PL - 4%	
				(v) Undrained shear strength of remoulded material	Clause 633	100 kN/m ²	-	
2C	Stony Cohesive Material	General Fill	Any material, or combination of materials.	(i) grading	BS 1377 Part 2	Tab 6/2	Tab 6/2	End product min 95% MDD and max 5% air voids
				(ii) plastic limit (PL)	BS 1377 Part 2	-	-	
				(iii) mc	BS 1377 Part 2	-	-	
				(v) Undrained shear strength of remoulded material	Clause 633	60 kN/m ²	-	
2D	Silty Cohesive Material	General Fill	Any material, or combination of materials.	(i) grading	BS 1377 Part 2	Tab 6/2	Tab 6/2	End product min 95% MDD and max 5% air voids
				(ii) mc	BS 1377 Part 2	-	-	
				(iv) Undrained shear strength of remoulded material	Clause 633	60 kN/m ²	-	
4	Various	Fill to landscape areas	See App 6/1	(i) grading	BS 1377 Part 2	-	125mm	See Clause 620 and App 6/1
				(ii) mc	BS 1377 Part 2	-	-	

Monitoring Plan

British Sugar, York

CLASS	GENERAL MATERIAL DESCRIPTION	TYPICAL USE	PERMITTED CONSTITUENTS (All subject to requirements of Clause 601 (SHW) and Appendix 6/1)	MATERIAL PROPERTIES REQUIRED FOR ACCEPTABILITY (in addition to requirements on use of fill materials in Clause 601 (SHW) and testing in Clause 631 (SHW))				COMPACTION REQUIREMENTS IN CLAUSE 612 (SHW)
				PROPERTY (See exception in previous column)	DEFINED AND TESTED IN ACCORDANCE WITH:-	ACCEPTABLE LIMITS WITHIN:		
						Lower	Upper	
5A	Topsoil, or turf, existing on site	Topsoiling	Topsoil or turf designated as Class 5A in the Contract	(i) grading	Clause 618	-	Clause 618	-
5B	Imported topsoil	Topsoiling	General purpose grade complying with BS 3882	-	-	-	-	-
5C	Imported Turf	Turfing	Material complying with BS3969	-	-	-	-	-
6A1	Selected well graded granular material	Below water	Natural gravel, natural sand, crushed gravel, crushed rock, other than argillaceous rock, crushed concrete, well burnt colliery spoil or any combination thereof	i) grading	BS1377 Part 2	As Class 6A. Tab 6/2	As Class 6A. Tab 6/2	No Compaction
				ii) uniformity coefficient	BS892	10	-	
				iii) plasticity index	BS1377 Part 2	Non Plastic	Non Plastic	
				iv) 10% fines	Clause 635	50kN	-	
6A2	Selected well graded granular material	Fill to soft areas and abandoned watercourses	Natural gravel, natural sand, crushed gravel, crushed rock, other than argillaceous rock, crushed concrete, well burnt colliery spoil or any combination thereof	i) grading	BS1377 Part 2	As Class 6A. Tab 6/2	As Class 6A. Tab 6/2	Tab 6/4 Method 5
				ii) uniformity coefficient	BS892	10	-	
				iii) mc	BS1377 Part 2 and Note 4	Optimum mc – 2.5%	Optimum mc	
				iv) plasticity index	BS1377 Part 2	Non plastic	Non plastic	
				v) optimum mc	BS1377 Part 4 Method 3.7	-	-	

Monitoring Plan

British Sugar, York

CLASS	GENERAL MATERIAL DESCRIPTION	TYPICAL USE	PERMITTED CONSTITUENTS (All subject to requirements of Clause 601 (SHW) and Appendix 6/1)	MATERIAL PROPERTIES REQUIRED FOR ACCEPTABILITY (in addition to requirements on use of fill materials in Clause 601 (SHW) and testing in Clause 631 (SHW))				COMPACTION REQUIREMENTS IN CLAUSE 612 (SHW)
				PROPERTY (See exception in previous column)	DEFINED AND TESTED IN ACCORDANCE WITH:-	ACCEPTABLE LIMITS WITHIN:		
						Lower	Upper	
				vi) 10% fines	Clause 635	50 kN	-	
6B	Selected coarse granular material	Starter layer	Natural gravel, natural sand, crushed rock, crushed concrete, slag, well-burnt colliery spoil or any combination thereof	i) grading	BS1377 Part 2	Tab 6/2	Tab 6/2	Tab 6/4 Method 5
				ii) plasticity index	BS1377 Part 2	Non plastic	Non plastic	
				iii) 10% fines value	Clause 635	50 kN	-	
6C	Selected uniformly graded material	Starter layer	Natural gravel, natural sand, crushed gravel, crushed rock other than argillaceous rock crushed concrete well-burnt colliery spoil or any combination thereof	i) grading	BS1377 Part 2	Tab 6/2	Tab 6/2	Tab 6/4 Method 3
				ii) uniformity coefficient	BS892	-	10	
				iii) plasticity index	BS1377 Part 2	Non plastic	Non plastic	
				iv) 10% fines	Clause 635	50 kN	-	
				v) mc	BS1377 Part 2 and Note 4	optimum mc - 2 %	optimum mc + 1%	
				vi) optimum mc	BS1377 Part 2	-	-	
6F1	Selected granular material (fine grading)	Capping	Any material, or combination of materials, other than unburnt colliery spoil and argillaceous rock	i) grading	BS1377 Part 2	As Class 6F1. Tab 6/2	As Class 6F1. Tab 6/2	Tab 6/4 Method 6
				ii) optimum mc	BS1377	-	-	
				iii) mc	BS1377 Part 2 and Note 4	-	Optimum mc +1%	
				iv) 10% fines values	Clause 635	30 kN	-	

Monitoring Plan

British Sugar, York

CLASS	GENERAL MATERIAL DESCRIPTION	TYPICAL USE	PERMITTED CONSTITUENTS (All subject to requirements of Clause 601 (SHW) and Appendix 6'1)	MATERIAL PROPERTIES REQUIRED FOR ACCEPTABILITY (in addition to requirements on use of fill materials in Clause 601 (SHW) and testing in Clause 631 (SHW))				COMPACTION REQUIREMENTS IN CLAUSE 612 (SHW)
				PROPERTY (See exception in previous column)	DEFINED AND TESTED IN ACCORDANCE WITH:-	ACCEPTABLE LIMITS WITHIN:		
						Lower	Upper	
6F2	Selected granular material (coarse grading)	Capping	Any material, or combination of materials, other than unburnt colliery spoil and argillaceous rock	i) grading	BS1377 Part 2	As Class 6F2. Tab 6/2	As Class 6F2. Tab 6/2	Tab 6/4 Method 6
				ii) optimum mc	BS1377 Part 4 (vib Hammer)	-	-	
				iii) mc	BS1377 Part 2 and Note 4	-	optimum mc + 1 %	
				iv) 10% fines value	Clause 635	30 KN	-	
				v) chemical constituents	App 1/5 Table 1/5 Part B			
6F3	Selected Granular Material	Capping	Site-won or imported bituminous planings & granulated asphalt but excluding materials containing tar or tar / bitumen binders. Site-won aggregate.	i) grading	BS1377 Part 2	-	As Class 6F2. Tab 6/2	Tab 6/4 Method 6
				ii) uniformity coefficient	BS892	-	-	
				iii) optimum mc	BS1377 Part 4 Method 3.7	-	-	
				iv) mc	BS1377 Part 2 and Note 4	optimum mc - 2%	optimum mc	
				v) bitumen content	BS 598 PART 102	-	10%	

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