

East Dunbartonshire Council

CRAIGFOOT ALLOTMENTS, MILTON OF CAMPSIE

Supplementary Phase 2 Ground Investigation



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EXECUTIVE SUMMARY

WSP UK Ltd was instructed by East Dunbartonshire Council to undertake supplementary ground investigations at Craigfoot Allotments, Antermony Road, Milton of Campsie following previous site investigations, with the aim of providing a site specific assessment criteria (SSAC) for lead and checking whether the loading area will be geotechnically suitable under the current design.

- Υ Following previous site investigation works and these supplementary investigations the following was noted:
- Υ Following bio-accessibility testing, it was not possible to produce a SSAC for lead lower than the existing GAC.
- Y Four lead exceedances of Human Health GAC have been identified within the shallow alluvial soils in the southern area of the site during supplementary testing. This equates to a total of eight lead exceedances in this area to date.
- Y No lead exceedances have been recorded for the northern area of the site (noted to comprise predominantly glaciofluvial soils versus alluvial soils).
- Y Lead exceedances are generally in the range of anticipated natural background concentrations based on BGS mapping data.
- Y While lead exceedances appear to be natural in origin (in the absence of identified anthropogenic input/source) as lead is a 'non-threshold' contaminant (i.e. on in which there is no safe dose below which an effect is not observed), then the 'ALARP' ('As Low As Reasonably Practicable') principle applies.

Previous ground investigation assessments determined that the existing levels in the south of the site are to be maintained; lead-impacted soils will may require excavation to 600mm below existing site levels, with levels to be reinstated using either soils from the northern slope or imported certified clean soils. Alternatively, further options for investigation and/or in-situ remediation are presented for consideration and discussion, which may allow avoidance of costly and unsustainable dig and dump methods.

Once development plans are advanced further, WSP recommends that a detailed remedial strategy document is developed for the site, to guide mitigation works and assist in subsequent validation, and submitted for Local Authority approval.

1 INTRODUCTION

1.1 AUTHORISATION

WSP UK Ltd (WSP) was instructed by East Dunbartonshire Council (EDC) (the Client) to undertake a supplementary geotechnical and environmental ground investigation at Craigfoot Allotments, Antermony Road, Milton of Campsie (the 'site'), in accordance with our proposal dated 11 March 2021 (ref. 70083065-BID) to support the site's redevelopment for allotment use.

1.2 BACKGROUND AND TERMS OF REFERENCE

Previous intrusive investigations in 2018 and 2020 (summarised in Section 2) carried out at the site, identified lead within shallow soils as representing potential risks to future site users. Additionally, a proposed loading area at the top of the existing slope was deemed to present a risk to its stability. Consequently, the following supplementary intrusive investigation works were recommended:

- Y Sampling and bio-accessibility testing in order for site specific assessment criteria (SSAC) to be produced to inform risks to future site users.
- Υ Geotechnical sampling and testing of the slope soils to inform slope stability risks.

Full details of previous assessments may be viewed in the following reports:

- Y WSP UK Ltd, Ground Investigation Report, Craigfoot Allotments dated March 2018, Ref 70012724_GIR [Ref. 1]; and,
- Y WSP UK Ltd, Ground Investigation Report, Craigfoot Allotments dated January 2020, Ref 70012724_GIR/V2 [Ref. 2].

The site location and boundary plans are presented in Figures 1 and 2 included in Appendix A.

1.3 DEVELOPMENT PLANS

The site is to be developed into a series of field allotments which will be located within the flatter southern part of the site. Access to the site will be gained via a new footpath that joins Antermony Road to the north of the site, where the loading area is also proposed.

Detailed design drawings are provided in Figures 2724-WSP-SK-001 to 2724-WSP-SK-006, all included in Appendix A.

1.4 PROJECT SCOPE

The scope of the project has comprised:

- **Υ** One day service clearance, goalpost set up due to overhead electricity lines, Scottish Power liaison;
- Υ One day window sampling for 3 three boreholes to 5m depth, plus six hand pits to 0.6m depth;
- Υ Lead and bio-accessibility testing;
- Υ Geotechnical testing;
- Y Geotechnical check of current earthwork design in relation to loading area (simply stating whether it is appropriate or will need additional considerations); and,
- Y Update to contamination risk assessment reporting.

This report should form part of the Health and Safety File for the site.

1.5 LEGISLATIVE CONTEXT AND GUIDANCE

The assessment was undertaken in the legislative context of:

- Υ Part 2A of The Environmental Protection Act (1990); and,
- Y Scottish Government Planning Advice Note 33 (PAN33).

The following good practice and statutory guidance was considered, and the assessment was undertaken in general accordance with:

- Υ Land Contamination: Risk Management (LCRM), 8t^h October 2020;
- Y British Standard 'Investigation of Potentially Contaminated Sites Code of Practice', BS EN 10175:2011 + A2:2017;
- Υ Defra 'Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance', PB13735 (2012); and,
- Υ British Standard 'Code of Practice for Ground Investigations', BS 5930:2015.

1.6 CONFIDENTIALITY STATEMENT AND LIMITATIONS

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

Υ East Dunbartonshire Council

This report was prepared in line with the WSP proposal and associated notes. This report shall not be relied upon or transferred to any other parties without the express written authorisation of WSP. No responsibility will be accepted where this report is used, either in its entirety or in part, by any other party.

Note that where this report summarises information provided from external sources, WSP cannot offer any guarantees or warranties for the completeness or accuracy of information relied upon.

General limitations of the assessment are included in Appendix B.

2 PREVIOUS REPORTING

Historical reporting, as summarised below, relates to previous ground investigation and tank removal works completed / reviewed by WSP as per **[Ref.1]** and **[Ref. 2]**.

2.1 GROUND INVESTIGATION REPORT – MARCH 2018

Salient points are presented below. For a full understanding the reader is directed to the original reporting referenced above **[Ref. 1].**

- Υ Ten exploratory holes were excavated, comprising five hand dug pits to maximum depths of 1.2m bgl and five mechanically excavated pits to maximum depths of 3.1m bgl;
- Y Made Ground was encountered to depths of up to 0.2m bgl in one location, comprising gravelly sand with glass fragments. Topsoil was encountered in the remaining locations to depths of 0.2m. Underlying natural materials comprised Alluvium and granular deposits. Bedrock of Mudstone and Sandstone was encountered in three locations.
- Y Chemical testing of up to 4 samples for a suite comprising heavy and phytotoxic metals, hexavalent chromium, miscellaneous inorganics (e.g. cyanide, sulphate, pH), Total Petroleum Hydrocarbons (TPH), speciated Polycyclic Aromatic Hydrocarbons (PAHs), phenols, Soil Organic Matter content (SOM), and asbestos identification;
- Y Soil results were screened against Generic Assessment Criteria (GAC) calculated using the Contaminated Land Exposure Assessment (CLEA) v. 1.071 model. Exceedances of lead were recorded at HP03 and HP04a in the southern part of the site;
- Y Lead exceedances associated with the sandy gravelly clay appeared to be naturally occurring as no obvious anthropogenic source was observed. However, despite the absence of an anthropogenic source, the sensitive allotment use dictates that the Lead GAC concentration which is permissible was exceeded, consequently additional assessments or mitigation were recommended if the Alluvium was to remain within a depth of approximately 600mm of the proposed allotment areas;
- Υ It was understood that groundworks had been further reviewed and a requirement had been identified to increase elevations in the proposed allotment area by 500mm and provide additional topsoil thickness. It was suggested that site-won materials from the northern slope may be used for the raising of ground levels. Aside from the composite slope topsoil sample (which was analysed for a limited suite), this area had not been subject to contamination testing to confirm it is suitable for allotment use;
- Y It was conjectured that the slope materials may be suitable for use as the fill material and following appropriate confirmatory testing, these could then form a suitable cover system to limit exposure and plant uptake from the Lead impacts observed in HP03 and HP04b;
- Y Further works were recommended to obtain additional soil samples from the north of site and update the assessments presented herein. WSP estimated this could be achieved with an additional day of hand-excavated pits along with recovery and analysis of an additional 4 to 5 samples, to be analysed for a limited suite of contaminants based on the site conditions previously encountered (metals suite).

2.2 GROUND INVESTIGATION REPORT V2– JANUARY 2020

Salient points are presented below. For a full understanding the reader is directed to the original reporting referenced above **[Ref. 2]**.

- Υ Nine exploratory holes were excavated by EDC, comprising hand-dug pits to maximum depths of 0.5m bgl;
- Y Logs provided spanned 0.3 0.5m bgl only. Natural materials comprised Alluvium and granular deposits;
- Υ Chemical testing of up to 9 samples for a suite comprising heavy and phytotoxic metals, pH and PAHs;
- Υ Soil results were screened against Generic Assessment Criteria (GAC) calculated using the Contaminated Land Exposure Assessment (CLEA) v. 1.071 model. Exceedances of lead were recorded at CFA-8 and CFA-10 (A composite sample from CFA-1 to CFA-9 across the site). A single hexavalent chromium exceedance was recorded in CFA-6;
- Y A potential source was not identified for the hexavalent chromium exceedance recorded at CFA-6 based on the sample description provided by EDC. Additionally, the screen was carried out assuming hexavalent chromium, but the chromium testing by EDC was for total chromium concentrations, and it was considered likely that other more stable forms of chromium (e.g. trivalent chromium) would form the majority of the total chromium concentration recorded. On this basis it was considered unlikely that hexavalent chromium concentrations would pose a risk to future site users with no further discussion on chromium warranted;
- Y Lead exceedances in the southern area of the site where the allotments are proposed appeared to be associated with the sandy gravelly clay and appeared to be naturally-occurring as no obvious anthropogenic source was observed or described. Despite the absence of an anthropogenic source, the sensitive allotment use dictated that mitigation or further assessment was required;
- Y It had been previously suggested that site-won materials from the northern slope may be used as a cover layer in the south. Although a lead exceedance was recorded in the composite sample (CFA-10) which included materials from this area, the exceedance in CFA-10 was marginal (69mg/kg compared to GAC of 64mg/kg), and would be below the Category Four Screening Level (C4SL) for lead under allotment end use (80mg/kg). No lead exceedances were directly recorded in the north. It was therefore considered unlikely that the soils in the north would pose a risk to human health and on this basis these soils were considered suitable for use as a cover system for the proposed allotment areas in the south;
- Υ Based on consultation with SEPA it was understood that site levels were to remain unchanged in the south. Lead-impacted soils would therefore require excavation to 600mm below existing site levels and removal off-site, with levels to be reinstated using either soils from the northern slope or imported certified clean soils;
- Y It was suggested that alternatively, it may be possible to avoid soil disposal costs and for soils to remain in-situ if it could be determined that the bioavailability of lead in site soils was low. The GAC applied above assume a relative bioavailability of 100% of lead in soils and therefore contributes to the dose in the GAC. Correction of the oral exposure pathway used in the GAC could be made by bio-accessibility testing. It was recommended that this testing be delivered in the south of the site to allow an updated assessment of risk, albeit it should be noted that there was no guarantee that such testing would refute risks to future allotment site users from the lead impacted soils.

3 SUPPLEMENTARY ENVIRONMENTAL GROUND INVESTIGATION

3.1 FIELD WORKS AND RATIONALE

The supplemental ground investigation was carried out on 26th and 27th April 2021 at the positions shown on **Figure 3 (Appendix A).** Exploratory hole records are included in **Appendix C**. Sample testing was scheduled and targeted to the Alluvial deposits, based on the findings of **Refs. 1 and 2**.

The investigation was carried out under the supervision of an experienced engineer from WSP.

Table 3-1 – Summary of 2021 Supplemental Ground Investigation Works Completed

Investigation Method	No.	Max Depth (m bgl)	Chemical Testing	Rationale*
Hand Pits (HP01/21 to HP06/21)	6	0.6	Lead, Bio- accessibility testing for lead	In order to determine the bioavailability of lead and, if possible, develop a site specific GAC.
Window Sample Boreholes	3	4.3	N/A	Geotechnical testing carried out to provide comment on suitability of loading area design.

Note: Samples obtained for testing were collected in 1kg plastic tubs, 250mg amber glass jars and 60g amber glass vials provided by ALS Laboratories.

3.2 CHEMICAL TESTING – SOILS

Soil samples were submitted for chemical analysis at ALS Laboratories in Hawarden. The results of the contamination testing are presented in **Appendix C**.

3.3 GROUND CONDITIONS ENCOUNTERED

A summary of ground conditions encountered is presented in Table 3-2. The lithologies and depths encountered were generally consistent with those encountered in **Ref. 1**.

Stratum	Depth to Base of Stratum (mbgl)	Elevation of Base of Stratum (mAOD)	Thickness (m)	Typical Description
Topsoil	0.08 to 0.36	47.82 to 42.05	0.08 to 0.36	Slightly sandy clayey silt with rare gravel
Made Ground Cohesive	0.45 to 0.45	51.44 to 51.44	0.45 to 0.45	Sandy silty clay with glass and ceramic fragments (WS01 only)
Alluvium	0.90 to 1.50	47.28 to 40.86	0.54 to 1.35	Slightly sandy slightly gravelly clayey silt, slightly sandy silty clay with rare gravel or slightly sandy gravelly silt.
Glaciofluvial Deltaic Deposits	3.20 to 3.20	48.69 to 48.69 (39.46)	2.75 to 2.75	Sandy clayey silt, silty sand and clayey gravelly sand
Glacial Till	Not proven (4.30)	Not proven (47.59)	Not proven (1.10)	Stiff sandy gravelly clay (WS01 only)

Table 3-2 – Summary of Strata Encountered During 2021 Supplementary Investigation

* Brackets indicate maximum unproven depth and thickness and the minimum elevation

No visual or olfactory evidence of contamination was identified during the supplementary investigations. Groundwater was recorded at the following locations summarised in Table 3-3:

Table 3-3 – Summary of Groundwater Strikes Encountered during Site Investigation

Exploratory Hole	Depth Groundwater Encountered (Strike) (mbgl)	Elevation Groundwater Encountered (Strike) (mAOD)	Depth to Groundwater after 20 mins (mbgl)	Elevation of Groundwater after 20 mins (mAOD)	Remarks
WS01	2.95	48.94	-	-	Seepage
WS03	1.50	40.86	1.50	40.86	
WS03	2.00	40.36	1.20	41.16	

4 CONTAMINATION QUANTITATIVE RISK ASSESSMENT

4.1 INTRODUCTION

Following the tiered approach which is described in LCRM, this Section provides a Generic Quantitative Risk Assessment (GQRA) of those contaminant linkages that were determined to be plausible in 2019 and identified as requiring further assessment.

4.2 HUMAN HEALTH RISK ASSESSMENT

4.2.1. Rationale

WSP has derived a set of Generic Assessment Criteria (GAC) for the CLEA generic land use scenarios using the CLEA Workbook v1.071 Excel modelling tool. Further details on the assumptions and methodologies adopted by WSP are provided in **Appendix D**.

The soil chemical data has been compared against an allotment GAC for a 6% Soil Organic Matter (SOM) content, based on an average SOM of 11.6% from two tests from the lab data in **[Ref. 1]** and **[Ref. 2]**.

To support development options, human exposure to all unsaturated soils, irrespective of depth, has been assumed possible for the purpose of this assessment. This will maximise the information available to the design team on the suitability of all unsaturated material and may support with their materials management options.

4.2.2. Assessment of Risks to Future Allotment Site Users

The results of our 2021 analysis for the identified contaminants of concern in shallow soils have been compared directly to their conservative screens. Four of the six locations exceeded the allotment GAC for lead of 64mg/kg:

- Υ HP02/21 132mg/kg
- Υ HP03/21 131mg/kg
- Υ HP05/21 105 mg/kg
- Υ HP06/21 92.8 mg/kg

When compared against the Category Four Screening Level (C4SL) for lead under allotment end use (80mg/kg; indicative of low rather than minimal risk, but still strongly precautionary), all above samples would also fail.

For reference, it is also noted that the allotment GAC and C4SL are based on the following exposure assumptions:

- Critical receptor is a young female child (aged 0 to 6 years old);
- Exposure duration is 6 years;
- Exposure pathways include direct soil ingestion, consumption of homegrown produce, consumption of soil adhering to homegrown produce, skin contact with soils, and outdoor inhalation of dust and vapours;
- No building is present.

When compared to the residential with homegrown produce GAC and C4SL (134 and 200mg/kg respectively, and noted to have the same exposure parameters as allotments, with the addition of indoor inhalation of dust), it is noted that no exceedances would be recorded. The allotment screening criteria assume a higher fraction of homegrown produce is ingested by allotment holders and their families, relative to those who grow produce in their gardens.

As the conservative screens assume a relative bioavailability of 100% of lead in the soils, part of the scope of works included bio-accessibility testing in order to provide a site-specific assessment criteria (SSAC).

4.2.3. Bioavailability and Bio-accessibility

The bioavailable fraction of a chemical (also known as absolute bioavailability or ABA) is the intake dose of the chemical (e.g. via ingestion, inhalation or dermal contact) which finds its way into, and is absorbed by, the body and reaches systemic circulation unchanged, as expressed by equation 1:

$$B \quad C = B_{D \ i}^{D \ \underline{t}} \qquad [Eq.1]$$

Where: ABA = absolute bioavailability of a chemical in dimensionless formDs = absorbed dose in mg kg-1BW day¹

 $Di = {}^{int}ake \ dose \ in \ mg \ kg-1BW \ day^{-1}$

The absolute bioavailability (ABA) of a chemical may vary between zero (if none of a chemical reaches systemic circulation intact) or 1.0 (100%) (if all of the chemical reaches the systemic circulation intact)¹. The bioavailability of a chemical is possible to measure only using in-vivo methods and is therefore not generally measured directly for human health but is based on toxicological studies.

Relative bioavailability (or RBA) is the comparison of the extent of absorption between two or more forms of the same chemical (e.g. lead carbonate and lead chromate), or the same chemical administered in different media (e.g. soil, water), or at different doses. In the context of this report, the relative bioavailability is effectively a measure of the bioavailability of the lead in the soil versus the bioavailability of lead in the toxicological study used to derive the lead GAC (i.e. comparison of the extent of absorption between lead administered in different media):

$$R \quad C \quad B \quad t, u \quad \text{i} x_{B}^{\underline{B}} l_{C \quad B \quad u \quad o \quad x}^{\underline{C} t \quad \underline{B} \circ \ i \quad l} \quad [Eq. 2]$$

¹ CLEA Software (Version 1.05) Handbook

Where: RBAsoil,tox = bioavailability from the soil sample relative to the bioavailability from the media used in the toxicological study, in dimensionless form

ABAsoil = absolute bioavailability of the chemical in soil, in dimensionless form

ABAtox = absolute bioavailability of the chemical in the media used in the toxicological study, in dimensionless form

It is additionally noted that the bioavailability discussed herein relates to the oral pathway contribution to the GAC only (i.e. inhalation not considered).

Bioavailability is typically determined by using bio-accessibility data as a proxy. The bio-accessibility of a contaminant is the amount of a substance within the gastrointestinal tract and available for absorption. Bio-accessibility of contaminants is typically determined via the Unified Bio-accessibility Research Group of Europe (BARGE) method, an in vitro, staged leachate process which simulates the natural phases of the digestive tract.

The soil GAC that have been used herein are based upon an assumption (CLEA default) of 1.0 for relative oral bioavailability in soil (i.e. the absolute bioavailability of the chemical in the soil sample is the same as the absolute bioavailability in the media used in the relevant toxicological study). This does not necessarily mean that soil bioavailability is 100%.

The toxicological basis for the WSP soil GAC is a dietary intake that gives a geomean blood concentration of 3.5 micrograms/decilitre (ug/dL) of lead. The bioavailability of lead via dietary intake is 50%. As the relative bioavailability (WSP soil GAC, lead) is 1.0 (100%), this equates to a soil bioavailability of 50%.

For comparison, the C4SL for lead uses the same toxicological benchmark, but assumes a soil bioavailability of 30%, resulting in a relative oral bioavailability of 0.6 (60%).

The bioavailability recorded from the laboratory testing is as follows:

Determinand	HP01	HP02	HP03	HP04	HP05	HP06
Lead after stomach only extraction mg/kg	31.7	81.5	109	26.1	60.8	41.8
Lead after stomach and intestine extraction mg/kg		22.9	26.1	<14	<14	<14
Bioaccessible lead (stomach only extraction) %	55.1	61.7	82.9	50.2	57.9	45
Bioaccessible lead (stomach and intestine extraction) %	<24.3	17.4	19.9	<27	<13.3	<15.1

Table 4-1 – Summary of Bioavailability Testing

It is industry best practice to use the most conservative value from bioavailability testing when undertaking soil DQRA. In this instance, this would be 82.9%. However, the CLEA model requires

that we input relative bioavailability. Converting a soil bioavailability (ABAsoil) figure of 82.9% to a relative oral bioavailability (RBAsoil,tox) (toxicological study is based on dietary exposure, as explained above), results in a value of 1.658, i.e. using equation 2:

$$R C B t, u \infty = \frac{82.9}{50}$$

This would lead to a soil SSAC for lead in allotments that is higher than the existing WSP GAC.

While the exposure assumptions which underpin the current WSP GAC are conservative in nature, the bioavailability values from the soil samples as tested do not allow for a SSAC to be derived that would be lower than the existing GAC.

Full laboratory records including chemical screening data are provided in Appendix C.

4.2.4. Assessment

Following on-site bioavailability testing it has not been possible to derive a SSAC lower than the existing WSP GAC. Lead has therefore been noted to exceed the Human Health GAC in four of the six supplemental locations tested, with the exceedances being of the same order of magnitude as those recorded within **[Ref. 1]** and **[Ref. 2]**.

Notwithstanding the above, the British Geological Survey (BGS) has derived 'normal' background concentrations for lead for England and Wales. In England the 'normal' background concentrations of lead are 180mg/kg for the 'principle' domain, 2,400mg/kg for the 'mineralisation' domain, and 820mg/kg for the 'urban' domain. Meanwhile, point data for lead concentrations in Scottish topsoil is available on a 10km grid. The closest data suggests lead concentrations of between 19 and 122.2ppm (19 and 122.2mg/kg respectively). Many of the site results reside within normal anticipated background concentrations, as anticipated given that the GAC exceedances recorded to date have been detected within shallow natural alluvial soils. It is noted that no exceedances have been reported to date within soils on the northern slope of the site; it is conjectured that this may be because the northern slopes is dominated by different lithology compared to the south of the site (i.e. mainly glaciofluvial deposits rather than alluvial deposits).

However, as lead is a 'non-threshold' substance (i.e. one in which there is no safe dose for exposure below which no adverse effects are observed), then the 'ALARP' principle ('As Low as Reasonably Practicable') is applicable.

It was understood in **[Ref. 2]** that site levels are to remain unchanged in the south and no information has been provided to the contrary at this time. Outline options for further works are presented in Section 6.0.

5 GEOTECHNICAL ASSESSMENT

5.1 GROUND CONDITIONS AND GROUND MODEL

The following ground summary is based on the preliminary ground investigation undertaken in January 2018, the supplementary ground investigation in 2019 and the works carried out in 2021 summarised in Section 3 above. The exploratory hole logs have been extracted from **[Ref. 1]** and **[Ref. 2]** and included in Appendix C.

5.1.1. Ground Conditions

In general, the recorded ground conditions in the lower southern part of the site comprise Topsoil underlain by Alluvium This is in turn underlain by either Glaciofluvial Deltaic Deposits, Glacial Till or solid geology of the Upper Limestone Formation. Made Ground is recorded underlying the topsoil in two exploratory holes.

As the site rises to the north, the Alluvium thins and is absent in the exploratory holes at the top of the slope. Here, Topsoil is recorded as being underlain by a sequence of Glaciofluvial Deltaic Deposits over cohesive Glacial Till.

A brief summary of each stratum is discussed below. For a more comprehensive description of the ground investigation and ground conditions, refer to the Ground Investigation Report **[Ref. 2]**

Topsoil

Topsoil was encountered in all exploratory holes to a maximum depth of 0.45m below ground level (bgl) [WS01].

Made Ground

Beneath the Topsoil, Made Ground was encountered in HP01 & HP04a (from the 2018 GI). In exploratory hole location HP01, the Made Ground is recorded as very soft to soft, very sandy, gravelly clay with glass fragments at 0.20m bgl. In HP04a, the Made Ground comprised gravelly clayey sand with glass fragments at 0.15m bgl. Granular components in HP01 & HP04a comprised fine to coarse angular to sub-rounded sandstone and various other lithologies.

The base of Made Ground was proven to a maximum depth of 0.20m bgl [HP01 & HP04a].

Alluvium

Alluvium is recorded in all exploratory holes, except WS01 and is generally described as "very soft to soft very sandy to sandy gravelly clay with occasional cobbles and rare boulders". However, in WS02, WS03, HP02 & TP01, soils described as "slightly clayey or silty clayey gravelly fine and medium sand" or "sandy fine and medium subangular or rounded smooth gravel" are recorded.

The maximum recorded depth to the base of the Alluvium is 2.30m bgl in TP06, with the thickest sequence (2.44m) recorded in WS02.

Glaciofluvial Deltaic Deposits

Deposits considered to represent Glaciofluvial Deltaic Deposits are recorded in WS01 – WS03, TP03, TP05 & TP06 and are described as comprising silt, sand and gravel.

The base of the Glaciofluvial Deltaic Deposits is not recorded in WS02, WS03, TP03 & TP05 (exploratory holes extend to a maximum depth of 3.10m bgl [TP03]). The base of the deposit is proven in WS01 at 3.20m bgl and in TP06 at 2.5m bgl.

Glacial Till

Deposits described as Glacial Till are recorded in WS01 & TP06 only. It is recorded from 3.20m bgl in WS01 and the base of the strata was not proven to a depth of 4.30m bgl. In TP06 Glacial Till was encountered from 2.30m bgl and the base of the strata was not proven to a depth of 2.60m bgl.

The Glacial Till is described as "stiff grey clay" or "sandy gravelly clay".

Weathered Solid Geology – The Upper Limestone Formation

Weathered Upper Limestone Formation is recorded in TP01 & TP02 as "mudstone and sandstone recovered as angular cobbles and gravel". The base of the weathered Upper Limestone Formation is not proven.

5.1.2. Groundwater

Shallow groundwater strikes were encountered in HP02, HP03, HP04a & HP04b at depths varying between 0.40m to 1.00m bgl, whilst HP01 is recorded to remain dry. In HP02, the groundwater rose from 1.00m to 0.75m bgl during a 15-minute period, whist the groundwater rose between 0.10m to 0.15m bgl in HP03, HP04a & HP04b. Groundwater seepages within TP01 & TP06 were noted at 2.00m and 1.45m bgl respectively.

In the supplementary exploratory hole locations, WS01 recorded a seepage at 2.95m bgl and WS03 recorded water strikes at 1.50m bgl and 2.00m bgl, rising to 1.20mbgl after 20 minutes. Water strikes from WS01 & WS03 were encountered in Alluvium.

5.2 SUMMARY OF STRATA

A summary of the strata recorded, based on all the available information, is presented in Table 5-1.

Table 5-1 - Mater	rial Encountered
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Stratum	Range of Depth to Base of Stratum (m bgl)	Thickness (m)	Stratum Encountered in Exploratory Hole	
Topsoil	0.05 – 0.45 (0.15)	0.05 – 0.45 (0.15)	All	
Cohesive Made Ground	0.20	0.15	HP01 only	
Granular Made Ground	0.20	0.10	HP04a only	
Cohesive Alluvium	>0.40 - >2.95 (>1.06)	0.40 - >2.30 (>0.96)	All, except WS01	
Granular Alluvium	0.75 – 2.60	0.60 - 0.65	HP02 & TP01	
Cohesive Glaciofluvial Deltaic Deposits	1.30	0.85	WS01 only	
Granular Glaciofluvial Deltaic Deposits	2.50 - >3.20 (>2.78)	0.20 - +2.70 (>1.77)	WS01, WS02, WS03, TP03, TP05 & TP06	
Glacial Till	>2.60 - >4.30	>0.10 - >1.10	WS01 & TP06	
The Upper Limestone Formation	>2.10 - >3.00	>0.20 - >0.40	TP01 & TP02	

Note: An average value has been provided in brackets if 3 or more values are available.

A Plus (+) symbol represents the base of the stratum was not proven.

5.3 **PROPOSED EARTHWORKS**

Minor earthworks are required for the proposed works. Refer to 'Craigfoot Allotments Proposed Levels' drawing (drawing No.2724-WSP-SK-002) and **Appendix A** in this report for earthwork details.

5.3.1. Footpath Construction

[Ref 2] The GIR [1] notes the construction of the footpath, which traverses the slope via two switchbacks, will require regrading of the existing ground profile. In order to maintain the crossfall of the footpath as it traverses the slope, the downslope side of the footpath is to be constructed on imported fill constructed on sidelong ground. Locally, the upslope side of the footpath will be cut into the slope.

The gradient of the new embankment and cut faces is to be 1 in 3 or shallower.

The new embankments are to be constructed of imported well graded granular fill (e.g. material meeting the requirements of a Class 1A in Series 600 of the Manual of Contract Documents for Highways Works).

The site proposals show a proposed stepped access in the northwest of the site. In order to maintain an appropriate cross fall, minor cut slopes are to be formed on the upslope side of the path. Again, side slopes are to be 1 in 3 or shallower.

5.3.2. Parking / Laydown Area Construction

The proposed parking / laydown area is to be supported on an embankment with side slopes of gradient 1V:2H. The embankment reaches a maximum height of 1.2 m above the existing ground profile. The embankment is to be constructed of a similar imported well graded granular fill as the footpath.

5.4 SLOPE STABILITY ASSESSMENT

The stability analysis for the slope and proposed parking/laydown area was modelled using GeoStudio Slope W software, which uses limit equilibrium methods to allow a search for critical slope surfaces for a given slope within the confines of the slip circle search criteria specified.

For the slope stability analysis, the Morgenstern and Price method of analysis has been used as it satisfies both moment and force equilibrium as required by BS NA EN 1997-1+A1: 2013, Eurocode 7: Geotechnical Design, Part 1: General Rules.

The overall stability of the existing slope and proposed parking / laydown area has been checked in Ultimate Limit States (ULS) with design values of actions and resistances. Partial factors used are defined in BS NA EN 1990: 2002+A1: 2005 Basis of Structural Design and material parameters in accordance with BS EN 1997-1+A1: 2013.

For the modelling of the slope analysis the following calculation sequence was followed:

- The geometrical model was established based on the contours denoted in the 'Craigfoot Allotments Proposed Levels' drawing (drawing No.2724-WSP-SK-002). A copy has been provided in Appendix A for reference.
- Y In areas of cutting and embankment associated with the footpath, a maximum side slope of 1V:3H has been adopted. In areas of proposed embankment associated with the laydown area a slope gradient of 1V:2H has been used.
- Υ An effective stress slope analysis was undertaken as a conservative scenario.
- Y Appropriate characteristic values of ground strength were selected based on geotechnical laboratory test results, empirical relationships and correlations, engineering judgement and published reputable literature.
- Y Design Approach 1, Combination 1 (DA1-1) and Design Approach 1, Combination 2 (DA1-2) partial factors were applied to actions, materials and resistances in accordance with BS NA EN 1990: 2002+A1: 2005 Basics of Structural Design and NA BS EN 1997-1+A1: 2013.
- 5.4.1. Ground Model and Geotechnical Parameters

The ground model and derived geotechnical parameters are presented in Table 5-2 and the characteristic design parameters are shown in Table 5-2. The interpreted ground model is based on the most representative material encountered.

Stratum	Ground Model				
	Top of Slope (m bgl)	Bottom of Slope (m bgl)	g (kN/m²)	f' (°)	c' (kPa)
Granular Engineering Fill	-	-	20	34	0
Cohesive Alluvium	-	0 – 1.5	18	26	0
Cohesive Glaciofluvial Deltaic Deposits	0 – 1.3	-	18	26	0
Granular Glaciofluvial Deltaic Deposits	1.3 – 3.2	1.5 – 3.0	19	30	0
Cohesive Glacial Till	3.2 – 4.3	-	20	28	0

Table 5-2 – Ground Model and Derived Geotechnical Parameters

Note: Derived geotechnical parameters for the Topsoil, Made Ground and granular Alluvium have not been derived due to the recorded thickness and distribution in the exploratory holes within /adjacent to the slope.

Unit Weight (g) is based on suggested values from Figure 1 in BS 8002: 2015 Code of Practice for Earth Retaining Structures [6].

Effective Shear Strength (f') has been derived from the equation for cohesive and granular soils in BS 8004: 2015 Code of Practice for Foundations [7] using SPT N, Atterberg Limit and Particle Size Distribution test results. The Effective Shear Strength for granular engineering fill is based on engineering judgement of Class 1A general granular fill.

Effective cohesion (c') is based on engineering judgement.

Stratum	g (kN/m²)	DA1-1		DA1-2	
		f' (°)	_c ' (kPa)	f' (°)	_c ' (kPa)
Granular Engineering Fill	20	34	0	28	0
Cohesive Alluvium deposits	18	28	0	23	0
Cohesive Glaciofluvial ^D eltaic Deposits	18	26	0	21	0
Granular G _l aciofluvial Deltaic Deposits	19	30	0	24	0
Cohesive Glacial Till	20	28	0	23	0
Applied surcharge – parking / laydown area (kN/m ²)		10		12.5	
Applied surcharge – temporary stockpiling (kN/m²)		20		25	
Applied surcharge – footpath (kN/m ²)		5		6.3	

Note: The applied surcharge for the parking area is based on suggested values from Table 3 in BS 6031[:] 2009 Code of Practice for Earthworks and T^able 7 in BS 8002: 2015 Code of Practice for Earth Retaining Structures for the footpath.

5.4.2. Considerations and Assumptions

- Y Ground elevations are based on information obtained from the 'Craigfoot Allotments Proposed Levels' drawing (drawing No.2724-WSP-SK-002) in the GIR [1] and in Appendix A of this report.
- Υ Groundwater conditions including groundwater levels have been modelled based on information in the GIR [1].
- Υ Topsoil, Made Ground, and granular Alluvium cohesive have not been modelled due to their recorded thickness and presence in the exploratory holes.
- Υ The embankment fill has been modelled on Class 1A Granular Engineering Fill.
- T Design values for material properties are based on in-situ and laboratory tests of soil samples.
 Where information is limited, engineering judgement and published literature has been used.
- Y A factored surcharge has been used to simulate actions exerted by the proposed parking/laydown area and footpath. In the absence of more exact calculations, the nominal loads due to typical highway loading has been defined as 10kN/m2, based on Table 3 in BS 6031: 2009 Code of Practice for Earthworks [8] and 5kN/m2 for the footpath based on Table 7 in BS 8002: 2015 Code of Practice for Earth Retaining Structures [6]. For sensitivity purposes, a surcharge of 20kN/m2 has been applied to represent potential stockpiling in the laydown area.
- Υ The Upper Limestone Formation has been modelled as an impenetrable stratum.
- Υ The top of the Upper Limestone Formation was not confirmed and has therefore been assumed to be 5m bgl.



- Υ The assessment does not consider any impact which temporary works might have on the slope's stability.
- 5.4.3. Results of Slope Stability Modelling

Two slope models were produced, the first assessing DA1-1 and the second assessing DA1-2. The slope models have been presented in Drawing 5-1 to Drawing 5-4 and a summary of the results are recorded in Table 5-4.

Table 5-4 – Degree of Utilisation Summary

Degree of Utilisation (DoU)	DoU in DA1-1	DoU in DA1-2
Parking / laydown area modelled with a surcharge of 10kN/m2	0.710 (see Figure 5-1)Error! Reference source not found.)	0.883 (see Figure 5-2)
Parking / laydown / stockpiling area modelled with a surcharge of 20kN/m2	0.743 (see Figure 5-3)	0.919 (see Figure 5- 4)

The Degree of Utilisation (DoU) is t^he ratio of the destabilising and stabilising forces required for equilibrium:

- Υ A DoU of <1 shows that the slope has an adequate factor of safety against instability.
- Υ A DoU of >1 shows that the slope does not have an adequate factor of safety against instability.

The model in Drawing 5-1 to Drawing 5-4 and degree of utilisation in Table 5-4 identifies the slope to have an adequate factor of safety against instability with the additional load exerted from the proposed parking/laydown area and potential stockpiling.

Craigfoot Allotments DA1-1

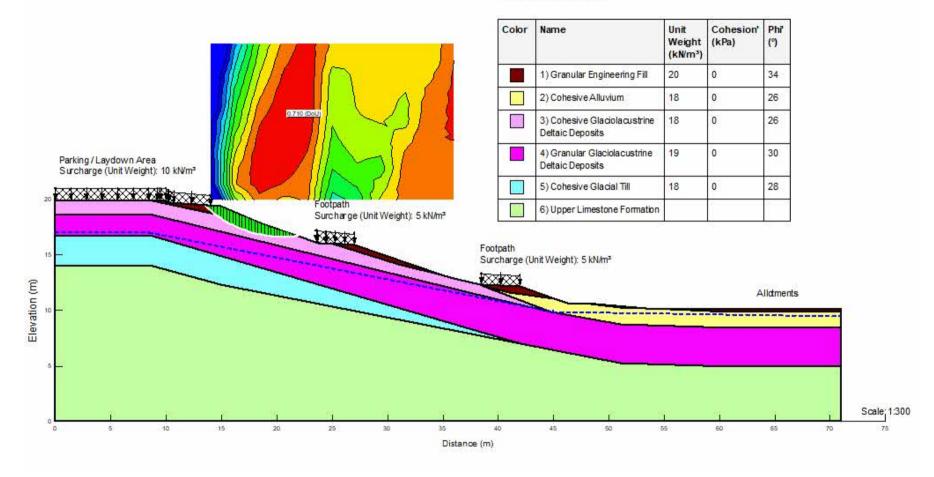


Figure 5-1 - Slope Stability Analysis - DA1-1

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Craigfoot Allotments DA1-2

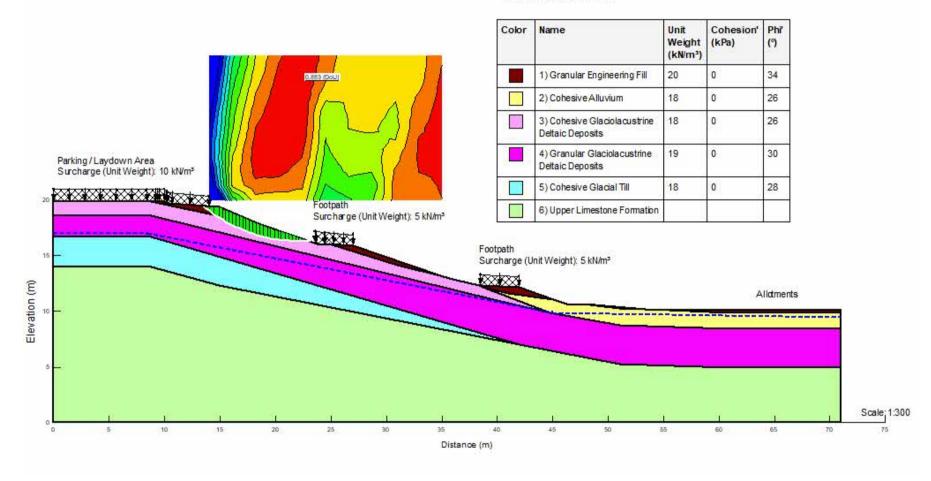


Figure 5-2 - Slope Stability Analysis - DA1-2

Craigfoot Allotments, Milton of Campsie Project No.: 70083065 | Our Ref No.: 70083065/01 East Dunbartonshire Council

CraigfootAllotments DA1-1 (potential stockpiling)

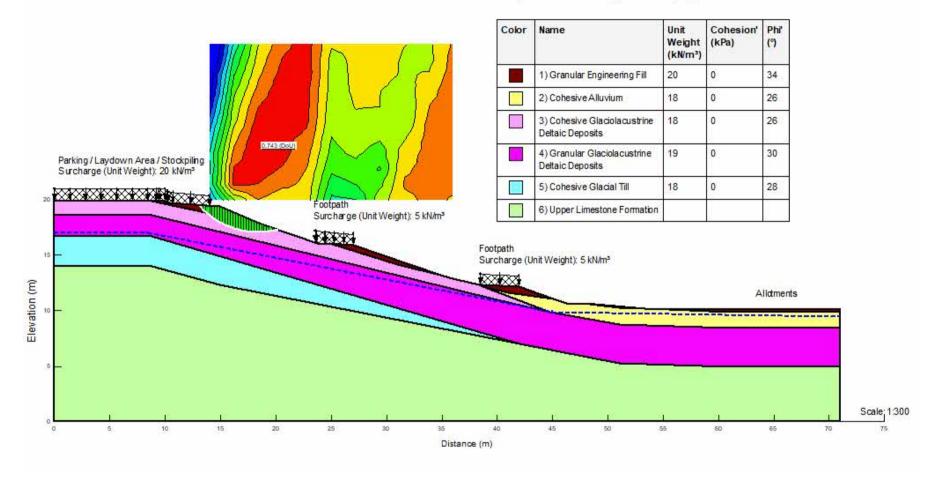


Figure 5-3 - Slope Stability Analysis - DA1-1 (sensitivity analysis)

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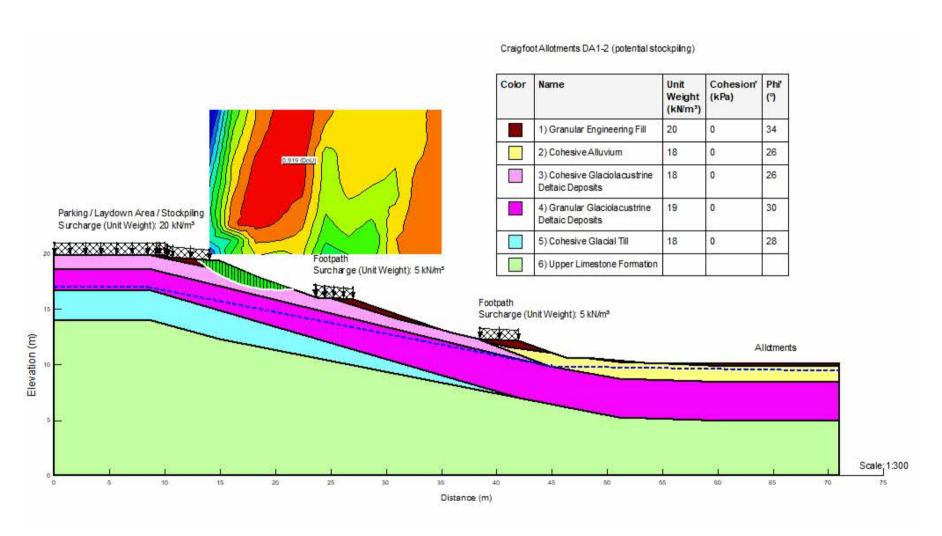


Figure 5-4 - Slope Stability Analysis - DA1-2 (sensitivity analysis)

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5.5 SUMMARY

Based on the findings of the additional ground investigation and the results of slope stability analysis, the slope should remain stable with the parking / laydown area at the crest of the slope. It should be noted that the load at the crest of the slope has been limited to 20 kN/m². Should higher loads need to be imposed (e.g. stockpiles of soils greater than say 1 m high), additional stability analyses should be undertaken to confirm the impact on the slope.

This assessment does not consider the impact of temporary works on the stability of the slope. An appropriate temporary works design should be completed prior to works being undertaken on the slope to maintain the stability of the slope during construction.

6 CONCLUSIONS & RECOMMENDATIONS

6.1 CONCLUSIONS

Based on the proposed redevelopment of the site for use as an allotment, the following conclusions are made following 2021 supplementary investigations and assessments presented herein:

- Y Following bio-accessibility testing, it was not possible to produce a SSAC for lead lower than the existing GAC.
- Υ Four lead exceedances of Human Health GAC were detected within the shallow soils in the southern area. This equates to a total of 8 lead exceedances in this area to date.
- Y No exceedances of lead were historically detected in the north of the site, thought to be due to the different dominant lithology in the north compared to the south (i.e. mainly glaciofluvial versus alluvial).
- Υ Lead exceedances are in the range of anticipated natural background concentrations based on BGS mapping data and were all detected in shallow alluvial soils.
- Y While lead exceedances appear to be natural in origin (in the absence of identified anthropogenic input/source) as lead is a 'non-threshold' contaminant (i.e. one in which there is no safe dose below which an effect is not observed), then the 'ALARP' ('As Low As Reasonably Practicable') principle applies.
- Υ Slope stability assessment indicted the slope to be stable with the additional load exerted from the proposed parking/laydown area.

6.2 **RECOMMENDATIONS**

A number of possible options now remain with respect to human health, including:

- 1. The site is not developed as an allotment;
- 2. The site is developed as an allotment using raised beds and no further testing or assessments are delivered. Such would be an economically beneficial solution, though it is understood that currently site levels need to remain at existing levels due to flooding issues so this may not be feasible at present. Notwithstanding this, it is understood the client is currently exploring the possibility of providing compensatory flood storage adjacent to the Glazert Water but upstream of the site. Consequently, this remains an option;
- 3. The site is developed as an allotment without raised beds, with imported clean soils used to replace the soils in the south (which would require off-site disposal). No further testing or assessments to be delivered. This would be a highly costly and unsustainable option;
- 4. The site is developed as an allotment without raised beds but with existing glaciofluvial soils from the northern slope (low lead concentrations) used to replace the soils in the south. Nominal validation sampling and testing would be recommended for this option;
- 5. Further testing and assessment is delivered to improve sample coverage for statistical purposes, and/or identify the dominant mineral forms of lead on site and which of these are contributing to the bio-accessibility. Such may allow development of the site without the need for raising levels or costly off-site disposal of impacted soils. This option, although costly, would be more economically beneficial than Option 3 (albeit there is no guarantee that further remediation may not be required after additional testing);
- 6. Lead in impacted soils is diluted via mixing with clean imported materials or in-situ treatment of impacted soils is delivered (e.g. application of phosphate to bind lead up as a non-labile lead

phosphate) to allow development of the site as an allotment, without the need for a change in levels. Such may require an initial feasibility study to determine the level of dilution required. For reference, phosphate is present in standard soil fertilisers;

It is currently recommended that the above options be presented for discussion with the regulator to identify a way forward.

Once the above options are narrowed down further, WSP recommends that a detailed remedial strategy document is developed for the site to guide mitigation works and assist in subsequent validation. This should also confirm the final cover layer thickness and detailed design.

To ensure that there are no significant ongoing issues with respect to human health and the wider environment, WSP recommends chemical testing for any imported soils to confirm suitability for future use in the context of human health, the water environment, and the built environment.

Appendix A

DRAWINGS

Confidential

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Key

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Site Boundary

Exploratory Hole Plan Hole Type

D Trial Pit/trench

Window Sampler

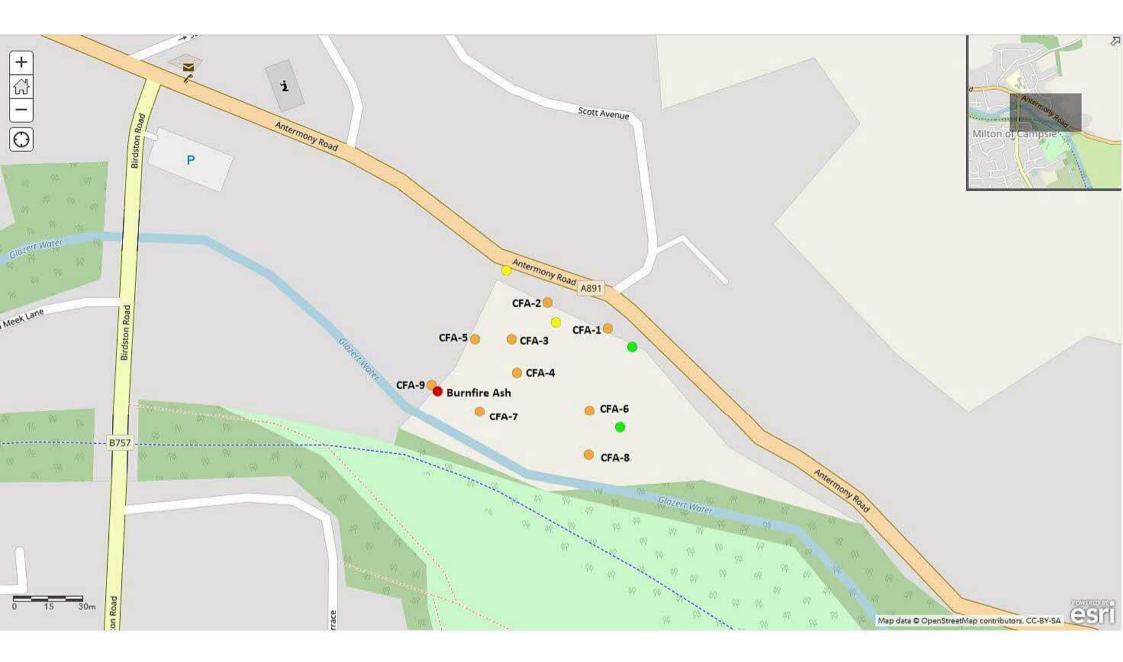


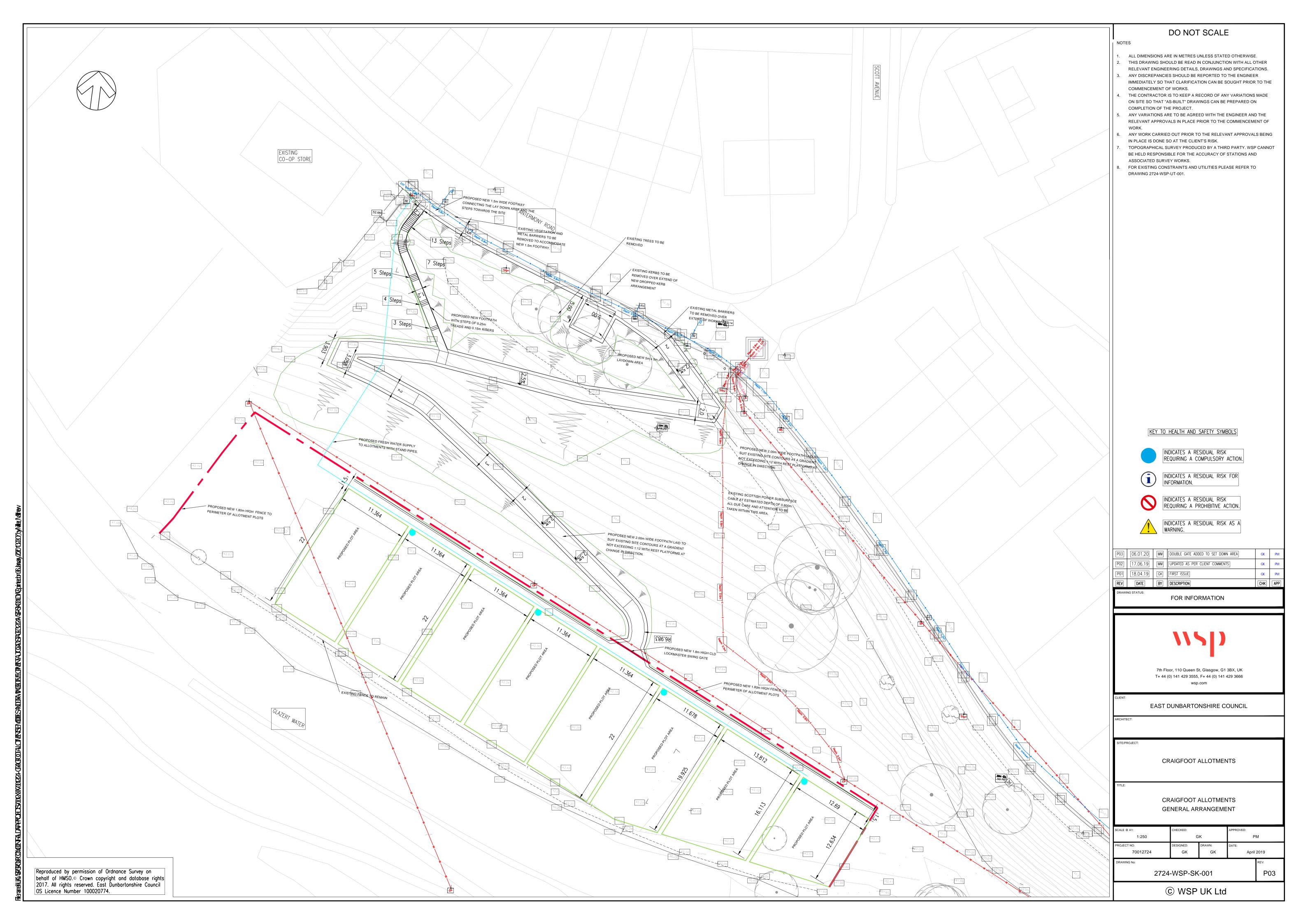
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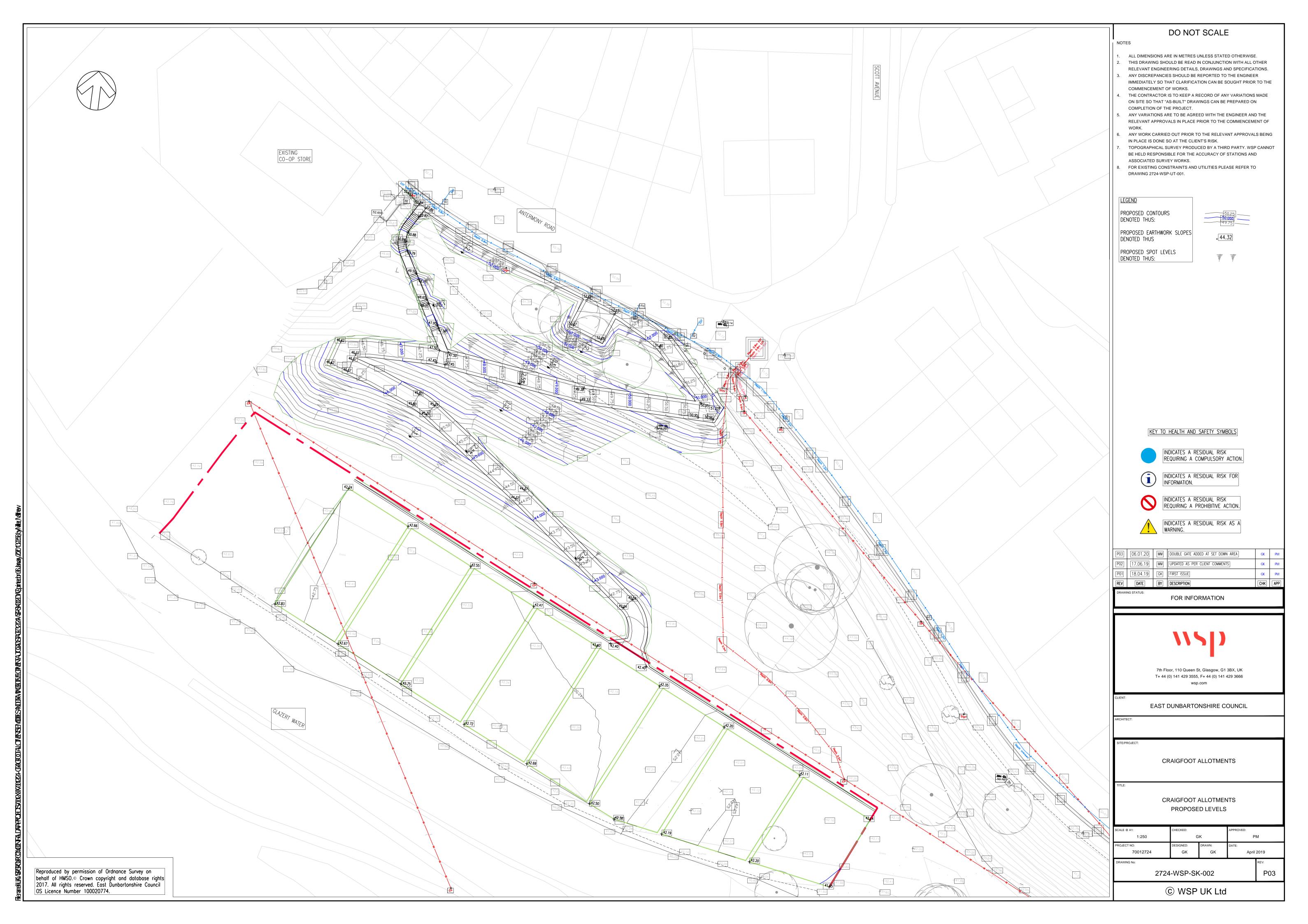
Craigfoot Allotments

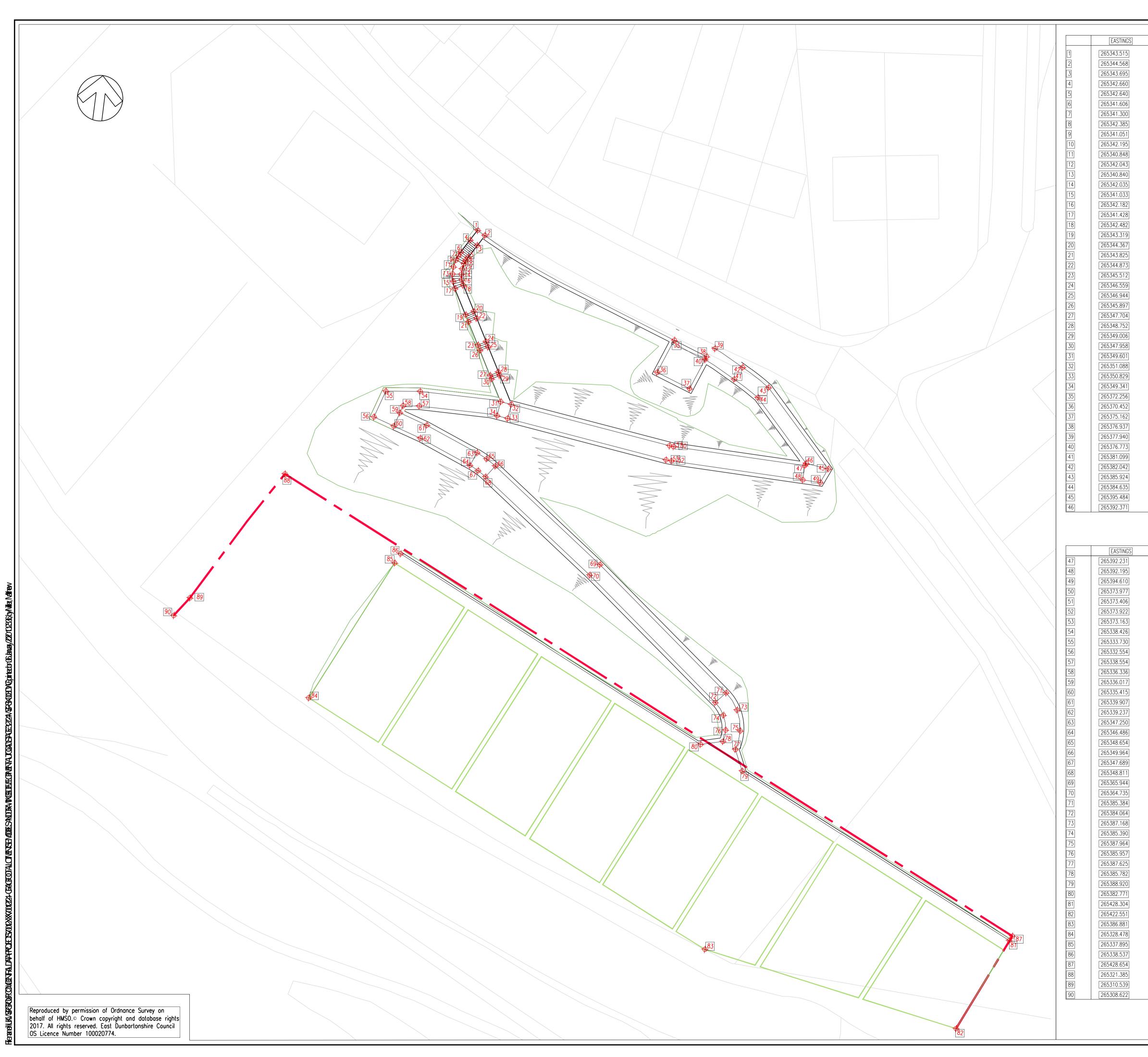
FIGURE No:

Figure 3: Borehole Location Plan





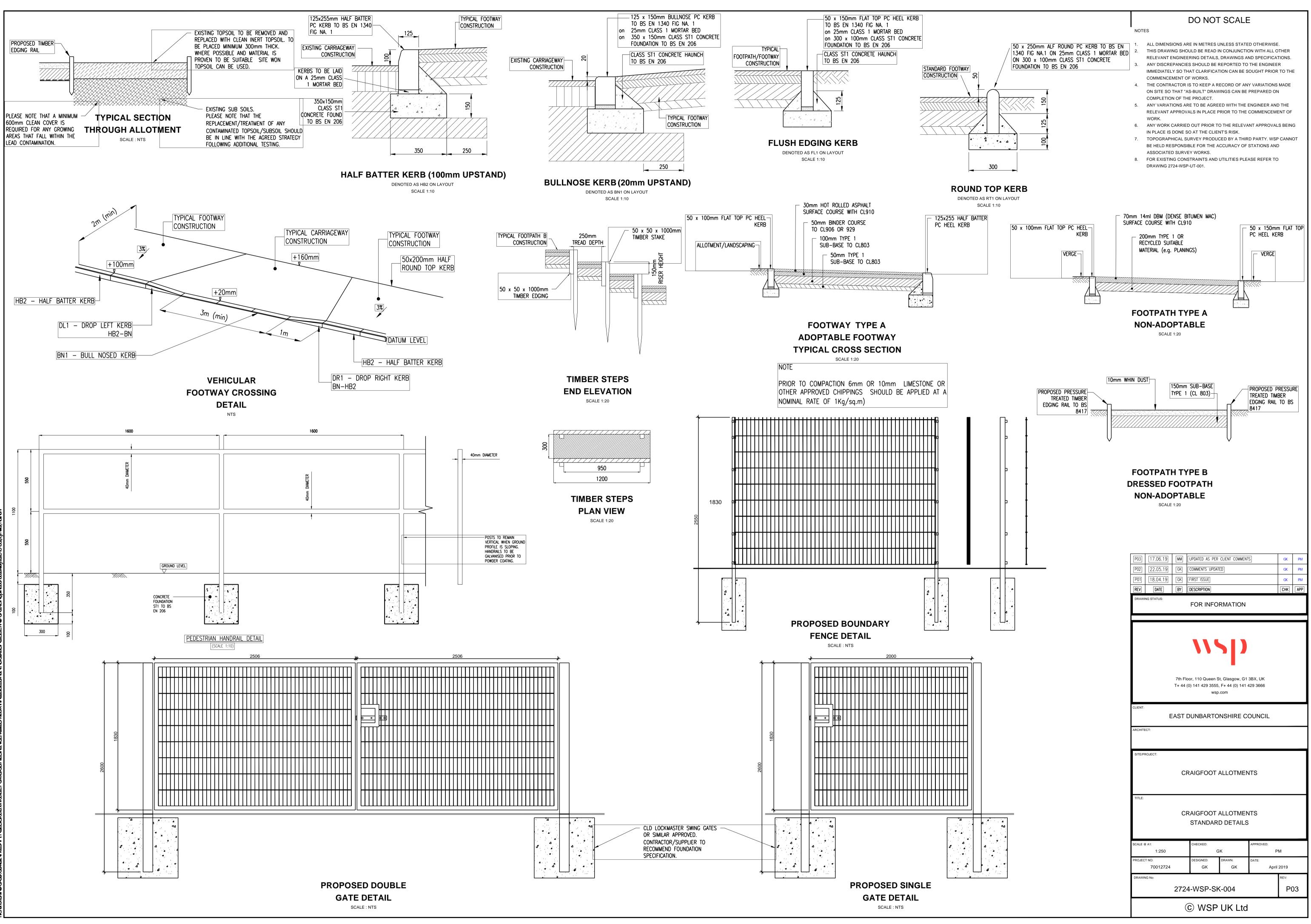


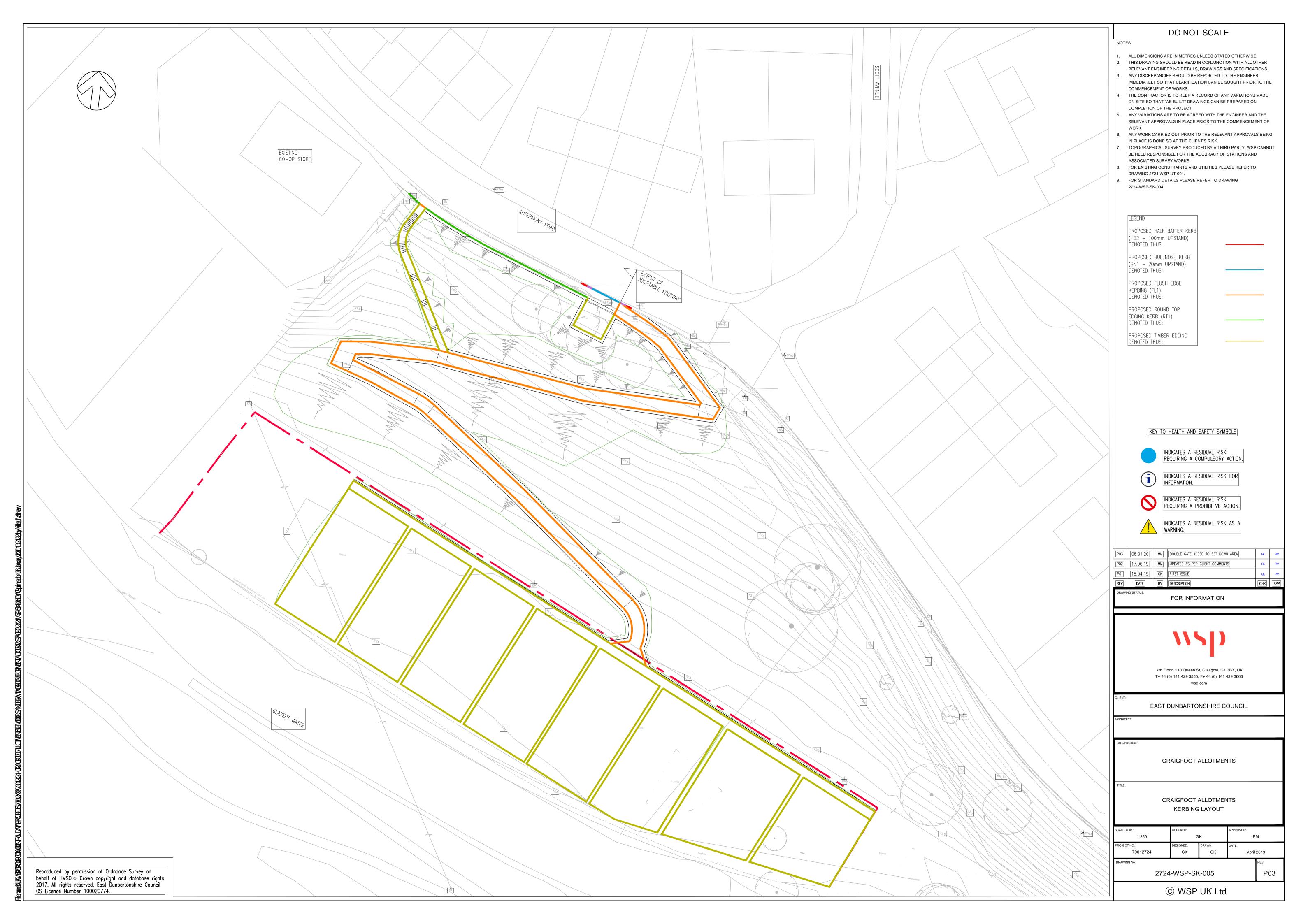


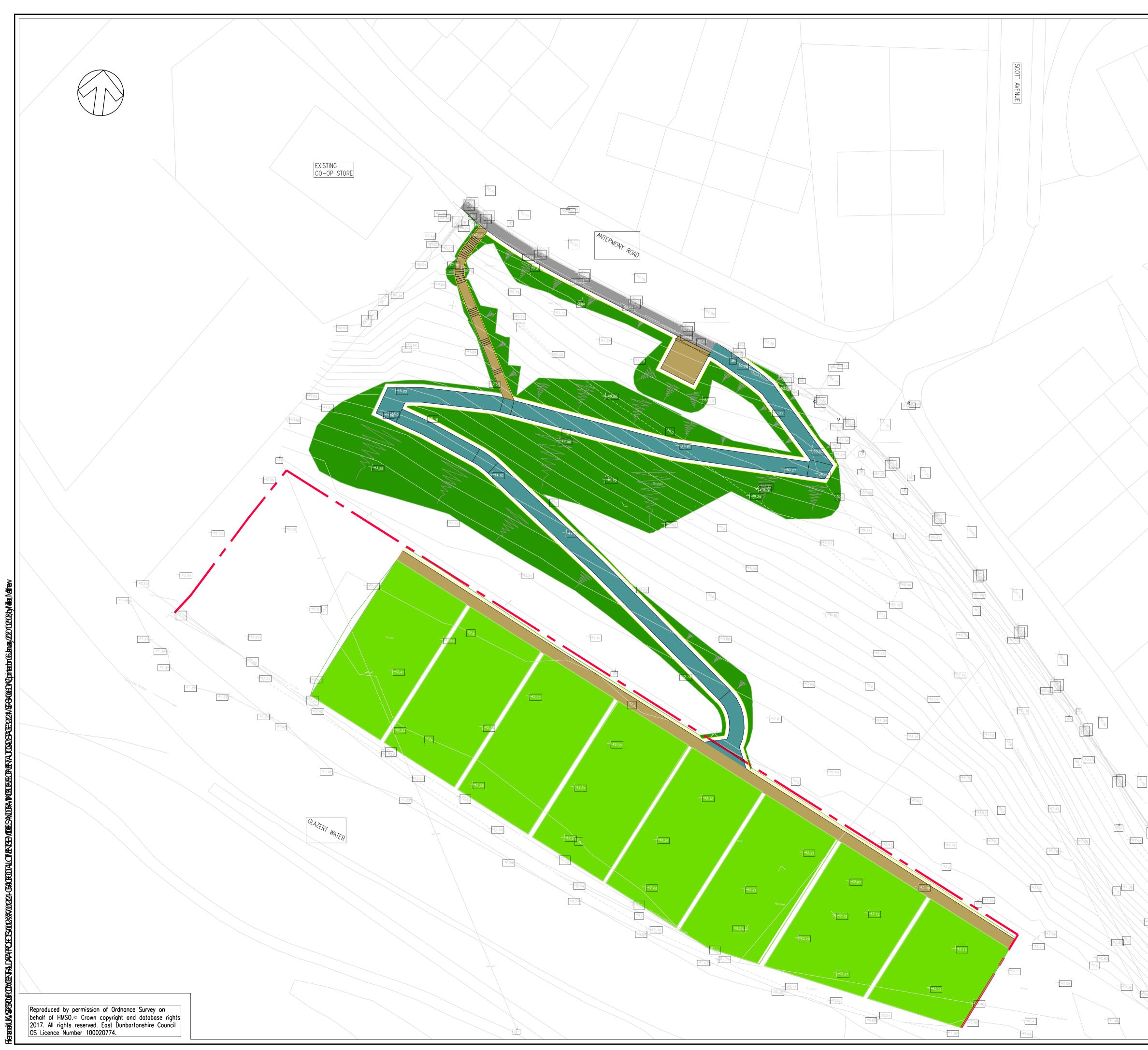
NOF	RTHINGS	LEVELS
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676670		52.856
676669		52.822
676669	9.714	52.822
67666	7.313	51.622
67666	7.921	51.622
67666	7.361	51.177
67666		51.175
67666		50.878
67666		50.879
67666		50.857
67666		50.857
676664		50.842
67666		50.245
676664		50.245
676662	2.837	49.796
67666	3.410	49.795
676659	9.448	49.500
676660	0.033	49.500
676658		48.753
676659		48.752
67665		48.650
67665		48.650
67665		48.050
67665		47.947
676652		47.950
67665		47.504
67665	1.135	47.502
676648	8.182	47.502
67664		47.502
67664		47.452
676640		47.452
676659		52.623
67665		52.374
67665		52.526
676659		52.470
67665	7.441	52.503
67665		52.140
67665		52.190
67665		51.853
67664		51.023
67664	5.012	50.947
	RTHINGS	LEVELS
67664	4.696	50.947
67664	4.696	50.947
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67664 67664	4.696 2.696 2.653 5.022 5.065 3.022 3.079 8.188 7.641 3.919 6.190 5.931 4.922 3.015 3.693 1.807 0.790 8.942	50.947 50.963 49.426 49.378 49.376 49.376 49.328 46.604 46.418 46.554 46.368 46.368 46.368 46.142 45.852 45.802
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67664 67663	4.696 2.696 2.653 5.022 5.065 3.022 3.079 8.188 7.641 3.919 6.190 5.931 4.922 3.015 3.693 1.807 0.790 8.942 0.128 9.296 8.375 7.662	50.947 50.963 49.426 49.378 49.376 49.328 46.604 46.418 46.554 46.368 46.368 46.192 46.142 45.852 45.802 45.790
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676644 676643 676644 676644 676643 676643 676644 676633 676634 676635 676637 676637 676637 676637	4.696 2.696 2.653 5.022 5.065 3.022 3.079 8.188 7.641 3.919 6.190 5.931 4.922 3.015 3.693 1.807 0.790 8.942 0.128 9.296 8.375 7.662 7.636 6.042	50.947 50.947 50.963 49.426 49.378 49.376 49.376 49.376 49.376 46.604 46.418 46.554 46.368 46.368 46.368 46.192 45.852 45.802 45.771 45.740 44.369
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NOTES ALL DIMENSIONS ARE IN METRES UNLESS STATED OTHERWISE. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERING DETAILS, DRAWINGS AND SPECIFICATIONS. ANY DISCREPANCIES SHOULD BE REPORTED TO THE ENGINEER IMMEDIATELY SO THAT CLARIFICATION CAN BE SOUGHT PRIOR TO THE COMMENCEMENT OF WORKS. THE CONTRACTOR IS TO KEEP A RECORD OF ANY VARIATIONS MADE ON SITE SO THAT "AS-BUILT" DRAWINGS CAN BE PREPARED ON COMPLETION OF THE PROJECT. ANY VARIATIONS ARE TO BE AGREED WITH THE ENGINEER AND THE RELEVANT APPROVALS IN PLACE PRIOR TO THE COMMENCEMENT OF WORK. 6. ANY WORK CARRIED OUT PRIOR TO THE RELEVANT APPROVALS BEING IN PLACE IS DONE SO AT THE CLIENT'S RISK. TOPOGRAPHICAL SURVEY PRODUCED BY A THIRD PARTY. WSP CANNOT BE HELD RESPONSIBLE FOR THE ACCURACY OF STATIONS AND ASSOCIATED SURVEY WORKS. FOR EXISTING CONSTRAINTS AND UTILITIES PLEASE REFER TO 8 DRAWING 2724-WSP-UT-001. KEY TO HEALTH AND SAFETY SYMBOLS INDICATES A RESIDUAL RISK REQUIRING A COMPULSORY ACTION. INDICATES A RESIDUAL RISK FOR INFORMATION. (\mathbf{i}) INDICATES A RESIDUAL RISK REQUIRING A PROHIBITIVE ACTION. \bigcirc INDICATES A RESIDUAL RISK AS A WARNING. P03 06.01.20 MM DOUBLE GATE ADDED TO SET DOWN AREA GK [P02] [17.06.19] [MM] [UPDATED AS PER CLIENT COMMENTS] GK P01 18.04.19 GK FIRST ISSUE GK REV DATE BY DESCRIPTION СНК АРР WING STATUS: FOR INFORMATION **\\S**]) 7th Floor, 110 Queen St, Glasgow, G1 3BX, UK T+ 44 (0) 141 429 3555, F+ 44 (0) 141 429 3666 wsp.com EAST DUNBARTONSHIRE COUNCIL PROJECT CRAIGFOOT ALLOTMENTS CRAIGFOOT ALLOTMENTS SETTING OUT SCALE @ A1: CKED: GK PM 1:250 OJECT NO GNED: GK GK 70012724 April 2019 AWING No: P03 2724-WSP-SK-003 © WSP UK Ltd

DO NOT SCALE







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LEGEND PROPOSED ALLOTMENTS CONSTRUCTION DENOTED THUS: PROPOSED EARTHWORKS SLOPES DENOTED THUS: FOOTWAY TYPE A ADOPTABLE CONSTRUCTION DENOTED THUS: FOOTPATH TYPE A PRIVATE CONSTRUCTION DENOTED THUS: FOOTPATH TYPE B CONSTRUCTION DENOTED THUS:
KEY TO HEALTH AND SAFETY SYMBOLS INDICATES A RESIDUAL RISK REQUIRING A COMPULSORY ACTION. INDICATES A RESIDUAL RISK FOR INFORMATION. INDICATES A RESIDUAL RISK FOR INFORMATION. INDICATES A RESIDUAL RISK REQUIRING A PROHIBITIVE ACTION. INDICATES A RESIDUAL RISK REQUIRING A PROHIBITIVE ACTION. INDICATES A RESIDUAL RISK AS A WARNING. P03 06.01.20 IMM DOUBLE CATE ADDED TO SET DOWN AREA P03 06.01.20 IMM UPDATED AS PER CLIENT COMMENTS P01 18.04.19 JR FIRST ISSUE REV DATE IDRAWING STATUS: FOR INFORMATION
Tth Floor, 110 Queen St, Glasgow, G1 3BX, UK T+ 44 (0) 141 429 3555, F+ 44 (0) 141 429 3666 wsp.com CLIENT: EAST DUNBARTONSHIRE COUNCIL ARCHITECT:
SITE/PROJECT: CRAIGFOOT ALLOTMENTS TITLE: CRAIGFOOT ALLOTMENTS FINISHES PLAN
SCALE @ A1: CHECKED: APPROVED: 1:250 GK PM
PROJECT NO: DESIGNED: DRAWN: DATE: 70012724 JR JR April 2019
DRAWING No: REV:
2724-WSP-SK-006 P03
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Appendix B

GENERAL LIMITATIONS

CONFIDENTIAL

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REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

GENERAL

- 1. WSP UK Limited has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed and outlined in the body of the report.
- 2. Unless explicitly agreed otherwise, in writing, this report has been prepared under WSP UK Limited standard Terms and Conditions as included within our proposal to the Client.
- 3. Project specific appointment documents may be agreed at our discretion and a charge may be levied for both the time to review and finalise appointments documents and also for associated changes to the appointment terms. WSP UK Limited reserves the right to amend the fee should any changes to the appointment terms create an increase risk to WSP UK Limited.
- 4. The report needs to be considered in the light of the WSP UK Limited proposal and associated limitations of scope. The report needs to be read in full and isolated sections cannot be used without full reference to other elements of the report and any previous works referenced within the report.

PHASE 1 GEO ENVIRONMENTAL AND PRELIMINARY RISK ASSESSMENTS

Coverage: This section covers reports with the following titles or combination of titles: phase 1; desk top study; geo environmental assessment; development appraisal; preliminary environmental risk assessment; constraints report; due diligence report; geotechnical development review; environmental statement; environmental chapter; project scope summary report (PSSR), program environmental impact report (PEIR), geotechnical development risk register; and, baseline environmental assessment.

- 5. The works undertaken to prepare this report comprised a study of available and easily documented information from a variety of sources (including the Client), together with (where appropriate) a brief walk over inspection of the Site and correspondence with relevant authorities and other interested parties. Due to the short timescales associated with these projects responses may not have been received from all parties. WSP UK Limited cannot be held responsible for any disclosures that are provided post production of our report and will not automatically update our report.
- 6. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only for the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, WSP UK Limited reserves the right to review such information and, if warranted, to modify the opinions accordingly.
- 7. It should be noted that any risks identified in this report are perceived risks based on the information reviewed. Actual risks can only be assessed following intrusive investigations of the site.
- 8. WSP UK Limited does not warrant work / data undertaken / provided by others.



REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

INTRUSIVE INVESTIGATION REPORTS

Coverage: The following report titles (or combination) may cover this category of work: geo environmental site investigation; geotechnical assessment; GIR (Ground Investigation reports); preliminary environmental and geotechnical risk assessment; and, geotechnical risk register.

- 9. The investigation has been undertaken to provide information concerning either:
 - i. The type and degree of contamination present at the site in order to allow a generic quantitative risk assessment to be undertaken; or
 - ii. Information on the soil properties present at the site to allow for geotechnical development constraints to be considered.
- **10.** The scope of the investigation was selected on the basis of the specific development and land use scenario proposed by the Client and may be inappropriate to another form of development or scheme. If the development layout was not known at the time of the investigation the report findings may need revisiting once the development layout is confirmed.
- **11.** For contamination purposes, the objectives of the investigation are limited to establishing the risks associated with potential contamination sources with the potential to cause harm to human health, building materials, the environment (including adjacent land), or controlled waters.
- **12.** For geotechnical investigations the purpose is to broadly consider potential development constraints associated with the physical property of the soils underlying the site within the context of the proposed future or continued use of the site, as stated within the report.
- **13.** The amount of exploratory work, soil property testing and chemical testing undertaken has necessarily been restricted by various factors which may include accessibility, the presence of services; existing buildings; current site usage or short timescales. The exploratory holes completed assess only a small percentage of the area in relation to the overall size of the Site, and as such can only provide a general indication of conditions.
- 14. The number of sampling points and the methods of sampling and testing do not preclude the possible existence of contamination where concentrations may be significantly higher than those actually encountered or ground conditions that vary from those identified. In addition, there may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which have therefore not been taken into account in this report.
- **15.** The inspection, testing and monitoring records relate specifically to the investigation points and the timeframe that the works were undertaken. They will also be limited by the techniques employed. As part of this assessment, WSP UK Limited has used reasonable skill and care to extrapolate conditions between these points based upon assumptions to develop our interpretation and conclusions. The assumption made in forming our conclusions is that the ground and groundwater conditions (both chemically and physically) are the same as have been encountered during the works undertaken at the specific points of investigation. Conditions can change between investigation points and these interpretations should be considered indicative.
- **16.** The risk assessment and opinions provided are based on currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values. Specific assumptions associated



REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

with the WSP UK Limited risk assessment process have been outlined within the body or associated appendix of the report.

- **17.** Additional investigations may be required in order to satisfy relevant planning conditions or to resolve any engineering and environmental issues.
- 18. Where soil contamination concentrations recorded as part of this investigation are used for commentary on potential waste classification of soils for disposal purposes, these should be classed as indicative only. Due consideration should be given to the variability of contaminant concentrations taken from targeted samples versus bulk excavated soils and the potential variability of contaminant concentrations between sampling locations. Where major waste disposal operations are considered, targeted waste classification investigations should be designed.
- 19. The results of the asbestos testing are factually reported and interpretation given as to how this relates to the previous use of the site, the types of ground encountered and site conceptualisation. This does not however constitute a formal asbestos assessment. These results should be treated cautiously and should not be relied upon to provide detailed and representative information on the delineation, type and extent of bulk ACMs and / or trace loose asbestos fibres within the soil matrix at the site.
- 20. If costs have been included in relation to additional site works, and / or site remediation works these must be considered as indicative only and must be confirmed by a qualified quantity surveyor.

EUROCODE 7: GEOTECHNICAL DESIGN

- **21.** On 1st April 2010, BS EN 1997-1:2004 (Eurocode 7: Geotechnical Design Part 1) became the mandatory baseline standard for geotechnical ground investigations.
- 22. In terms of geotechnical design for foundations, slopes, retaining walls and earthworks, EC7 sets guidance on design procedures including specific guidance on the numbers and spacings of boreholes for geotechnical design, there are limits to methods of ground investigation and the quality of data obtained and there are also prescriptive methods of assessing soil strengths and methods of design. Unless otherwise explicitly stated, the work has not been undertaken in accordance with EC7. A standard geotechnical interpretative report will not meet the requirements of the Geotechnical Design Report (GDR) under Eurocode 7. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. The report is likely to represent a Ground Investigation Report (GIR) under the Eurocode 7 guidance.

DETAILED QUANTITATIVE RISK ASSESSMENTS AND REMEDIAL STRATEGY REPORTS

23. These reports build upon previous report versions and associated notes. The scope of the investigation, further testing and monitoring and associated risk assessments were selected on the basis of the specific development and land use scenario proposed by the Client and may not be appropriate to another form of development or scheme layout. The risk assessment and opinions provided are based on currently available approaches in the generation of Site Specific Assessment Criteria relating to contamination concentrations and are not considered to represent a risk in a specific land use scenario to a specific receptor. No liability can be accepted for the retrospective effects of any future changes or amendments to these values, associated models or associated guidance.



REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

- 24. The outputs of the Detailed Quantitative Risk Assessments are based upon WSP UK Limited manipulation of standard risk assessment models. These are our interpretation of the risk assessment criteria.
- 25. Prior to adoption on site they will need discussing and agreeing with the Regulatory Authorities prior to adoption on site. The regulatory discussion and engagement process may result in an alternative interpretation being determined and agreed. The process and timescales associated with the Regulatory Authority engagement are not within the control of WSP UK Limited. All costs and programmes presented as a result of this process should be validated by a quantity surveyor and should be presumed to be indicative.

GEOTECHNICAL DESIGN REPORT (GDR)

26. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. All the relevant information needs to be provided to allow for a GDR to be produced.

MONITORING (INCLUDING REMEDIATION MONITORING REPORTS)

- 27. These reports are factual in nature and comprise monitoring, normally groundwater and ground gas and data provided by contractors as part of an earthworks or remedial works.
- 28. The data is presented and will be compared with assessment criteria.

Appendix C

SITE INVESTIGATION INFORMATION

CONFIDENTIAL

11.

Appendix C.1

EXPLORATORY HOLE LOGS

CONFIDENTIAL

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			//	/						TRIAL F	PIT LO	G		Hol	le No. H	P01	/21	
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Jo	ob No	7008	3306	65			Client		E	ast Dunbarto	nshire Cou	ncil		Da	2	26-04- 26-04-	21 21	
Co	ontracto	r / Dril	ller			Meth	nod/Plar	nt Useo	ł	Logged By		Co-Ordina	0		Groun	d Level	(m)	
		WS	Ρ				Har	d Dug	Pit	D	G		265329.80 676608.63			42.	55	
	SAMF	PLES	& TE	STS	;						STR	ATA						Install / Backfill
	Depth	Туре	DID (V mqq)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (m)	Depth (Thick <u>-n</u> ess)	1		Desc	ription				Legend	Geology	
-							42.45	0.10	Grass ove quartz. (1	er soft brown sligh FOPSOIL)	tly sandy claye	y SILT with ra	are subrounded (gravel	of /	× · × × · ×	TS	
0.	30	ES	0					(0.50)	Grass ove	er soft brown sligh ALLUVIUM)	tly sandy claye	y SILT with ra	are subrounded (gravel	of	× × × × × ×	ALV	
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N N)		¥		Orientati		No issues	Hole terminate No visual or olf	d at 0.6 actory evidenc	e of contamination					
			L						rees from north		No groundwate							
00 00	Scal	e 1:31	.25				l dimens dentifica		metres. Log	gs should be read	in accordance	with the prov	ided Key. Descri	iptions	are bas	ed on vis	sual and	

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	Job No	7008	306	65			Client		E	ast Dunbarto	nshire Cou	uncil		Da		26-04- 26-04-	21 21	
C	Contracto	r / Dril	ler			Meth	nod/Plar	nt Usec	1	Logged By		Co-Ordina			Groun	d Level	(m)	
		WS	Ρ				Han	d Dug	Pit	D	G	E N	265351.15 676616.24			42.	41	
	SAM	1			-	-		Depth			STR	ATA				1		Install / Backfill
	Depth	Туре	DID () mdd)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (m)	(Thick -ness)			Desc	cription				Legend	Geology	
0).00-0.30	ES					42.21	0.20		er soft brown sligh	tly sandy claye	ey SILT. (TOP	SOIL)			× × × × × ×	TS	
[0).20		0					-(0.40)	Soft brow gravel of	n slightly sandy cl sandstone, coal a	ayey SILT with and quartzite. (occasional si ALLUVIUM)	ubrounded fine	to med	ium	× × × × × × × ×	ALV	
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RD 7		А			С) 0.3		0	.30m	Stability:								
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G ST/		l	D)		¥		Orientati		Stable		Ifactory evidence	e of contaminatio	n				
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	0	0.4.04	25		Note	es: A	ll dimens	ions in	metres. Lo	gs should be read	in accordance	e with the prov	ided Kev. Desc	riptions	are bas	ed on vis	sual and	
80	Scal	e 1:31	.20				dentificat							,				

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Job No	700	8306	65			Client		E	ast Dunbarto	onshire Cou	ncil		Da		26-04- 26-04-	21 21	
Contract	or / Dr	iller			Met	hod/Plan	nt Used	1	Logged By		Co-Ordina	tes ()		Groun	d Level	(m)	
	WS	SP				Han	id Dug	Pit	D	G	E N	265358.28 676595.93			42.	48	
SAM	IPLES	1	-	-				1		STR	ATA				1	1	Install / Backfill
Depth	Туре	(V mqq)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (m)	Depth (Thick <u>-n</u> ess)			Desc	ription				Legend	Geology	
-						42.38		Grass ove quartz ar	er soft brown sligh nd coal and freque	tly sandy claye ent rootlets. (TC	y SILT with ra DPSOIL)	re subangular g	ravel o	of /	× × × ×	TS	
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									Shoring/Support:			Water Str	ikes				
CIKAIG		₩ 0.	.3 →					.30m		Date	Time	Strike	Minute	es :	Standing	Rer	narks
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Job No	7008	3306	65		(Client		E	ast Dunbarto	nshire Cou	ıncil		Da	ate	26-04- 26-04-	21 21	
Contracto	or / Dri WS				Meth	nod/Plar Har	nt Used nd Dug		Logged By	G		tes () 265378.72 676606.68		Groun	d Level 42.		
SAM	IPLES	& TE	STS							STR							Install /
Depth		1		P.Pen (kN/m2)	Water	Elev. (m)	Depth (Thick				ription				Legend	Geology	Backfill
-						42.15	<u>-n</u> ess) - 0.15	Grass ove	er soft brown sligh gravel of sandstor	tly sandy claye	ey SILT with or e and frequen	ccasional subro	ounded	l fine to	×××	TS	
- - 0.40-0.60 0.50	ES	0				41.70	- -(0.45) - 0.60	Soft brow	n slightly sandy cla e and quartzite ar	ayey SILT with	rare subround				× × × × × × × × × ×	ALV	
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	A	₩ 0. E	3	C (T 0.3		Width	.30m -	None Stability:			-					-
		C)		¥			on	Stable		ed at 0.6m	e of contamination	n	I		1	
Sca	ale 1:31	.25				l dimens dentifica		metres. Log	gs should be read	in accordance	with the prov	ided Key. Desc	riptions	s are bas	ed on vis	ual and	

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Job N		008	306	65		(Client		E	ast Dunbarto	nshire Cou	ıncil		D	ate	26-04- 26-04-	21 21	
Contra		' Dril WSF				Meth	nod/Plar	nt Used nd Dug		Logged By	2	Co-Ordina E	265385.79		Groun	d Level 42.		
													676585.65			72.	20	Install /
S/	AMPL					-	5 1	Depth			STR	ΑΤΑ						Backfill
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0.10-0.2	20	ES					42.10	- 0.15 -	subround	led gravel of quart n slightly sandy cli	tz and coal. (T	OPSOIL)				× × ×	TS	
-								(0.45)	quartz ar	nd coal. (ALLUVIU	M)	Tale Sublour	ded graver of s	anusio	ine,	× × × × × ×	ALV	
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Conti	ractor	/ Dril	ler			Meth	od/Plar	nt Usec	1	Logged By		Co-Ordina	tes ()	_	Groun	d Level	(m)	
		WSF	5				Han	id Dug	Pit	D	G		265407.66 676583.45			42.	13	
5	SAMPI	LES	& TE	STS					1		STR	АТА				1		Install / Backfill
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-							42.05	0.08		clayey SILT with c sh brown clayey S						× × × ×	TS	
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					_	_		Length		Shoring/Support:			Water Stri					
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	110 Que Glasgov	en Street v G1 3BX)141 429 3	555	I	Proj∉	ect				Craigfoot	Allotments			Sheet			
Job No	7008	3065			Clier	nt			Eas	t Dunbarto	nshire Co	uncil		Date)4-21)4-21	
Contracto	or / Dril	ler	Ν	Neth	nod/F	Plant	Used		L	ogged By		Co-Ordina	ates ()	G	Fround Lev	vel (m)	
GE) Drillii	ng Ltd				Arch	way Rig	I		D	G		265376.94 076655.11			51.89	
SA	AMPLI	ES & TE	STS						- 1			STRAT	۹				
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- - - - 0.30	в		0.1				51.44	- (0.45) - 0.45	and	d glass fragme	ents. (TOPSÓ	IL)				СМС	
0.80	в		0					- - -(0.85)						DDIES OF	· X	× × × GFDI	
-	Depth Type Test Result Q: Q													- · .	× ×		
- 1.50 	(S) SPT (S)	3,4,4 N=15. 4,3,4 3,4,4 N=15.	0				10.71	-	×							GFDL	
-2.00	(S) SPT	1,1,1 N=5. 4,4,2						(0.35)	Loo sub	se brown silty bangular to rou	slightly gravel unded smooth	of sandstone		d mediun	n o		
- 2.50-2.95 -						↓		(0.45)			ey sandy grave	Ily CLAY. (GL	ACIOFLUVIAL D	ELTAIC			
3.00		7,10,12				÷	48.69	- 3.20	sut (Gl	bangular to rou LACIOFLUVIA	unded smooth	of sandstone EPOSITS)		d mediur		GFDI	
- 3.50-4.00 - - - - 4.00	U	5,5,7						- - - - - - -	Ver	y stiff grey san	dy gravelly CL	AY. (TILL)					
- - - - - -	(S)	13,30,0 N=50/ 150mm.					47.59	4.30 - - - -							×— ×	×	.000
4.00								- - - - - - - -									
	Hole	Diamete	· ·					Recov	very	1			Water Str	kes		. I.	
4 20	Diar	neter (mm) 300 91 81	3	mark 300 91 81	s	Core 1	Fop (m)	Core Bas	e (m)	% Recovery	Date 27-04-21	Time	Strike 2.95	Minutes	Standi	ng (Casing
												ed at 4.3m due	to refusal e of contamination				
	ale 1:37	<i>.</i> 5				iensic ficatic		etres. Lo	ogs s	hould be read	in accordance	e with the prov	ided Key. Descri	otions are	e based on	visual an	d

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Contracto		ller ng Ltd		Meth			Used vay Rig]	Lo	ogged By Di	G		ttes () 265388.75 1 676634.16		Grour	nd Level 48.	. ,	
S		ES & TES	STS									STRAT						
Depth	Туре	Test Result		HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (m)	Depth (Thick			De	scription	<u> </u>			Legend	Geology	Dia Install / Backfill
-							47.82	<u>-ness)</u> - - (0.36) - 0.36	roo		n slightly sandy s fine and medi OIL)					×o × × × ×	TS	
0.50	в		0				47.48	(0.34) 0.70			ndy gravelly SIL d quartzite. (AL		ine and mediu	m subro	ounded	× × × ×	ALV	
Light brown slightly sandy gravelly CLAY and dolerite. Gravel is fine and medium quartzite. (ALLUVIUM) B . 0 B . 0										ly CLAY with medium subr	frequent cobbl ounded of sar	les of qu ndstone	uartz and		ALV			
1.00 1.20-1.50	00 B . 0 20-1.50 B . B . Contract Contract										s fine . DELTA	AIC		GFDD				
[(S) 7,12,14 Dense									\sim						TO			
(S) 7,12,14 N=38. Dense brown silt 1.70 B									clayey very gra	avelly fine an	d medium SAN	D. Grav	vel is	×	GFDD			
2.40	(S) SPT (S)	N=50/ 275mm. 10,13,13 11,8,18 N=50/ 250mm.					45.38	- (1.00) 									GFDD	
Hole Diameter (mm) Remarks Core Top (m) Core Base (m) % Recovery Date													Water S			<u> </u>		
1.50 300 300 2.00 91 91 2.40 81 81											Minut	es	Standing	Ca	asing			
	General Remarks Hole terminated at 2.4m on possible cobble or dense gra No visual or olfactory evidence of contamination No groundwater encountered											Iravelly sa	nd due to s	spt refusa	als			
Sca	ale 1:37	7.5				ensio ficatio		etres. Lo	ogs sl	hould be read	in accordance		ided Key. Des	criptions	s are bas	ed on vis	sual and	

,		/// UK Ltd						WIN	D	ow s/	AMPLE	E LOG		H	ole No.	WSC)3	
1	10 Que Slasgow	en Street / G1 3BX /141 429 3	555		Proj€	ect				Craigfoot	Allotments			S	heet			
Job No	7008	3065			Clier	nt			East	t Dunbarto	nshire Cou	ıncil		C		27-04- 27-04-		
Contractor	r / Dril	ler		Meth	hod/F	Plant	Used		Lo	ogged By		Co-Ordina	U U		Grour	nd Level	(m)	
GD	Drillir	ng Ltd				Arch	way Riç	9		D	G		265359.66 676613.95			42	36	
SA	MPLE	ES & TE	STS					1				STRATA	١			1		
Depth	Туре	Test Result	DID (V mqq)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (m)	Depth (Thick <u>-n</u> ess)				escription					Geology	Inst Bac Mi
							42.21	- 0.15			soft brown sl				,	× × × ₀ ×	TS	臣
							44.04	(0.40) - 0.55	and	d medium sub	angular to sub nd quartzite. (A	rounded of val				$\left \begin{array}{c} \mathbf{x} \\ \mathbf{x} \\ \mathbf{x} \\ \mathbf{x} \end{array} \right \mathbf{x} $	ALV	臣
0.50	В		0			2 	41.81	- - - - - - - -	gra to s	vel of sandsto	rown slightly s ne and quartzi various litholo /IUM)	te. Gravel is fi	ne and medi	um sub	angular	× × × × × × × × × × × × × × × × × × ×	ALV	
.00 B . 01 .50 SPT 2,6,7 9,8,10 N=34. .80-2.00 B . 01 2.00-2.70 B 4,5,6 (S) 7,10,11 N=34. . 0.1 2.70 (S) 8,15,50 0,9,0 N=59/ 50mm.							39.46	- - - - - - - - - - - - - - -	GR (GL	AVEL of vario ACIOFLUVIA	dy fine and me us lithologies : L DELTAIC DI	sandstone, qu EPOSITS)					GFDD	
									very se (m)	% Recovery		ed at 2.90 on pos	Strike 1.50 2.00	• Strikes Mini 2 2 2	0	Standing 1.50 1.20		asing
											Casing unable No visual or ol	to advance bey		tion				
			1		1						IND VISUAL OF O	woron/ ovidonec	or contaminat	uon				

		/ /SP	1						TRIAL F	PIT LO	G			e No. HF	'01	
Telep	110 Qu Glasgo hone: ax: 014	w G1 3 0141 -	3BX 429 35	55		Project		Craigfo	ot Allotment	s, Milton of	Campsie)	She		of 1	
Job No	700 [,]	127:	24			Client		E	ast Dunbarto	onshire Cou	ıncil		Dat	12-0	1-18 1-18	
Contracto	or / Dr MF					hod/Pla Ianually		d vated Pit	Logged By M	IF	E	ates (NGR) 265342.000 676632.000		Ground Le	vel (m A0 3.310) DD)
SAMF	PLES	& TI	ESTS	 }						STR	ATA					Install Backfil
Depth	Туре	DID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (<u>T</u> hick -ness)			Desc	ription			Lege	nd Geolog	
						43.26 43.11 42.51		Very soft is fine to o Very soft angular to Light brov	er dark brown san to soft dark brown coarse angular to to soft dark brown o subrounded of sa	very sandy gra subrounded of very sandy gra andstone. CLAY. Gravel i	avelly CLAY w sandstone. (M avelly CLAY. (IADE GROUN Gravel is fine to	ID) o coarse	Gravel		
1.00	ES					42.11	- -(0.40) 	subround	ed of various litho	logies.				 	ALV ALV	
-																
							Length	20	Shoring/Support:	Date	Time	Water Strike	Strikes Minute	s Standi		emarks
D		– 0.: A	<u>.</u>			B 0.3 ⊥	Width 0 Orientati degr	.30m .30m on ees from oorth	none Stability:	General Rem	arks	bgl. No visual or				
Scal	e 1:31	.25				II dimens dentificat	ions in		gs should be read	in accordance	with the provi	ded Key. Desc	riptions a	are based on v	isual and	

110 Queen Street				PIT LO	G			HP0	2	
Glasgow G1 3BX Telephone: 0141 429 3555 Fax: 0141 429 3666	Project		ot Allotments	s, Milton of	Campsie)	Sheet	1 of	1	
lob No 70012724	Client	Ea	ast Dunbarto	nshire Cou	ıncil		Date	12-01- 12-01-		
Contractor / Driller MF	Method/Pla Manuall	ant Used y Excavated Pit	Logged By M	F	E	ates (NGR) 265338.000 676618.000	G	round Level 42.4		D)
SAMPLES & TESTS				STR	ATA					Install Backfil
Depth Type Comparison () () () () () () () () () () () () ()	Sate (mAOD	Depth)) <u>(T</u> hick -ness)		Desc	ription			Legend	Geology	
0.20 ES ES	42.34	8 0.10 Grass over Brown grav to subroun (0.65) - - 3 - 0.75	r brown sandy CL velly clayey SANI ded of sandstone	D with occasion	al cobbles. G			ular	ALV	
0.80 ES	±	-(0.30) subrounde	n sandy gravelly (d of various lithol	CLAY. Gravel is ogies.	s fine and me	dium subangul	ar to		ALV	
		Length	Shoring/Support:							
		0.30m		Date	Time	Water S Strike	Minutes	Standing	Rei	marks
P 0.3 A D C C	→ B 0.3	Width	none Stability:			1.00 bgl due to water : countered	30 strike at 1.00	0.75	l or olfact	tory
Scale 1:31.25 Note	es: All dimen	degrees from north sions in metres. Logs			riptions are	based on visu	ual and			

		/ /SP	1						TRIAL F	PIT LO	G		Ho	le No.	HP0	3	
Te	110 Qu Glasgo elephone: Fax: 014	een St w G1 3 0141 4	3BX 429 35			Project		Craigfo	ot Allotments	s, Milton of	f Campsie	9	Sh	eet	1 of	1	
Job No	, 700	127:	24			Client		E	ast Dunbarto	nshire Cou	uncil		Da	ate	12-01- 12-01-	18 18	
Contrac	ctor / D					hod/Pla Ianually		d rated Pit	Logged By M	F	E	ates (NGR) 265365.000 676604.000		Grour	nd Level 42.2		D)
SAI	MPLES	& TE	ESTS	S						STR	ATA						Install / Backfill
Depth	п Туре	DID (Vmqq)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (<u>T</u> hick -ness)				ription				Legend	Geology	
0.20 0.30	ES ES				1	42.19	Very soft to soft brown very sandy gravelly CLAY with occasional co fine to coarse angular to subrounded of various lithologies including timber and coal.						oles. Gra andstone	avel is e,		TS ALV	
0.80	ES				Į Į Į			Light brow	vn sandy gravelly (CLAY. Gravel i	is fine to coars	se subangular	to round	led of		ALV	
									Shoring/Support:			Water	Strikes				
								.30m	none	Date 12-01-18	Time	Strike 0.85	Minut 60		Standing 0.70	Rer	narks
Notae: All dimensions in motions long should be read in apportance with the provided Key. Descriptions are here												ory					
5	cale 1:3	.25				ll dimens dentificat		metres. Log	gs should be read	in accordance	with the provi	ded Key. Deso	criptions	are base	ed on visu	ial and	

Meth	Project		Craigfoo	ot Allotments				ISh				
Meth	Client				s, Milton of	Campsie	9		eet	1 of	1	
			E	ast Dunbarto	nshire Cou	ıncil		Da		12-01- 12-01-		
	nod/Pla anually		d vated Pit	Logged By M	F	E	ates (NGR) 265377.000 676600.000		Groun	d Level 42.2		D)
					STR							Install /
(kN/m2) Water	Elev. (mAOD)					ription				Legend	Geology	Backfill
	42.00	0.20	Brown gra coarse an GROUND Very soft t	velly clayey SANI gular to subround) o soft brown very	D with fragmen ed of various lit sandy gravelly	t of glass at 0 thologies inclu CLAY. Grave	uding sandstor	ne. (MAD	PE /		TS GMG ALV	
	∎ 0.3 ¥	Width 0 Orientati	.30m .30m -	none	Hand pit termi	nated due to wa	Strike 0.40	Minute 15		0.30		narks
		42.10 42.00 41.80 ↓ 4	42.10 0.10 42.00 0.20 41.80 0.40 41.80 0.40 	42.10 0.10 Grass over 42.00 0.20 Brown gra coarse an GROUND Very soft t ubrounde - - - - - - - - - - - - -	42.10 0.10 Grass over brown sandy CL 42.00 0.20 Brown gravelly clayey SANI coarse angular to subround CROUND) 41.80 0.40 Very soft to soft brown very subrounded of various lithol Very soft to soft brown very subrounded of various lithol Image: Coarse angular to subround end of various lithol Image: Coarse angular to subround end of various lithol Image: Coarse angular to subround end of various lithol Image: Coarse angular to subround end of various lithol Image: Coarse angular to subround end of various lithol Image: Coarse angular to subround end of various lithol Image: Coarse angular to subround end of various lithol Image: Coarse angular to subround end of various lithol Image: Coarse angular to subround end of various lithol Image: Coarse angular to subround end of various lithol Image: Coarse angular to subround end of various lithol Image: Coarse angular to subround end of various lithol Image: Coarse angular to subround end of various lithol Image: Coarse angular to subround end of various lithol Image: Coarse angular to subround end of various lithol Image: Coarse angular to subround end of various lithol Image: Coarse angular to subround end of various lithol Image: Coarse angular to subround end of various lithol Image: Coarse angular to subround end of various lithol Image: Coarse angular to subrou	42.10 0.10 Grass over brown sandy CLAY. (TOPSOIL 42.00 0.20 Brown gravelly clavey SAND with fragmen coarse angular to subrounded of various lit 41.80 0.40 Very soft to soft brown very sandy gravelly ubrounded of various lithologies including Very soft to soft brown very sandy gravelly ubrounded of various lithologies including Very soft to soft brown very sandy gravelly ubrounded of various lithologies including Image: state s	42.10 0.10 Grass over brown sandy CLAY. (TOPSOL) 42.00 0.20 Brown gravelly clavey SAND with fragment of glass at 0 41.80 0.40 CROUND) Verounded of various lithologies including sandstone a 0.41.80 0.40 Verounded of various lithologies including sandstone a 0.41.80 0.40 Verounded of various lithologies including sandstone a 0.41.80 0.40 Verounded of various lithologies including sandstone a 0.41.80 0.40 0.41.80 0.40 0.42.90 0.40 0.41.90 0.40 0.42.90 0.40 0.41.90 0.40 0.42.90 0.40 0.41.90 0.40 0.41.90 0.40 0.42.90 0.40 0.41.90 0.40 0.41.90 0.40 0.42.90 0.40 0.41.90 0.40 0.42.90 0.40 0.41.90 0.40 0.42.90 0.40 0.41.90 0.40 0.42.90 0.40 <td>42:10 0:10 Grass over trown sandy CLAY. (TOPSOL) 42:00 0:20 Brown gravelly clayey SAND with fragment of glass at 0.15m bgl. Gravelis classes angular to subrounded of various lithologies including sandstore and coal. 41:80 0.40 Grass angular to subrounded of various lithologies including sandstone and coal. 41:80 0.40 Grass angular to subrounded of various lithologies including sandstone and coal. 41:80 0.40 Grass angular to subrounded of various lithologies including sandstone and coal. 41:80 0.40 Grass angular to subrounded of various lithologies including sandstone and coal. 41:80 0.40 Grass angular to subrounded of various lithologies including sandstone and coal. 41:80 0.40 Grass angular to subrounded of various lithologies including sandstone and coal. 41:80 0.40 Grass angular to subrounded of various lithologies including sandstone and coal. 41:80 0.40 Grass angular to subrounded of various lithologies including sandstone and coal. 41:80 0.40 Grass angular to subrounded of various lithologies including sandstone and coal. 41:80 0.30 Interview of various lithologies including sandstone and coal. 41:80 0.30 Interview of various lithologies including sandstone and coal.</td> <td>42:10 0.10 Grass over brown sandy CLAY. (TOPSOIL) 42:00 0.20 Brown gravely clays SAND with fragment of glass at 0.15m bgl. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine top system very sandy gravely clay.</td> <td>42:00 0:10 Crass over brown sandy CLAY. (CPSOL) 42:00 220 Brown gravelly clays Shot With tiggment of glass at 0.15m bgl. Gravel is fine to coarse angular to subrounded of various lithologies including sandstone. (MADE 41:00 0:00 Stot to soft brown very sandy gravely CLAY. Gravel is fine to coarse angular to ubrounded of various lithologies including sandstone and coal. 41:00 0:00 Very soft to soft brown very sandy gravely CLAY. Gravel is fine to coarse angular to ubrounded of various lithologies including sandstone and coal. 0:00 Very soft to soft brown very sandy gravely CLAY. Gravel is fine to coarse angular to ubrounded of various lithologies including sandstone and coal. 0:00 Stotning/Support: Water Strikes 0:00 Stotning/Support: Water Strikes 0:00 Stotning/Support: Date Water Strikes 0:00 Stotning Support: Date Mater Strikes 0:00 Stotning Stotning Stotning Stotning 0:00 Stotning Stotning Gate Time Strike Minutes 1 Stotning 0:00 Stotning Stotning Stotning Stotning Stotning 0:00 Stotning Stotning Stotning Stotning Stotning</td> <td>4.10 0.10 Gress over brown sandy CLAY. (TOPSOL). 12.00 20.00</td> <td>42.0 0.10 Crease over throom andry CLAY: (TOPSOLL) TS 42.00 0.20 Broom group/clayes, SAND with Fragment of glass at 0.15m bgl. Gravel is fine to 0 carse angular to subrounded of various lithologies including sandstone. (MADE CROUND) TS Market of the soft brown very sandy gravely CLAY. Gravel is fine to coarse angular to 2000 cROUND) 41.80 0.40 Very soft to soft brown very sandy gravely CLAY. Gravel is fine to coarse angular to 2000 cROUND) TS Market of various lithologies including sandstone and coal. 41.80 0.40 Very soft to soft brown very sandy gravely CLAY. Gravel is fine to coarse angular to 2000 cROUND) TS Market of various lithologies including sandstone and coal. 41.80 0.40 Very soft to soft brown very sandy gravely CLAY. Gravel is fine to coarse angular to 2000 cROUND) TS Market of various lithologies including sandstone and coal. 41.80 0.40 Very soft to soft brown very sandy gravely CLAY. Gravel is fine to coarse angular to 2000 cROUND. TS Market of various lithologies including sandstone and coal. 41.80 0.40 Very soft to soft brown very sandy gravely CLAY. Gravel is fine to coarse angular to 2000 cROUND. TS Market of various lithologies including sandstone and coal. 41.80 0.30 0.30m Stability. Date Time Site of Natingrave transis includito at 0.40m bgl. No visual or olfactory evide</td>	42:10 0:10 Grass over trown sandy CLAY. (TOPSOL) 42:00 0:20 Brown gravelly clayey SAND with fragment of glass at 0.15m bgl. Gravelis classes angular to subrounded of various lithologies including sandstore and coal. 41:80 0.40 Grass angular to subrounded of various lithologies including sandstone and coal. 41:80 0.40 Grass angular to subrounded of various lithologies including sandstone and coal. 41:80 0.40 Grass angular to subrounded of various lithologies including sandstone and coal. 41:80 0.40 Grass angular to subrounded of various lithologies including sandstone and coal. 41:80 0.40 Grass angular to subrounded of various lithologies including sandstone and coal. 41:80 0.40 Grass angular to subrounded of various lithologies including sandstone and coal. 41:80 0.40 Grass angular to subrounded of various lithologies including sandstone and coal. 41:80 0.40 Grass angular to subrounded of various lithologies including sandstone and coal. 41:80 0.40 Grass angular to subrounded of various lithologies including sandstone and coal. 41:80 0.30 Interview of various lithologies including sandstone and coal. 41:80 0.30 Interview of various lithologies including sandstone and coal.	42:10 0.10 Grass over brown sandy CLAY. (TOPSOIL) 42:00 0.20 Brown gravely clays SAND with fragment of glass at 0.15m bgl. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine to coarse angular top system very sandy gravely CLAY. Gravel is fine top system very sandy gravely clay.	42:00 0:10 Crass over brown sandy CLAY. (CPSOL) 42:00 220 Brown gravelly clays Shot With tiggment of glass at 0.15m bgl. Gravel is fine to coarse angular to subrounded of various lithologies including sandstone. (MADE 41:00 0:00 Stot to soft brown very sandy gravely CLAY. Gravel is fine to coarse angular to ubrounded of various lithologies including sandstone and coal. 41:00 0:00 Very soft to soft brown very sandy gravely CLAY. Gravel is fine to coarse angular to ubrounded of various lithologies including sandstone and coal. 0:00 Very soft to soft brown very sandy gravely CLAY. Gravel is fine to coarse angular to ubrounded of various lithologies including sandstone and coal. 0:00 Stotning/Support: Water Strikes 0:00 Stotning/Support: Water Strikes 0:00 Stotning/Support: Date Water Strikes 0:00 Stotning Support: Date Mater Strikes 0:00 Stotning Stotning Stotning Stotning 0:00 Stotning Stotning Gate Time Strike Minutes 1 Stotning 0:00 Stotning Stotning Stotning Stotning Stotning 0:00 Stotning Stotning Stotning Stotning Stotning	4.10 0.10 Gress over brown sandy CLAY. (TOPSOL). 12.00 20.00	42.0 0.10 Crease over throom andry CLAY: (TOPSOLL) TS 42.00 0.20 Broom group/clayes, SAND with Fragment of glass at 0.15m bgl. Gravel is fine to 0 carse angular to subrounded of various lithologies including sandstone. (MADE CROUND) TS Market of the soft brown very sandy gravely CLAY. Gravel is fine to coarse angular to 2000 cROUND) 41.80 0.40 Very soft to soft brown very sandy gravely CLAY. Gravel is fine to coarse angular to 2000 cROUND) TS Market of various lithologies including sandstone and coal. 41.80 0.40 Very soft to soft brown very sandy gravely CLAY. Gravel is fine to coarse angular to 2000 cROUND) TS Market of various lithologies including sandstone and coal. 41.80 0.40 Very soft to soft brown very sandy gravely CLAY. Gravel is fine to coarse angular to 2000 cROUND) TS Market of various lithologies including sandstone and coal. 41.80 0.40 Very soft to soft brown very sandy gravely CLAY. Gravel is fine to coarse angular to 2000 cROUND. TS Market of various lithologies including sandstone and coal. 41.80 0.40 Very soft to soft brown very sandy gravely CLAY. Gravel is fine to coarse angular to 2000 cROUND. TS Market of various lithologies including sandstone and coal. 41.80 0.30 0.30m Stability. Date Time Site of Natingrave transis includito at 0.40m bgl. No visual or olfactory evide

	()	/ /SP	1						TRIAL I	PIT LO	G				HP04	4b	
Tele	110 Qu Glasgo phone: ax: 014	w G1 3 0141 -	3BX 429 35	555		Project		Craigfo	oot Allotment	s, Milton of	Campsie	Э	She	eet	1 of	1	
Job No	700 [,]	127:	24			Client		E	East Dunbarto	onshire Cou	ıncil		Da		12-01- 12-01-	18 18	
Contracto	or / Dr MF					nod/Pla anually		ed vated Pit	Logged By	1F	E	ates (NGR) 265376.000 676599.000		Grour	nd Level 42.2		D)
SAMI	PLES	& TI	ESTS	 S						STR							Install /
Depth	Туре	1	HSV (kN/m2)		Water	Elev. (mAOD)	Depth (<u>(T</u> hick -ness)	ו			ription				Legend	Geology	_ Backfill
- - - - - - - - - - - - - -	ES					42.08	0.10	Very soft subround	er brown sandy C to soft brown very led of various litho	sandv gravellv	CLAY, Grave	el is fine to coa	rse angu	ilar to		TS	
D		- 0.: A				■ 0.3	Width).30m).30m ion	Shoring/Support: none Stability:	Date 12-01-18 General Rem Hand pit termin evidence of cc	nated at 0.60m	Water Strike 0.60 bgl due to water	Minute 10		Standing 0.50		marks
0-	lo 4:04	25		Not	es: Al	I dimens	I	rees from north metres. Lo	gs should be read				riptions :	are base	ed on visu	ual and	
Sca	le 1:31	.25		mar	nual io	lentificat	tion.					.,					

		/SP	1						TRIAL F	PIT LO	G			le No.	TP0	1	
Telep	110 Que Glasgo hone: ax: 014	w G1 3 0141 4	3BX 129 35	55		Project		Craigfo	ot Allotment	s, Milton of	Campsie	e	She	eet	1 of	1	
Job No	700 ²	1272	24		1	Client		E	ast Dunbarto	onshire Cou	ıncil		Da		19-01- 19-01-		
Contracto	or / Dr AB 20				Meth	nod/Pla 360	nt Use Excava		Logged By M	F	E	ates (NGR) 265318.000 676614.000		Grour	nd Level 42.		D
SAMF	PLES	& TE	STS							STR	ATA						lr B
Depth	Туре	DID (DmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	Depth (<u>T</u> hick -ness)			Desc	ription				Legend	Geology	
0.20	ES					42.31	_		er brown sandy CL to soft brown grav			el is fine to coa	arse andu	lar to		TS	
-						42.01	(0.30) 0.50	subround	ed of various litho	ogies including	sandstone a	nd coal with ra	are rootle	ts.		ALV	
0.50-0.60 - - - - 1.00-1.20 - - - -	В						- - - - - - - - - - - - - - - - - - -	Very soft Alternatin	brown very sandy g laminated layers	gravelly SILT v s of orange and	vith occasiona dark grey fro	al cobbles and im 1.5m bgl.	rare bou	Ilders.		ALV	
- 	в				1 <u>↓</u>	40.51	2.00										
2.00-2.20	В				Ŧ	40.01	(0.50)	Orange s various lit	andy fine to coars hologies including	e subangular to sandstone wit	subrounded n medium bo	GRAVEL and ulder content.	COBBLE	ES of		ALV	
2.50-2.60	В					39.91	2.60	Dark grey	v sandy fine to coa sandstone.	-				ies		ALV	-[]
-						39.51	-(0.40) 3.00		r fractured MUDS	ONE recovere	d as angular	gravel and cot	obles			ULGS	
- - - - - - - - - - - - - - - -																	
							Length	40	Shoring/Support:	Date	Time	Water	Strikes Minute	es	Standing	Re	
⊢∎ D		– 4.′ A				B 1	Width	.10m .00m	none Stability:	19-01-18	orles	2.00				See 2.00 Ir incr as	pa Om nflu rea the
		С				<u>+</u>	Orientati degr r	ion rees from north	unstable	General Rem Trial pit termin contamination	ated at 3.00m b	ogl due to pit inst	tability. No	o visual o	olfactory	adv evidence	/an 9 of
Scal	e 1:31	.25				l dimens dentificat		metres. Log	gs should be read	in accordance	with the provi	ded Key. Desc	criptions a	are base	ed on visu	ual and	

	()	// /SP	1						TRIAL F	PIT LO	G		Ho	le No.	TP0	2	
Tele	110 Qua Glasgor phone: ax: 014	een St w G1 3 0141 4	3BX 129 35	55	F	Project		Craigfo	ot Allotments	s, Milton o	f Campsie	e	Sh	eet	1 of	1	
Job No	700 ²	1272	24		(Client		E	ast Dunbarto	onshire Cou	uncil		Da		19-01- 19-01-	18 18	
Contracto	or / Dr AB 20				Meth	nod/Pla 360	nt Use Excava		Logged By M	F	E	ates (NGR) 265336.000 676642.000		Grour	nd Level 44.8		D)
SAM	PLES	& TE	STS	l						STR	ATA						Install / Backfill
Depth	Туре	PID (ppmV)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)				Desc	cription				Legend	Geology	Dackin
-						44.75	-ness) 0.10		er brown sandy CL to soft dark brown		,	Gravel is fine t	to coorso		<u></u>	TS	
-						44.50	(0.25) - 0.35	angular to rootlets	subrounded of va	arious lithologie	es including sa	andstone and	coal with	rare		ALV	
- 0.50-0.70 - - - - - - - - - - - - - -	В						- - - - - - - - - - - - - - - - -	Very soft	orangish brown sli	ightly gravelly s	sandy silty CL	AY with rare r	ootlets.			ALV	
[1.90-2.10	в					42.95	1.90	Light brov	vn fractured SANE	OSTONE recov	vered as angu	lar gravel and	cobbles		<u> </u>	ULGS	
							Length		Shoring/Support:			Water	Strikes				
Image: Stability: Im								sandstone	Standing e bedrock. taminatior	No	ered						
	le 1:31	.25		Note	es: All nual ic	l dimens lentificat	ions in i	orth	gs should be read	in accordance	with the provi	ded Key. Des	criptions	are base	ed on visu	ual and	

	() WSP		/						TRIAL F	PIT LO	G		Hole N	TPO	3	
1	110 Que Glasgov hone: (en St v G1 3	reet BBX	555		Project		Craigfo	oot Allotment	s, Milton of	Campsie		Sheet	1 of	1	
Job No	7001	272	24			Client		E	ast Dunbarto	onshire Cou	ıncil		Date	19-01- 19-01-	18 18	
Contracto	r / Dril	ller			Meth	nod/Plan	nt Used		Logged By			ates (NGR) E 265364.00	G	round Level	(m AOI	D)
	AB 20	000				360	Excava	itor	M	F		N 676645.00		47	.06	
SAMI Depth	1	1		1	Water	Elev.	Depth (Thick			STR	ATA			Legend	Geology	Inst Bac
		н q	т₹	l ⊂ ₹	3	(mAOD) 46.96	- <u>n</u> ess)	Grass ove	er brown sandy Cl	_AY. (TOPSOI	_)			<u>zt 1</u> z - <u>zt 1</u>	TS	
0.20	ES					46.66	(0.30) 0.40	angular t (ALLUVII	,	arious litholog	ies including	sandstone wit	h rare rootle	<u> </u>	ALV	
- 1.00-1.30	в					45.76 1.30 Orangish brown very clayey fine to coarse SAND and GRAVEL. Grave coarse angular to subrounded of various lithologies including sandsto mudstone. Gravel and cobble content increasing with depth. (GLACIO										
-							6 1.30 6 1.30 Orangish brown very clayey fine to coarse SAND and GRAVEL. Gravel coarse angular to subrounded of various lithologies including sandstor mudstone. Gravel and cobble content increasing with depth. (GLACIOI DELTAIC DEPOSITS) 1.30 - 1.60 Dark yellow sandstone boulder (1.80) 2.50 - 3.10 Occasional boulders and lenses of clay					tone and		GFDD		
2.60-2.90	В					43.96	- - - - - - - - -	2.50 - 3.10			es of clay					
-							- - - - - - - -									
						<u> </u>	Length		Shoring/Support:	Date	Time		Strikes		<u> </u>	<u> </u>
	A C Middle C								Minutes rater encounter	Standing red. No visual o		y				

	() WSP	~	//							PIT LO	G		Hol	e No.	TP0	5	
Tele	110 Qu Glasgo phone:	en St	reet	555		Project		Craigf	oot Allotment	s, Milton of	Campsie		She	eet	1 of	1	
Job No	700 [,]	1272	24			Client		E	East Dunbarto	onshire Cou	ıncil		Da		19-01- 19-01-	18 18	
Contracto	or / Dri	ller			Meth	nod/Plar	nt Used		Logged By		Co-Ordina	. ,		Groun	d Level	(m AOI	D)
	AB 20	000				360	Excava	itor	N	IF		265376.00 676630.00			44.	31	
SAM	IPLES	1	1	1			Depth			STR	ATA						Install / Backfill
Depth	Туре	(V mqq)	HSV (kN/m2)	P.Pen (kN/m2)	Water	Elev. (mAOD)	(Thick			Desc	ription				Legend	Geology	,
-						44.16			er brown sandy C						<u>x'''</u> <u>x''</u>	TS	
- -						43.81	(0.35) 0.50	angular	to soft dark browr to subrounded of (ALLUVIUM)	i very sandy gra various litholog	avelly CLAY. G ies including s	ravel is fine to andstone and	coarse coal wit	th rare		ALV	
- 0.70-1.00 - - - -	В					43.01		subroun increasi	brown very claye ded of various lith ng with depth. Col m bgl. (GLACIOF	ologies includir oble content fre	ng sandstone. quent by 2.5m	Gravel and col bgl. Occasion	oble cor	ntent			
- - - - - - - - - - - - - - -	В						(2.50) 									GFDD	
	B					41.31	3.00 - - - - - - - - - - - - - - - - - -										
							Length		Shoring/Support:	D-11	T	Water S			Ctor -!!		
	А	< − 1 E		C	3.4		Width	40m 00m	none	Date	Time	Strike	Minute	28	Standing	Rei	marks
	A	C					Orientatio		Stability: unstable		ated at 3.00m b	gl due to pit insta contamination er			vater enco	untered. I	No
Sca	ale 1:31	.25		Not mar	es: Al nual io	II dimens dentifica	ions in tion.	metres. Lo	gs should be read	l in accordance	with the provi	ded Key. Desc	riptions	are bas	ed on vis	ual and	

	() WSP					D				PIT LO	G		Hole N	TPO	6	
	110 Que Glasgov hone: (F	<i>N</i> G1	3BX	555		Project		Craigfo	oot Allotment	s, Milton of	Campsie	1	Sneet	1 of	1	
Job No	7001	1272	24			Client		E	ast Dunbarto	onshire Cou	uncil		Date	19-01 19-01		
Contracto	or / Dri AB 20				Met	hod/Plar	nt Used Excava		Logged By	IC		ates (NGR) E 265380.00		Ground Level	(m AOI .13	D)
			-070			300	LAGava		IV			N 676596.00		42	.15	Inst
Depth	PLES Type		HSV (kN/m2)	1	Water	Elev. (mAOD)	Depth (Thick				ATA			Legend	Geology	Bad
0.30-0.40	В		×)	<u> </u>		42.03	<u>-ness)</u> 0.10 - - -(0.60) -	Very soft of fine to co	er brown sandy Cl dark brown slightl arse angular to ro LUVIUM)	y gravelly sand	ly silty CLAY				ALV	
0.80-1.00 -	 various lithologies including sandstone, coal and fragments of wood (1.20) 1.45 - 1.55 Band of black soil associated with water strike at 1.45m b coal. No recovery in bucket 							rounded of I. (ALLUVIUI	M)	ALV						
1.70-1.90 2.00-2.20 2.30-2.50 2.50-2.60	B B B					40.23 1.90 40.23 1.90 50ft dark grey very gravelly sandy CLAY with large cobbles and bould fine to coarse angular to rounded of various lithologies including san (ALLUVIUM) 39.83 2.30 39.63 2.50 39.53 2.60 Stiff grey CLAY.					ndstone.	is				
-																
		<u> </u>	<u> </u>				Length		Shoring/Support:	Date	Time	Water	Strikes	Standing	Rei	
A C 3 Vidth 1.20m Stability: General Remarks Trial pit terminated at 2.60m bgl due to pit insta contamination encountered.								Minutes	Standing	Seep 1.45 Ir incr fror depth	mark page 5m bo filux rease m this n as f					

Location	Sample depth	Description	Comment
CFA-1	0.30-0.50m	Brown mottled orange silty sand Clay with cobbles	
CFA-2	0.30-0.50m	Orange brown silty fine to coarse sand and find to coarse Gravel.	
CFA-3	0.30-0.50m	Firm consistency sandy Gravelly Clay with cobbles	
CFA-4	0.30-0.50m	Loose brown sandy coarse angular gravel	Sloping ground
CFA-5	0.30-0.50m	Firm consistency sandy Gravelly Clay with cobbles	
CFA-6	0.30-0.50m	Reddish brown grey slightly gravelly sand with occasional cobble	
CFA-7	0.30-0.50m	Dark Grey brown very gravelly sand with occasional cobble.	
CFA-8	0.30-0.50m	Mottled brown clayey fine to coarse Sand and fine to coarse Gravel with cobbles	
CFA-9	0.30-0.50m	Dark Brown fine to coarse sand with granular gravel	Sample taken adjacent to Bonfire ash location

Appendix C.2

LABORATORY RESULTS AND SOIL SCREEN

CONFIDENTIAL

LABORATORY TEST CERTIFICATE

Certificate No: To: Client :

Gerry Devlin GD Drilling Ltd. 38 Asher Road Chapelhall Airdrie ML6 8TA

21/569 - 01



10 Queenslie Point **Queenslie Industrial Estate** 120 Stepps Road Glasgow G33 3NQ

Tel: 0141 774 4032

email: info@mattest.org Website: www.mattest.org

Dear Sirs,

LABORATORY TESTING OF SOIL

Introduction

We refer to samples taken from Craigfoot Allotments, Milton of Campsie and delivered to our laboratory on 21st May 2021.

Material & Source

Sample Reference	:	See Report Plates
Sampled By	:	Client
Sampling Certificate	:	Not Supplied
Location	•	See Report Plates
Description	:	See Page 2
Date Sampled	:	Not Supplied
Date Tested	•	21st May 2021 Onwards
Source	:	Craigfoot Allotments, Milton of Campsie

Test Results;

As Detailed On Page 2 to Page 12 inclusive

Comments:

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation This report should not be reproduced except in full without the written approval of the laboratory All remaining samples for this project will be disposed of 28 days after issue of this test certificate

Remarks;

Approved for Issue		
T McLelland (Director)	Date10/06/	
Issue No. 01	Page 1 of 12	2643

GD DRILLING LIMITED CRAIGFOOT ALLOTMENTS, MILTON OF CAMPSIE



BOREHOLE	SAMPLE	DEPTH (m)	SAMPLE DESCRIPTION
WS01	В	0.80	Brown slightly gravelly very sandy very silty CLAY with root fibres. Gravel is fine to coarse.
WS01	В	1.50	Brown slightly clayey silty fine to coarse SAND and GRAVEL.
WS01	U	2.50-2.95	Brown slightly gravelly sandy CLAY. Gravel is fine to coarse.
WS01	U	3.50-4.00	Mottled brown very gravelly very sandy very silty CLAY. Gravel is fine to coarse.
WS02	В	1.20-1.50	Brown clayey very silty fine to coarse SAND and GRAVEL.
WS02	В	1.80-2.40	Brown silty fine to coarse SAND and GRAVEL with pockets of clay.
WS03	В	1.00	Brown very gravelly very sandy very silty CLAY. Gravel is fine to coarse.
WS03	В	1.80-2.00	Brown very gravelly very sandy very silty CLAY. Gravel is fine to coarse.
WS03	В	2.00-2.70	Brown fine to coarse SAND and GRAVEL.

SUMMARY OF SAMPLE DESCRIPTIONS

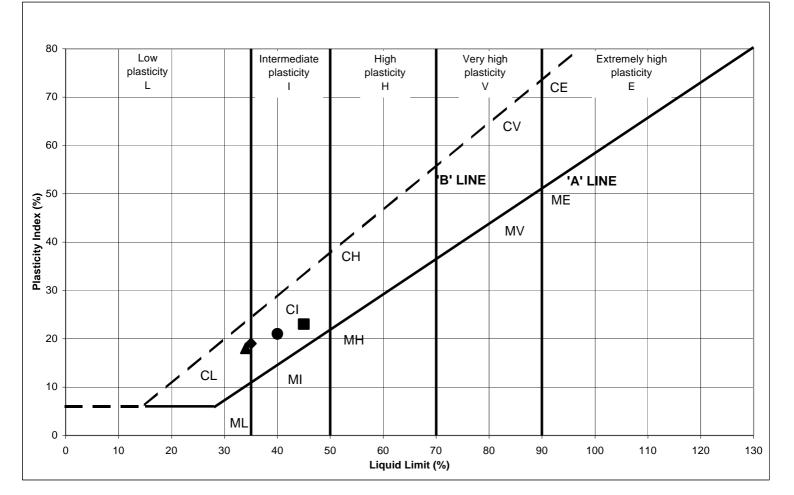


BOREHOLE	SAMPLE	DEPTH (m)	MOISTURE CONTENT (%)
WS01	В	0.80	35
WS01	U	2.70	17
WS01	U	3.50	13
WS03	В	1.00	32

Tested in accordance with BS 1377: Part 2: 1990: Clause 3

SUMMARY OF MOISTURE CONTENT TEST RESULTS



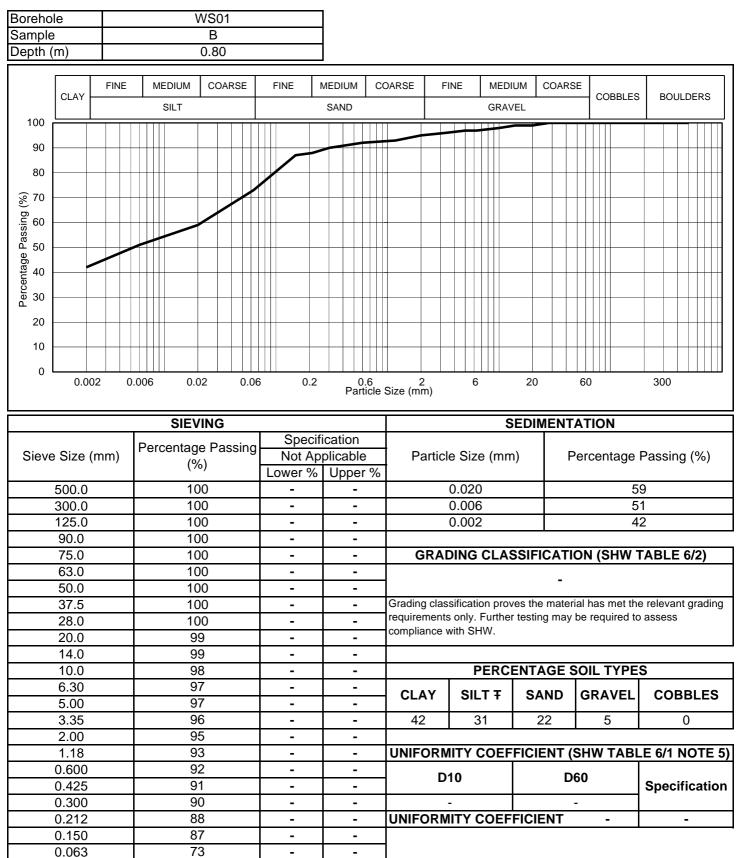


Symbol	Borehole	Sample	Depth	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	% Passing 0.425mm Sieve	Remarks
	WS01	В	0.80	35	45	22	23	u 1	Clay with intermediate plasticity
•	WS01	U	2.80	17	35	16	19	76	Clay with low plasticity
	WS01	U	3.90	13	34	16	18	64	Clay with low plasticity
•	WS03	В	1.00	32	40	19	21		Clay with intermediate plasticity
\diamond									
Δ									
0									
×									
ж									

All samples were tested in accordance with BS 1377 : Part 2 : 1990 Clause 4.4, 5.3 and 5.4. All samples were washed on a 0.425mm test sieve prior to test.

SUMMARY OF ATTERBERG LIMITS TEST RESULTS

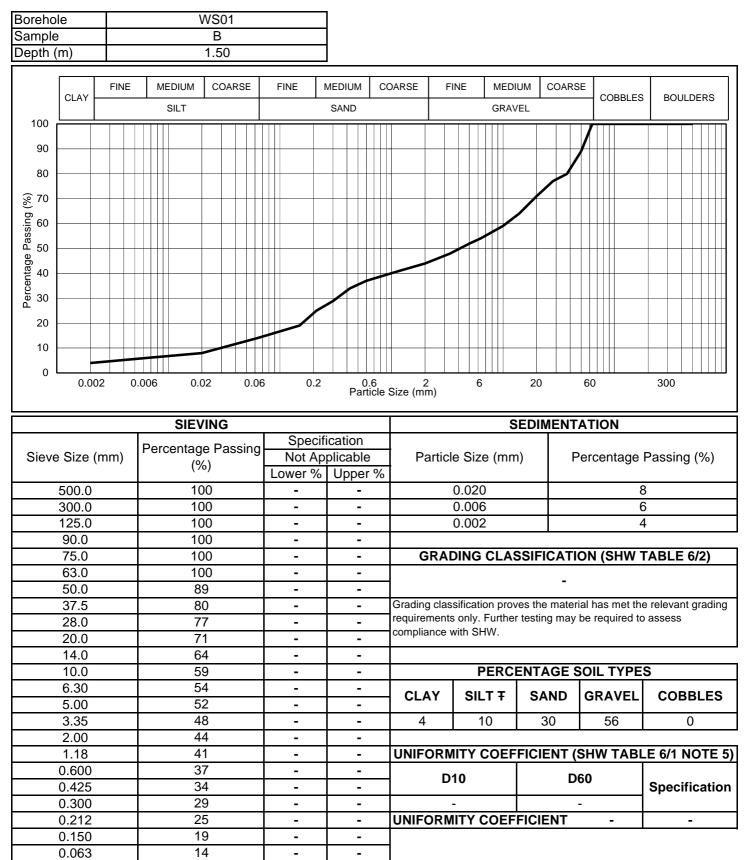




Remarks

Ŧ Where a sedimentation test was not carried out, this figure represents total fines, i.e., particles of diameter less than 63 microns

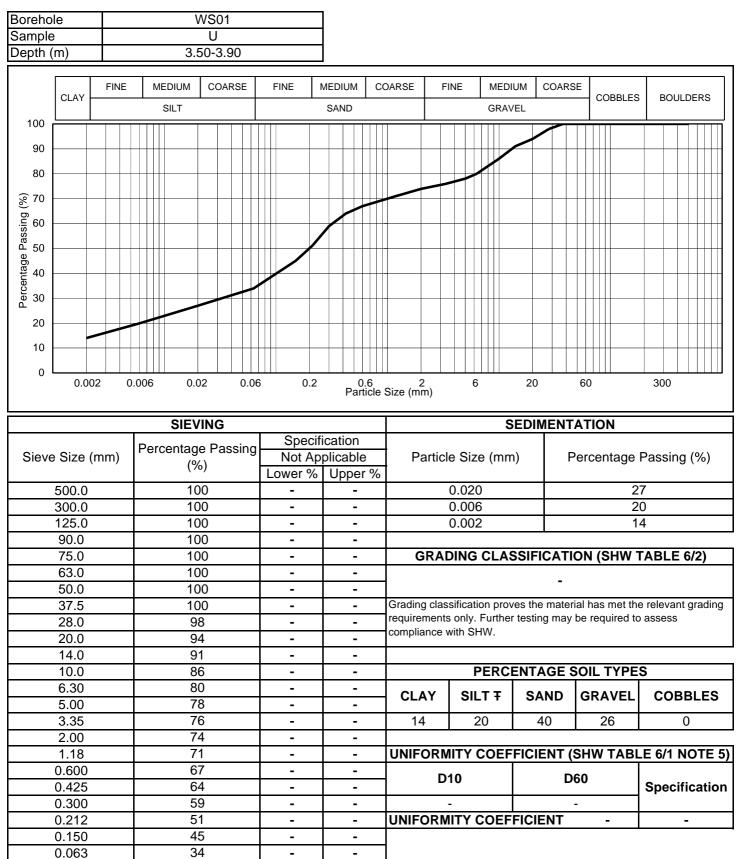




Remarks

T Where a sedimentation test was not carried out, this figure represents total fines, i.e., particles of diameter less than 63 microns Sample does not meet minimum mass requirement for material type

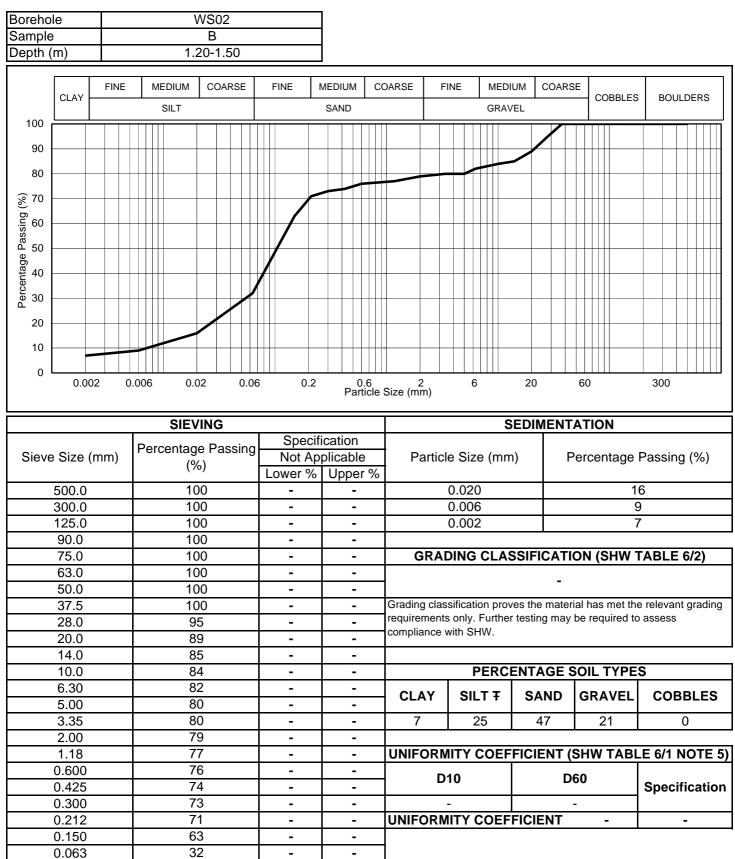




Remarks

Ŧ Where a sedimentation test was not carried out, this figure represents total fines, i.e., particles of diameter less than 63 microns

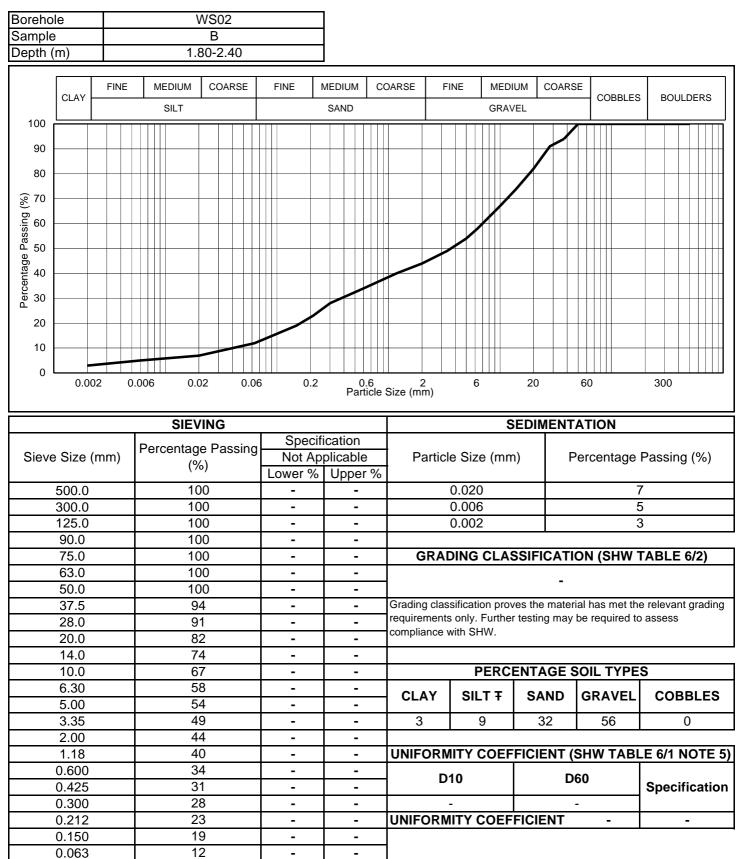




Remarks

T Where a sedimentation test was not carried out, this figure represents total fines, i.e., particles of diameter less than 63 microns Sample does not meet minimum mass requirement for material type

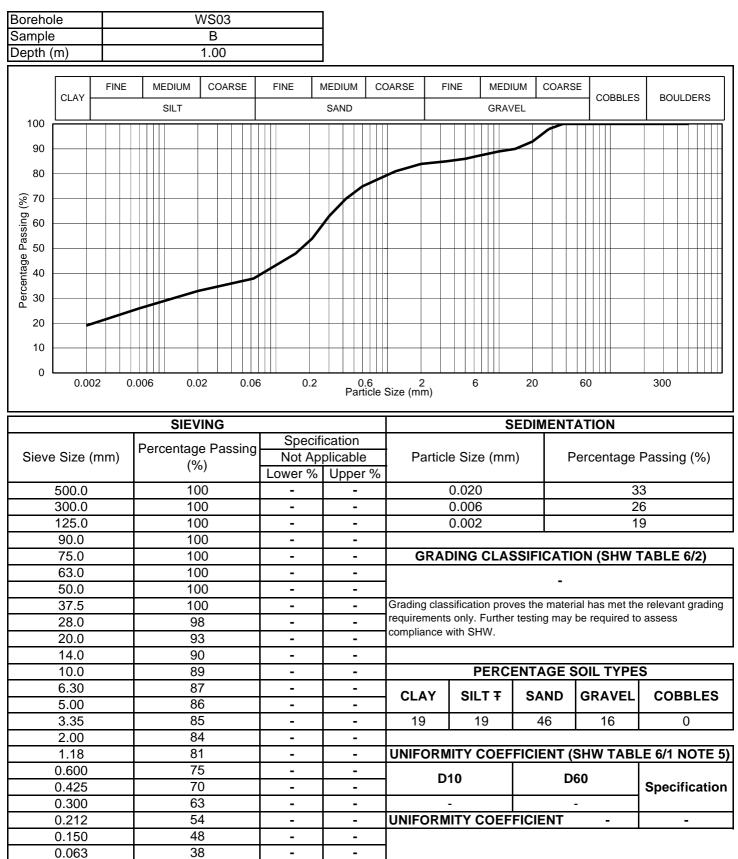




Remarks

Ŧ Where a sedimentation test was not carried out, this figure represents total fines, i.e., particles of diameter less than 63 microns

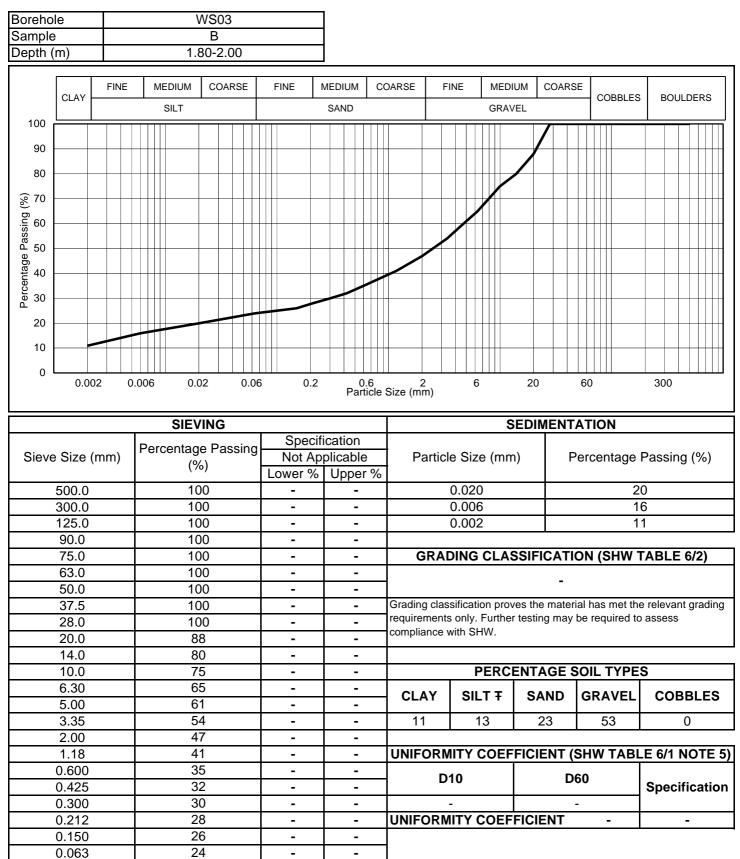




Remarks

Ŧ Where a sedimentation test was not carried out, this figure represents total fines, i.e., particles of diameter less than 63 microns

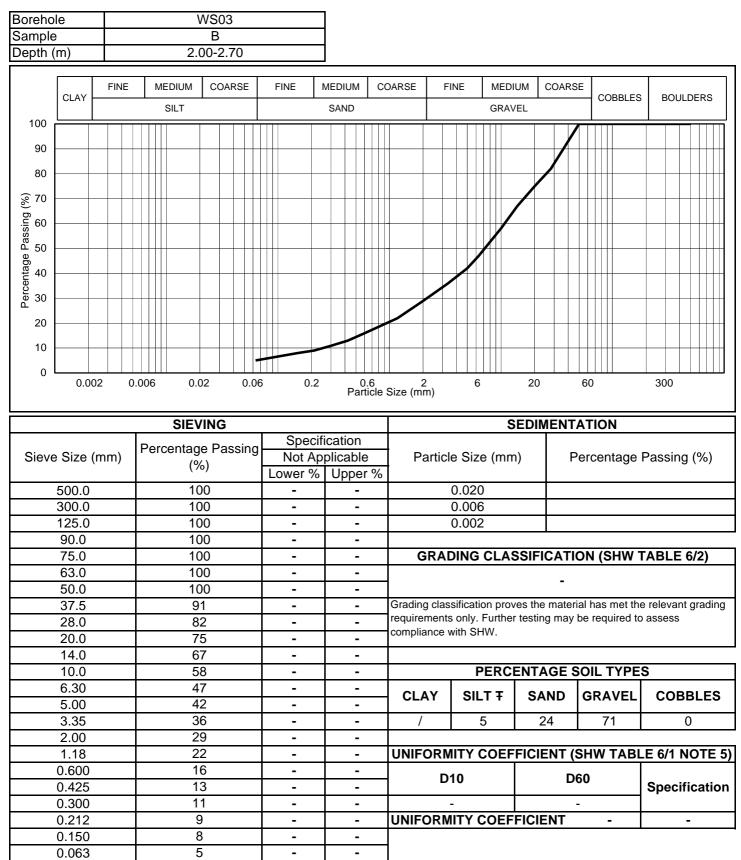




Remarks

T Where a sedimentation test was not carried out, this figure represents total fines, i.e., particles of diameter less than 63 microns Sample does not meet minimum mass requirement for material type





Remarks

T Where a sedimentation test was not carried out, this figure represents total fines, i.e., particles of diameter less than 63 microns Sample does not meet minimum mass requirement for material type



Unit 7-8 Hawarden Business Park Manor Road (off Manor Lane) Hawarden Deeside CH5 3US Tel: (01244) 528700 Fax: (01244) 528701 email: hawardencustomerservices@alsglobal.com Website: www.alsenvironmental.co.uk

WSP PB SCOTLAND 7 Lochside View Edinburgh Park Edinburgh EH12 9DH

Attention: Daniel Graham

CERTIFICATE OF ANALYSIS

Date of report Generation:
Customer:
Sample Delivery Group (SDG):
Your Reference:
Location:
Report No:

16 July 2021 WSP PB SCOTLAND 210427-78 70083065 Craigfoot Allotments 606010

This report has been revised and directly supersedes 598905 in its entirety.

We received 6 samples on Tuesday April 27, 2021 and 6 of these samples were scheduled for analysis which was completed on Friday May 21, 2021. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM) or ALS Life Sciences Ltd Aberdeen (Method codes S).

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.

Incorrect sampling dates and/or sample information will affect the validity of results.

The customer is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved By:

Sonia McWhan Operations Manager



ALS Life Sciences Limited. Registered Office: Units 7 & 8 Hawarden Business Park, Manor Road, Hawarden, Deeside, CH5 3US. Registered in England and Wales No. 4057291. Version: 2.8 Version Issued: 16/07/2021



CERTIFICATE OF ANALYSIS Client Reference:70083065 Order Number: 70083065-01s

Bonort Number: 606010

Report Number:606010Superseded Report:598905

Validated

Received Sample Overview

Lab Sample No(s,	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
24161308	HP01/21	ES	0.30 - 0.40	26/04/2021
24161312	HP02/21	ES	0.00 - 0.30	26/04/2021
24161316	HP03/21	ES	0.50 - 0.60	26/04/2021
24161320	HP04/21	ES	0.40 - 0.60	26/04/2021
24161324	HP05/21	ES	0.10 - 0.20	26/04/2021
24161328	HP06/21	ES	0.20 - 0.30	26/04/2021

Only received samples which have had analysis scheduled will be shown on the following pages.

210427-78

Craigfoot Allotments

 $\begin{array}{c} 606010 \\ 598905 \end{array}$

Report Number: Superseded Report:

CERTIFICATE OF ANALYSIS

SDG: Location:	210427-78 Craigfoot Al	lotments		ent R Ier N)830)830	65 65-01s
Results Legend X Test M No Determination	Lab Sample	24161308	24161312	24161316	24161320	24161324	24161328		
Sample Types -	Custome Sample Refe	HP0 1/ 21	HP02/21	HP03/21	HP04/21	HP05/21	HP06/21		
S - Soil/Solid UNS - Unspecified Solid GW - Ground Water SW - Surface Water LE - Land Leachate	AGS Refere	ES	ES	ES	ES	ES	ES		
PL - Prepared Leachate PR - Process Water SA - Saline Water TE - Trade Effluent TS - Treated Sewage US - Untreated Sewage	Depth (r	0.30 - 0.40	0.00 - 0.30	0.50 - 0.60	0.40 - 0.60	0.10 - 0.20	0.20 - 0.30		
RE - Recreational Water DW - Drinking Water Non-regulatory UNL - Unspecified Liquid SL - Sludge G - Gas OTH - Other	Containe	250g Amber Jar (ALE210)	250g Amber Jar (ALE210)	250g Amber Jar (ALE210)	250g Amber Jar (ALE210)	250g Amber Jar (ALF210)	250g Amber Jar (ALE210)		
	Sample T	уре	ß	ß	ß	ß	ß	ß	
Bioaccessible Metals	All	NDPs: 0 Tests: 6	x	x	x	x	x	x	
Metals in solid samples by OES	All	NDPs: 0 Tests: 6	x	x	x	x	x	x	
Sample description	All	NDPs: 0 Tests: 6	x	x	x	x	x	x	



SDG:

Location:

210427-78

CERTIFICATE OF ANALYSIS

Client Reference:70083065 Craigfoot Allotments Order Number: 70083065-01s Report Number: 606010 Superseded Report: 598905

Sample Descriptions

Grain Sizes							
very fine < 0.0	0.063mm fine 0.063	3mm - 0.1mm m e	dium 0.1mm	n - 2mm coar	rse 2mm - 1	Omm very coa	arse > 10mm
Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	I nclusions	Inclusions 2	
24161308	HP01/21	0.30 - 0.40	Dark Brown	Sandy Silt Loam	Stones	Vegetation	
24161312	HP02/21	0.00 - 0.30	Dark Brown	Sandy Silt Loam	Stones	Vegetation	
24161316	HP03/21	0.50 - 0.60	Dark Brown	Sandy Loam	Stones	Vegetation	
24161320	HP04/21	0.40 - 0.60	Dark Brown	Sandy Loam	Stones	Vegetation	
24161324	HP05/21	0.10 - 0.20	Dark Brown	Sandy Silt Loam	Stones	Vegetation	
24161328	HP06/21	0.20 - 0.30	Dark Brown	Sandy Silt Loam	Stones	Vegetation	

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provid sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are c naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major pa

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the n sample.

(ALS)

Validated

SDG:		210427-78		ICATE OF	ANAL 1515	Depart Nur	mber: 606010	
	: (Craigfoot Al	lotments Ord	ler Number: 7	0083065-01s	Report Nur Superseded	Report: 59890	5
Results Legend	Cust	omer Sample Ref.	HP01/21	HP02/21	HP03/21	HP04/21	HP05/21	HP06/21
SO17025 accredited. M mCERTS accredited. Aqueous / settled sample. diss.fift Dissolved / filtered sample. tot.unfilt total / unfiltered sample. Subcontracted - refer to subcontractor accreditation status	report for	Depth (m) Sample Type Date Sampled Sample Time	0.30 - 0.40 Soil/Solid (S) 26/04/2021	0.00 - 0.30 Soil/Solid (S) 26/04/2021	0.50 - 0.60 Soii/Solid (S) 26/04/2021	0.40 - 0.60 Soil/Solid (S) 26/04/2021	0.10 - 0.20 Soil/Solid (S) 26/04/2021	0.20 - 0.30 Soil/Solid (S) 26/04/2021
 % recovery of the surrogate standard to efficiency of the method. The results of compounds within samples aren't corre recovery (F) Trigger breach confirmed 1-4:§@ Sample deviation (see appendix) 		Date Received SDG Ref ab Sample No.(s) AGS Reference Method	27/04/2021 210427-78 24161308 ES	27/04/2021 210427-78 24161312 ES	27/04/2021 210427-78 24161316 ES	27/04/2021 210427-78 24161320 ES	27/04/2021 210427-78 24161324 ES	27/04/2021 210427-78 24161328 ES
Moisture Content Ratio (% of as received sample)	%	PM024	22	26	17	25	22	33
Lead	<0.7 mg/kg	TTM181	57.5 N	132 I N	131 И М	51.9 M	105 M	92.8 M
Lead after stomach only extraction	<5 mg/kg	TT/409	31.7	81.5	109	26.1	60.8	41.8
Lead after Stomach and Intestine extraction	<14 mg/kg	TT/409	<14	22.9	26.1	<14	<14	<14
Bioaccessible Lead (Stomach only Extraction)	%	TT/409	55.1	61.7	82.9	50.2	57.9	45
Bioaccessible Lead (Stomach and Instestine Ex.)	%	TTV409	<24.3	17.4	19.9	<27	<13.3	<15.1



210427-78Client Reference:70083065Craigfoot AllotmentsOrder Number: 70083065-01s

Report Number:606010Superseded Report:598905

Validated

Table of Results - Appendix

Method No	Reference	Description
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES
TM409	UBS procedure for the measurement of inorganic contaminant bioaccessibility from solid matrices	Determination of Bioaccessibility of Metals

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM) or ALS Life Sciences Ltd Aberdeen (Method codes S).



210427-78Client Reference:70083065Craigfoot AllotmentsOrder Number: 70083065-01s

Report Number:606010Superseded Report:598905

Validated

	0						
Test Completion Dates							
Lab Sample No(s,	24161308	24161312	24161316	24161320	24161324	24161328	
Customer Sample Ref	HP01/21	HP02/21	HP03/21	HP04/21	HP05/21	HP06/21	
AGS Ref.	ES	ES	ES	ES	ES	ES	
Depth	0.30 - 0.40	0.00 - 0.30	0.50 - 0.60	0.40 - 0.60	0.10 - 0.20	0.20 - 0.30	
Typ e	Soil/Solid (S)						
BARGE Stomach & Intest A	20-May-2021	20-May-2021	20-May-2021	20-May-2021	20-May-2021	20-May-2021	
BARGE Stomach & Intest B	20-May-2021	20-May-2021	20-May-2021	20-May-2021	20-May-2021	20-May-2021	
BARGE Stomach A	20-May-2021	20-May-2021	20-May-2021	20-May-2021	20-May-2021	20-May-2021	
BARGE Stomach B	20-May-2021	20-May-2021	20-May-2021	20-May-2021	20-May-2021	20-May-2021	
Bioaccessible Metals	21-May-2021	21-May-2021	21-May-2021	21-May-2021	21-May-2021	21-May-2021	
Metals in solid samples by OES	12-May-2021	12-May-2021	12-May-2021	12-May-2021	12-May-2021	12-May-2021	
Sample description	29-Apr-2021	29-Apr-2021	29-Apr-2021	29-Apr-2021	29-Apr-2021	29-Apr-2021	

	ALS Enviro	onmental, Land		QF.7.5.1 Data Amendments Form (Issue N Date: 03/03/2020 Issued and Authorised by Quality Manage			
SDG	Sample Event	Sample ID	Date Amended	Amendment Reason	Previous Reference	New Reference	Supersedes Report
210427-78	24161308	HP01	16/07/2021	Sample ID Change	HP01	HP01/21	598905
210427-78	24161312	HP02	16/07/2021	Sample ID Change	HP02	HP02/21	598905
210427-78	24161316	HP03	16/07/2021	Sample ID Change	HP03	HP03/21	598905
210427-78	24161320	HP04	16/07/2021	Sample ID Change	HP04	HP04/21	598905
210427-78	24161324	HP05	16/07/2021	Sample ID Change	HP05	HP05/ 21	598905
210427-78	24161328	HP06	16/07/2021	Sample ID Change	HP06	HP06/ 21	598905

SDG: 210427-78 Client Reference: 70083065 Report Number: 606010 Location: Craigfoot Allotments Order Number: 70083065-01s Report Number: 598905



General

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil a except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammoniun NH4 by the BRE method, VOC TICs and SVOC TICs.

2. If sufficient sample is received a sub sample will be retained free of charge days after analysis is completed (e-mailed) for all sample types unless the san destroyed on testing. The prepared soil sub sample that is analysed for as bestos will retained for a period of 6 months after the analysis date. All bulk sampi retained for a period of 6 months after the analysis date. All samples received an scheduled will be disposed of one month after the date of receipt unle instructed to the contrary. Once the initial period has expired, a storage charge w applied for each month or part thereof until the client cancels the request for s storage. ALS reserve the right to charge for samples received and store analysed.

3. With respect to turnaround, we will always endeavour to meet client require wherever possible, but turnaround times cannot be absolutely guaranteed du many variables beyond our control.

4. We take responsibility for any test performed by sub-contractors (marked asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who complete a quality questionnaire or are audited by ourselves. For some determin, there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with known track record will be utilised.

5. If no separate volatile sample is supplied by the client, or if a headspace or sedim is present in the volatile sample, the integrity of the data may be compromised. This be flagged up as an invalid VOC on the test schedule and the result marked as deviatin on the test certificate.

6. NDP · No determination possible due to insufficient/unsuitable sample.

7. Results relate only to the items tested.

8. LoDs (Limit of Detection) for wet tests reported on a dry weight ba corrected for moisture content.

9. Surrogate recoveries - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

10. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

11. In certain circumstances the method detection limit may be elevated du sample being outside the calibration range. Other factors that may contribute include possible interferences. In both cases the sample would be diluted which w cause the method detection limit to be raised.

12. Mercury results quoted on soils will not include volatile mercury as the analy performed on a dried and crushed sample.

13. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile limay occur.

14. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles G CFID/G CMS and all subcontracted analysis.

15. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

16. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

17. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as "mixed hydrocarbons". Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs).

18. Sample Deviations

If a sample is classed as deviated then the associated results may be compromised.

1	Container with Headspace provided for volatiles analysis
2	Incorrect container received
3	Deviation from method
4	Matrix interference
•	Sample holding time exceeded in laboratory
@	Sample holding time exceeded due to late arrival of instructions or samples
§	Sampled on date not provided

19. Asbestos

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from suppli bulk materials which have been examined to determine the presence of asb fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogen sub sample which has been examined to determine the presence of asbestos fib using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and

Asbestos Type	Common Name				
Chrysofile	White Asbestos				
Amosite	Brown Asbestos				
Cocidolite	Blue Asbestos				
Fibrous Actholite	-				
Fibrous Anhophyllite	-				
Fibrous Tremolite	-				

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test ot <u>than: - Trace - Whe</u>re only one or two asbestos fibres were identified.

Respirable Fibres

Respirable fibres are defined as fibres of <3 μm diameter, longer than 5 μm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.

Standing Committee of Analysts, The Quantification of Asbestos in Soil (2017).

Further guidance on typical asbestos fibre content of manufactured pr can be found in HSG 264.

The identification of asbestos containing materials and soils falls wi schedule of tests for which we hold UKAS accreditation, however ϵ interpretations and all other information contained in the report are outside

16/07/2021

	Soil Analytical Results Screening Sheet			
- 115	Site Name:	Craigfoot Allotments		
	Job Number:	70012724		
	Screening Criteria:	Allotments 6% SOM		

	No.	Min	Mean	Max	GAC	# GAC	HP01/21	HP02/21	HP03/21	HP04/21	HP05/21	HP06/21
Determinant	Samples	mg/kg	mg/kg	mg/kg	mg/kg	Exceeds	0-0.6	0-0.6	0-0.6	0-0.6	0-0.6	0-0.6
Lead	6	51.9	95.03	132	64	4	57.5	132	131	51.9	105	92.8

Appendix D

RISK ASSESSMENT METHODOLOGIES

CONFIDENTIAL

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METHODOLOGY FOR THE DERIVATION OF GENERIC QUANTITATIVE ASSESSMENT CRITERIA TO EVALUATE RISKS TO HUMAN HEALTH FROM SOIL & GROUNDWATER CONTAMINATION

UK APPROACH

In the UK, the potential risks to human health from contamination in the ground are usually evaluated through a generic quantitative risk assessment (GQRA) approach. This allows generic and conservative exposure assumptions to be readily applied to risk assessments, and can be a useful tool for rapidly screening data and to identify those contaminants or scenarios that could benefit from further investigation and/or site-specific detailed quantitative risk assessment (DQRA). Current industry good practice is to use the approach presented in the Environment Agency (EA) publications SR2¹ and SR3². This approach allows the derivation of Generic Assessment Criteria (GACs), primarily for chronic exposure.

In April 2012, the Department of Environment, Food and Rural Affairs (Defra) published updated statutory guidance³ which introduced a four category approach to determining whether land <u>in</u> <u>England and Wales</u> is contaminated or not on the grounds of significant possibility of significant harm (SPOSH). **Figure 1** presents a graphical representation of the categories.

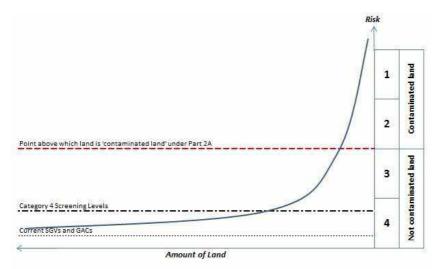


Figure 1: Four Categories for Determining if Land Represent a SPOSH

Cases classified as Category 1 are considered to be SPOSH based on actual evidence or an unacceptably high probability of harm existing. Category 4 cases are those where there is no risk, or a low risk of SPOSH.

¹ Environment Agency '*Human Health Toxicological Assessment of Contaminants in Soil*', Report SC050021/SR2. January 2009.

² Environment Agency 'Updated Technical Background to the CLEA Model,' Report SC050021/SR3. January 2009.

³ Defra 'Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance'. April 2012.



GACs represent a minimal risk level, well within Category 4. A 2014 publication by Contaminated Land: Applicatons in Real Environments (CL:AIRE),SP1010⁴ and endorsed by Defra⁵ provided an approach to determine Category 4 Screening Levels (C4SLs) which are higher than the GACs whilst being "more pragmatic but still strongly precautionary". It also provided C4SLs for six contaminants of concern. Although the C4SLs were designed to support Part 2A assessments to determine 'contaminated land' they are specifically mentioned, along with reference to the Part 2A statutory guidance, by the Department for Communities and Local Government (DCLG) for use in a planning context⁶.

An updated version the Contaminated Land Exposure Assessment (CLEA) Workbook (v1.071) was released by the EA in September 2015 to take into account the publication of SP1010. The updates comprised: additional toxicity data for the six chemicals for which C4SLs were derived; two new public open space land use scenarios; updated exposure parameters; options to run the model using C4SL exposure assumptions; and increased functionality. There were no changes to algorithms, so it is still possible to replicate the withdrawn SGVs using the input parameters held within v1.071.

It should be noted that the four category approach has not been adopted in Scotland under Part 2A or the planning regime. The Part 2A statutory guidance applicable in Scotland (Paper SE/2006/44 dated May 2006) does not reflect the changes introduced by Defra in April 2012 which allow for the use of C4SLs within Part 2A risk assessments. Additionally, it is considered that the principal of 'minimal risk' should still apply under planning in Scotland, based on current guidance.

WSP APPROACH

Following the withdrawal of the SGVs, and in the absence of an industry-wide, accepted set of GACs it is down to individual practitioners to derive their own soil assessment criteria. WSP has used the approach provided within SR2, SR3, SP1010, CLEA Workbook v1.071 and SR4⁷ to produce a set of minimal risk GACs. The chemical-specific data within two key publications were considered during their production: CL:AIRE 2010⁸ and LQM 2015⁹. Both documents provide comprehensive sets of GACs for different contaminants of concern.

The LQM Suitable For Use Levels (S4ULs) have selected exposure parameters consistent with the C4SL exposure scenarios. This approach was rejected by WSP as not representing minimal risk. However, the LQM S4UL document was critically reviewed and the approach and chemical input parameters were utilised where considered to be appropriate.

An industry-led C4SL Working Group is in the process of deriving a larger set of C4SLs in the near future, for approximately 20 contaminants. This will include a critical review of the chemical input data for all selected substances, and may therefore lead to further amendments to the chemical input data used in the WSP in-house screening values. It is considered likely that the contaminant list will

⁴ CL:AIRE 'Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination' SP1010, Final Project Report (Revision 2). September 2014.

⁵ Defra 'SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document'. December 2014.

⁶ DCLG Planning Practice Guidance 'Land Affected by Contamination', particularly Paragraphs 001 and 007. Ref IDs: 33-001-20140306 & 33-007-20140612.

⁷ Environment Agency 'CLEA Software (Version 1.05) Handbook (and Software)', Report SC050021/SR4. September 2009.

⁸ CL:AIRE 'The EIC/AGS/CL:AIRE Soil Generic Assessment Criteria for Human Health Risk Assessment'. ISBN 978-1-05046-20-1. January 2010.

⁹ Nathanail et al '*The LQM/CIEH S4ULs for Human Health Risk Assessment*', Land Quality Press, ISBN 978-0-9931084-0-2. 2015.

crossover with the 2009 EIC/AGS/CL:AIRE GACs. As such, this document was not critically reviewed by WSP.

WSP's current approach to the assessment of risks to human health is to continue to evaluate minimal risk through the use of in-house derived GACs, and to use the published C4SLs as a secondary tier of assessment until such time as additional C4SLs are published and/or in-house values are derived.

EXPOSURE MODELS

LAND USES

WSP has largely adopted the exposure assumptions of the generic land use scenarios included within SR3, with two additional public open space scenarios included from within SP1010 and two bespoke exposure scenarios (highways):

- à Residential with homegrown produce consumption;
- à Residential without homegrown produce consumption;
- à Allotments;
- à Commercial;
- à Public open space near residential housing (POS_{resi});
- à Public park (POS_{park});
- à Highways (surface soils); and
- à Highways (subsurface soils).

Exceptions are described in the following Sections.

SOIL PROPERTIES

SR3 assumes a sandy loam soil with a pH of 7 and a Soil Organic Matter (SOM) content of 6% for its generic land uses, based on the geographical spread of topsoils in the UK. WSP has adopted these default values. In addition, GACs based on an SOM of 1% and 2.5% have been derived, based on common experience of the nature of Made Ground and lack of topsoil on many brownfield sites.

RECEPTOR CHARACTERISTICS AND BEHAVIOURS

SP1010 provides some updated exposure parameters for long-term inhalation rates¹⁰ and the consumption rates for homegrown produce¹¹ compared to those provided in SR3. This data was used to derived WSP's GACs.

The changes in inhalation rates do not apply to the allotment generic land use scenario, as these are based on the breathing rates for short-term exposure of light to moderate intensity activity which were derived from a study that was not updated in USEPA 2011, so the SR3 rates were retained.

¹⁰ USEPA, National Centre for Environmental Assessment 'Exposure Factors Handbook: 2011 Edition' EPA/600/R-09/052F. September 2011.

¹¹ National Diet and Nutrition Survey 2008/2009 to 2010/2011.



HIGHWAYS EXPOSURE SCENARIOS

Human health GAC for a Highways exposure scenario have been derived. The site area is defined by publicly accessible land adjacent to highways, comprising both hard and soft landscaped areas. Exposure is considered to be largely transitory.

There are no publicly available GAC for this exposure scenario. Consequently, WSP have derived GAC for the following exposure scenarios:

- à Highways (surface soils); and
- à Highways (sub-surface soils).

Surface soils GAC are for soil at ground level and within 300mm of the surface. Conversely, subsurface GAC are for soils at a depth exceeding 0.3m bgl. These GAC are not to be used as import criteria.

The critical receptor is a young female child, CLEA age classes 4-9. This is consistent with the critical receptor for the POS(resi) exposure scenario, and considered to be appropriate for a child potentially playing outside without direct adult supervision.

For all GAC, a sandy loam soil and a soil organic matter content of 1% is assumed. There is no building on site.

Exposure scenarios for surface and subsurface soils are detailed below. These are considered to be conservative estimates, due to the mostly transitory use of publically accessible lands adjacent to highways.

HIGHWAYS GAC (SURFACE SOILS)

The relevant exposure pathways include direct soil and dust ingestion, dermal contact (outdoors) and the inhalation of outdoor dust and vapour.

The exposure frequency is 170 days per annum, and the occupancy period outdoors is 1 hour per day (as per the POS (resi) exposure scenario). The soil and dust ingestion rate has been set at 50 mg/day, consistent with a POS(park) exposure scenario.

HIGHWAYS GAC (SUBSURFACE SOILS)

The single relevant exposure pathway is the inhalation of outdoor vapour. Direct exposure pathways are not viable due to the depth of the soils below ground level.

The exposure frequency is 170 days per annum, and the occupancy period outdoors is 1 hour per day (as per the POS (resi) exposure scenario). The soil and dust ingestion rate has been set to zero, as direct exposure pathways to soils at this depth are not viable.

CHEMICAL DATA

PHYSICO-CHEMICAL PARAMETERS

Physico-chemical properties for the contaminants for which GACs have been derived have been obtained following critical review of the following hierarchy of data sources:

- 1. Environment Agency/Defra SGV reports where available;
- 2. Environment Agency 'Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values', Report SC050021/SR7, November 2008; and
- **3.** Published fate and transport reviews within Nathanail et. al 2015 and CL:AIRE 2010.

Where appropriate, and where sufficient data is available, values were adjusted to reflect a UK soil temperature of $10^{\circ}C$ (e.g. K_{aw}).

TOXICOLOGICAL DATA

Toxicological data for the derivation of minimal risk Health Criteria Values (HCV) for each contaminant was selected with due regard to the approach presented in SR2. Where appropriate, the following hierarchy of data sources was used:

- **1.** UK toxicity reviews published by authoritative bodies including:
 - < EA;
 - < Public Health England (PHE);
 - < Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT); and
 - < Committee on Carcinogenicity of Chemicals in Food, Consumer Products and the Environment (COC).
- 2. Authoritative European sources such as European Food Standards Agency (EFSA)
- **3.** International organisations including:
 - < World Health Organisation (WHO); and
 - Joint FAO/WHO Expert Committee on Food Additives (JECFA).
- 4. Authoritative country-specific sources including:
 - United States Environmental Protection Agency (USEPA);
 - < US Agency for Toxic Substances and Disease Registry (ATSDR);
 - < US Integrated Risk Information System (IRIS); and
 - < Netherlands National Institute for Public Health and the Environment (RIVM).

Factors such as the applicability of the data to human health (e.g. epidemiological vs. animal studies), the quality of the data, the level of uncertainty in the results and the age of the data were also taken into account in the final selection. Details for specific substances are available on request.

MEAN DAILY INTAKES

Estimations of background exposure for each threshold substance have been updated. In line with the SR2 approach, the exposure from non-threshold substances in the soil does not take into account exposure from other sources, and as such GACs were derived without consideration of the Mean Daily Intake (MDI) for those substances.

The data published by the EA in its series of TOX reports between 2002 and 2009 was evaluated to determine whether the values were considered to remain valid today. Values from these current UK published sources were not amended unless they were considered to be significantly different so that the GACs remained as comparable as possible with the revoked SGVs.

ORAL MEAN DAILY INTAKES

Oral MDI were generally estimated as the sum of exposure via the ingestion of food and drinking water using the default adult physiological parameters presented in Table 3.3 of SR2.

Data on the exposure of substances from food ingestion was generally obtained from UK Total Diet Studies (TDS) published by the Food Standards Agency (FSA) and its predecessor the Ministry of Agriculture, Fisheries and Food (MAFF) and from studies commissioned by COT. Where no UK-specific data was available, MDI were derived from the European Food Safety Authority (EFSA), Health Canada and US sources. This was a rare occurrence, and in these instances, the data was evaluated to determine its applicability to the UK.

Data on the concentrations of substances in tap water was obtained from a variety of sources. UK data was used where available, with preference given to Drinking Water Inspectorate (DWI) 2014 data from water company tap water testing (LOD, 1st and 99th percentile data is available). Where the substance was not included in tap water testing, other UK sources of information were considered including:

- à DWI data from water company tap water testing from previous years;
- à COT; and
- à FSA.

Where UK data was not available, a number of other data sources were considered, largely WHO International Programme on Chemical Safety (IPCS) Concise International Chemical Assessment Documents (CICADs) and background documents for the development of Guidelines for Drinking Water Quality, using professional judgement on the relevance of the data to the UK. The final decision on the MDI from drinking water was made using professional judgement on the balance of relevance and probability, taking into account the detection limit where not detected, Koc and solubility, reduction in use of the substance, banned substances, tight controls (e.g. on explosives) and with due consideration to the SR2 instruction that "if no data or information in background exposure are available, background exposure should be assumed to be negligible and the MDI set to zero....".

Data from other countries was generally not used because it was considered that the hydrogeology of these countries along with industrial practices were unlikely to be reflective of the UK.



INHALATION MEAN DAILY INTAKES

Inhalation MDIs were based on estimates of average daily exposure by the inhalation pathway and calculated using the default adult physiological parameters presented in Table 3.3 of SR2.

The inhalation MDIs were generally estimated using background exposure data from the UK, derived from Defra's UK-AIR: Air Information Resource¹², which provides ambient air quality data from a number of sites forming a UK-wide monitoring network. The MDIs for heavy metals were based on rolling annual average metal mass concentration data from Defra's UK Heavy Metals Monitoring Network from the period October 2009 to September 2010¹³.

Information for some substances was obtained from UK sources including Environment Agency TOX reports and data from the UK Expert Panel on Air Quality Standards (EPAQS). Where recent UK data was not available, data was sourced from the International Programme on Chemical Safety (IPCS), the World Health Organisation (WHO), the Agency for Toxic Substances and Diseases Registry (ATSDR), Health Canada, and various other peer-reviewed sources summarised by LQM/CIEH¹⁴.

For other substances, where no data or information on background exposure was available, background exposure was assumed to be negligible and the MDI set at 0.5*TDI in accordance with guidance in SR2.

PLANT UPTAKE

Soil to plant concentration factors are available in CLEA v1.071 for arsenic, cadmium, hexavalent chromium, lead, mercury, nickel and selenium. For all remaining inorganic chemicals, concentration factors were obtained using the PRISM model. Substance-specific correction factors have been selected in accordance with the guidance established within SR3. This is consistent to the approach utilised in the derivation of the LQM S4UL and the EIC/AGS/CL:AIRE GAC.

Where there is a lack of appropriate data to enable the derivation of specific soil to plant concentrations factors for organic chemicals, plant uptake was modelled within CLEA v1.071 using the generic equations recommended within SR3, as follows:

- à Green Vegetables Ryan et al. (1988);
- à Root Vegetables Trapp (2002);
- à Tuber Vegetables Trapp et al. (2007); and
- à Tree Fruit Trapp et al. (2003).

There are no suitable models available for modelling uptake for herbaceous fruit or shrub fruit. Exposure is considered negligible.

¹² Crown 2016 copyright Defra via uk-air.defra.gov.uk, licenced under the Open Government Licence (OGL).

¹³ Defra, 2013 Spreadsheet of historic data for multiple years for the Metals network. Available online at: <u>http://uk-air.defra.gov.uk/data/metals-data</u>. [Accessed 13/03/2016].

¹⁴ LQM/CIEH, 2015. The LQM/CIEH S4ULs for Human Health Risk Assessment.



SOIL SATURATION LIMITS

GACs are not limited to their theoretical soil saturation within CLEA, although where either the aqueous or the vapour-based saturation is exceeded, this is highlighted within the Workbook (compared with the lower of the two values). This affects pathways which depend on partitioning calculations so in reality this only affects the vapour pathways and is relevant to organic substances and other substances, such as elemental mercury, that have a significant volatile component. However, the Workbook highlights saturation for direct contact pathways to indicate to the user where further qualitative consideration of free phase contamination at the surface may be required.

Where the lower of the two saturation limits is exceeded and the vapour pathway is the only exposure route being considered, the chronic risks to human health are likely to be negligible. Further evaluation could be undertaken using an alternative model suitable for evaluating non-aqueous phase liquids (NAPLs), such as the Johnson & Ettinger (J&E) approach described in USEPA 2003. However, WSP considers that if NAPLs are suspected, given the known limitations and oversimplifications of J&E, soil vapour monitoring is a more accurate way of assessing potential risks.

Where the lower saturation limit is exceeded for the vapour pathway and a number of exposure routes are being considered, then the contribution from the NAPL via vapour inhalation to the overall exposure can be evaluated using the procedure provided in SR4. WSP would evaluate this as part of a DQRA process or through soil vapour monitoring on-site to determine site-specific soil vapour concentrations.

CHEMICAL SPECIFIC ASSUMPTIONS

CYANIDES

Cyanide has high acute toxicity, and short term exposure is an important consideration when assessing the risks from soils contaminated with cyanide. The primary risk to human receptors from free cyanide in soils is an acute risk.

There is no current UK guidance available for calculating acute risks from free cyanide. Consequently, GAC for acute exposure were derived using the algorithms presented in MADEP 1992¹⁵ and assuming a one-off ingestion of 10g of soil (this conservative value has been taken as an upper bound estimate for a one-off soil ingestion rate amongst children). Receptor body weights have been selected according to the critical receptor for each exposure scenario. The lowest of the chronic and acute GAC for each land use scenario were adopted by WSP.

LEAD

The SGV for lead was withdrawn by the EA in 2009, and in 2011 the EA withdrew their published TOX report in light of new scientific evidence. The C4SL for lead was derived using the latest scientific evidence from a large human dataset. As such, no chemical-specific margin was applied in the derivation of the C4SL for lead. It may be possible for WSP to derive a GAC for lead using the same dataset and applying a chemical-specific margin, but the value is likely to be lower than UK natural background concentrations. Therefore, WSP has adopted the toxicological data used to derive the C4SLs in deriving the GAC for lead until such time as alternative GACs are published by an authoritative body. The relative bioavailability was set at 100% in line with the approach taken for other GACs, whereas the C4SL assumes 60% for soil and 64% for airborne dust. Thus, the WSP GAC are lower than the C4SLs.

¹⁵ MADEP 'Background Documentation for the Development of an "Available Cyanide" Benchmark Concentration' 1992. <u>http://www.mass.gov/dep/toxics/cn_soil.htm</u>



POLYCYCLIC AROMATIC HYDROCARBONS

WSP's approach to the assessment of polycyclic aromatic hydrocarbons (PAHs) uses the surrogate marker approach. BaP was used as a surrogate marker for all genotoxic PAHs in line with the Health Protection Agency 2010¹⁶ recommendations and SP1010. This assumes that the PAH profile of the data is similar to that of the coal tars used in the Culp *et al* oral carcinogenicity study from which the toxicity data for BaP was produced. In reality, this profile has been shown by HPA to be applicable on the majority of contaminated sites based on assessment of sites across the country.

The alternative is the Toxic Equivalency Factor (TEF) approach which uses a reference compound and assigns TEFs for other compounds based on estimates of potency. Key uncertainties with this approach include the assumption that all compounds have the same toxic mechanism of action within the body and that no compounds with a greater potency than the reference compound are present. It is considered by the HPA that the TEF approach is likely to under predict the true carcinogenicity of PAHs and therefore favours the surrogate marker approach.

For these reasons, WSP considers that the adoption of BaP as a surrogate marker for genotoxic PAHs, as opposed to the TEF approach, is reasonable. In rare cases where the PAH profile may differ from the wide definitions of the Culp *et al* study the user should discuss their project with an experienced risk assessor. In addition, WSP has derived a GAC for naphthalene, which is commonly a risk driver due to its high volatility, relative to other PAH compounds.

TRIMETHYLBENZENES

The GAC for trimethylbenzenes can be used for the assessment of any individual isomer (1,2,3-trimethylbenzene, 1,2,4-trimethylbenzene or 1,3,5-trimethylbenzene), or a mixture of the three isomers.

CHEMICAL GROUPS

For a number of chemical groups, the available toxicity data is for combinations of chemicals. Given that the physico-chemical parameters may differ between the chemicals, the GACs for the chemicals within the groups have been calculated and then the lowest GAC selected to represent the entire group. This was the approach taken by the EA for m-, o- and p-xylenes, and has also been adopted by WSP for:

- à 2-chlorophenol, 2,4-dichlorophenol, 2,4,6-trichlorophenol and 2,3,4,6-tetrachlorophenol;
- à 2-, 3- and 4-methylphenol (total cresols);
- à aldrin and dieldrin; and
- à α and β -endosulphan.

¹⁶ HPA Contaminated Land Information Sheet 'Risk Assessment Approaches for Polycyclic Aromatic Hydrocarbons (PAHs) 2010



EXPOSURE TO VAPOURS

INHALATION OF MEASURED VAPOURS

WSP has derived a set of soil vapour GACs (GAC_{sv}) that allow for the assessment of measured site soil vapour concentrations, using J&E, in order to establish potential risks via indoor inhalation of vapours. This methodology enables a more robust assessment of exposure via the inhalation of soil vapours indoors than using CLEA-derived soil GAC, as it is based upon measured soil vapour concentrations beneath the site. It also allows for the assessment of vapours from all source terms (i.e. groundwater, soil or NAPL). Outdoor inhalation was not included. WSP considers that the indoor inhalation pathway is the significantly dominant risk-driver.

The generic land use scenarios within CLEA (residential and commercial) that were used to derive the soil GAC were used to define the receptor and building characteristics for the soil vapour GAC. Only residential and commercial generic land use scenarios include the indoor inhalation of vapours pathway.

The GAC_{sv} were derived for three different soil types; sand, sandy loam and clay, reflecting the importance of this parameter within the J&E model. A depth to contamination of 0.85 m below the base of the building foundation was assumed (i.e. 1 m below ground level). This differs from the depth assumed for the soil GAC (0.5 m bgl), but was selected by WSP as a reasonable worst case scenario.

It is acknowledged that the J&E commonly over-predicts indoor vapour concentrations. In particular, it will significantly over-predict vapour concentrations for suspended floor slabs, which many new builds are constructed with, it does not take into account lateral migration and assumes an infinite source of contamination at steady state conditions. In addition, it is common for soil gas/vapour wells to be installed with at least 1 m of plain riser at the surface and this equates to a total depth of 0.85 m below the building foundation plus a 0.15 m thick foundation, and so is more representative of the depth that samples will be taken from.

The TDSIs and IDs for each substance were converted from μ gkg⁻¹bwday⁻¹ to μ gm⁻³ using the standard conversions quoted in Table 3.3 of SR2, thereby replacing the need to model C_{air} in the equation:

$$= \alpha . v . 1,000,000$$

Where:

 C_{air} is the concentration of vapours within the building, mg⁻³ α is the steady state attenuation coefficient between soil and indoor air, dimensionless C_{vap} is the soil vapour concentration, mgcm⁻³

The target concentrations within indoor air for each substance (C_{air}) are a function of receptor inhalation rates and occupancy periods, as defined by the site conceptual exposure model (assuming standard CLEA occupancy periods and receptors).

The attenuation factor was calculated using J&E (Equation 10.4 in SR3) and the resulting C_{vap} is equivalent to the GAC_{sv} for the modelled exposure scenario.

Where reported soil vapour concentrations exceed the relevant saturated vapour concentration, free product may occur, and the user should discuss their project with an experienced risk assessor.

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