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APPENDICES

Appendix 1

Geotechnics (2020) Ground Investigation Factual Report

Appendix 2

Groundwater DQRA

1. INTRODUCTION

Ramboll UK Limited (Ramboll) have been appointed by Kronospan Ltd to provide contaminated land consultancy services as part of the proposed development of a Raw Board Store (RBS) at their existing site in Chirk, North Wales.

As part of this work, Ramboll managed an intrusive ground investigation in 2021 in order to obtain information required to make an assessment of the underlying ground and groundwater conditions for the proposed design. The ground investigation combined geotechnical and contaminated land requirements.

1.1 Existing Information

The following existing reports provide information relating to the ground conditions and contamination at the site:

- Geotechnics Ltd, June 2021. Kronospan Raw Board Storage – Ground Investigation Factual Report (reference PN214198). Prepared for Kronospan Ltd.

In addition, information on ground conditions is available from a previous ground investigation at Kronospan where a number of boreholes were located close to the proposed development area:

- Geotechnics Ltd, October 2017. Kronospan Storage Building Factual Report. Prepared for Kronospan Ltd.

1.2 Planning Permission

The following conditions have been received relating to contamination as part of planning application reference P/2017/0700 (planning appeal reference: APP/H6955/A/18/3193142).

6) Prior to the commencement of development approved by this planning permission (or such other date or stage in development as may be agreed in writing with the local planning authority), the following components of a scheme to deal with the risks associated with contamination of the site shall each be submitted to and approved, in writing, by the local planning authority:

1. All preliminary risk assessment which has identified:

- All previous uses*
- Potential contaminants associated with those uses*
- A conceptual model of the site indicating sources, pathways and receptors*
- Potentially unacceptable risks arising from contamination at the site.*

2. A site investigation scheme, based on (1) to provide information for a detailed assessment of the risk to all receptors that may be affected, including those off site.

3. The site investigation results and the detailed risk assessment (2) and, based on these, an options appraisal and remediation strategy giving full details of the remediation measures required and how they are to be undertaken.

4. A verification plan providing details of the data that will be collected in order to demonstrate that the works set out in (3) are complete and identifying any requirements for longer-term monitoring of pollutant linkages, maintenance and arrangements for contingency action.

Any changes to these components require the express consent of the local planning authority. The development shall be carried out in accordance with the approved scheme.

7) Prior to the commencement of development, a verification report demonstrating completion of the works set out in the approved remediation strategy and the effectiveness of the remediation shall be submitted to and approved, in writing, by the local planning authority. The report shall include results of sampling and monitoring carried out in accordance with the approved verification plan to demonstrate that the site remediation criteria have been met. It shall also include any plan (a "long-term monitoring and maintenance plan") for longer-term monitoring of pollutant linkages, maintenance and arrangements for contingency action, as identified in the verification plan, and for the reporting of this to the local planning authority.

8) Reports on monitoring, maintenance and any contingency action carried out in accordance with a long-term monitoring and maintenance plan shall be submitted to the local planning authority as set out in that plan. On completion of the monitoring programme a final report demonstrating that all long-term site remediation criteria have been met and documenting the decision to cease monitoring shall be submitted to and approved in writing by the local planning authority.

9) If, during development, contamination not previously identified is found to be present at the site then no further development (unless otherwise agreed in writing with the local planning authority) shall be carried out until the developer has submitted, and obtained written approval from the local planning authority for, an amendment to the remediation strategy detailing how this unsuspected contamination shall be dealt with.

11) Piling or any other foundation designs using penetrative methods shall not be permitted other than with the express written consent of the local planning authority, which may be given for those parts of the site where it has been demonstrated that there is no resultant unacceptable risk to groundwater.

This report has been prepared to provide information relating to Conditions 6.1, 6.2 and first part of 6.3 only. Further information will still be required to discharge Conditions 6.3(2) to 11.

1.3 Objectives

The ground investigation was carried out with the objective of identifying potential contaminated land constraints and providing geotechnical information for reference design recommendations for the proposed development of the site.

The objectives of the additional ground investigation and assessment were as follows:

- To confirm and also provide additional information on the ground conditions and distribution of shallow strata beneath the site identified during the previous investigations at the Kronospan site;
- To provide additional information on the presence and likely extent of potential contaminants;
- To conduct a contaminated land risk assessment for the existing site and future development along with an indication of potential for remediation / mitigation (if required) based on the results from the ground investigation;
- To provide information to allow for geotechnical design (outside the scope of this report); and
- To provide recommendations for further works, where appropriate.

1.4 Reporting

This report discusses the findings of the ground investigation and provides recommendations relating to the potential risks and constraints on development at the site associated with contamination.

Geotechnical aspects have been reported separately in the Ground Investigation Report and Geotechnical Design Report being prepared by Ramboll.

1.5 Constraints and Limitations

This report has been prepared for Kronospan Ltd and shall not be relied upon by any third party unless that party has been granted a contractual right to rely on this report for the purpose for which it was prepared. This report should not be used in whole or in part by any third parties or modified without the express permission of Ramboll in writing.

Ramboll have not been appointed to undertake a preliminary risk assessment (also known as a desk study).

Ramboll has endeavoured to assess all information provided to them but makes no guarantees or warranties for the completeness or accuracy of third party information relied upon.

The recommendations summarised in this report relate to developing the site for the end use discussed in Section 2.2 of this document and are based on information available at the time of writing the report. Any substantial changes to the proposed design or the development may require a reassessment.

The ground investigation has been undertaken using exploratory holes located at positions determined from the current site layout and proposed development works. Exploratory hole locations were subject to existing operational activities at the site and some locations needed to be moved.

The ground investigation was undertaken using standards current at the time of the work. Since the ground conditions are only known in detail at each exploratory hole location, the ground conditions between holes have been interpolated. The actual nature of the ground may differ from our interpretation. The extent of the additional ground investigation carried out was to develop a ground model of the site for design purposes.

Similarly, chemical analysis has been undertaken on samples recovered only at the exploratory hole positions, and it is possible that areas of contamination are present between the exploratory holes. In addition, groundwater levels will vary seasonally and with changes in weather conditions.

2. SITE SETTING

2.1 Site Location and Description

Kronospan is located on the western side of Chirk, adjacent to the B5070 Holyhead Road at National Grid Reference 328652,338370. The wider Kronospan site covers an area of circa 40 ha of which approximately 14 ha has been developed with industrial buildings and plant.

Figure 2.1 Site Location (source Google Earth Pro).



The western perimeter of the Kronospan site is formed by the Shrewsbury to Chester railway. The Llangollen Canal is located to the west of the railway line approximately 30m from the boundary of the site at its closest point.

Kronospan manufactures high quality wood-based panels and associated products. The primary products manufactured by Kronospan at the Chirk site are particle board and medium density fibreboard (MDF), from which a number of secondary products are produced such as laminate flooring, worktops and melamine facing boards.

The proposed development is located towards the central southern part of a large area of existing industrial buildings at the Kronospan site. The existing area is used as a laminating press line and includes pits and old foundations. The area is currently occupied by an existing portal frame structure that houses the P11 manufacturing line. The site is level with a ground bearing concrete slab with a number of pits, typically 1.0m to 2.0m deep.

2.2 Development Proposal

The proposed development comprises a large raw board store located amongst other large manufacturing buildings and plant. The proposed building sits roughly centrally amongst the existing industrial development. The development entails raising the existing ridge of the building

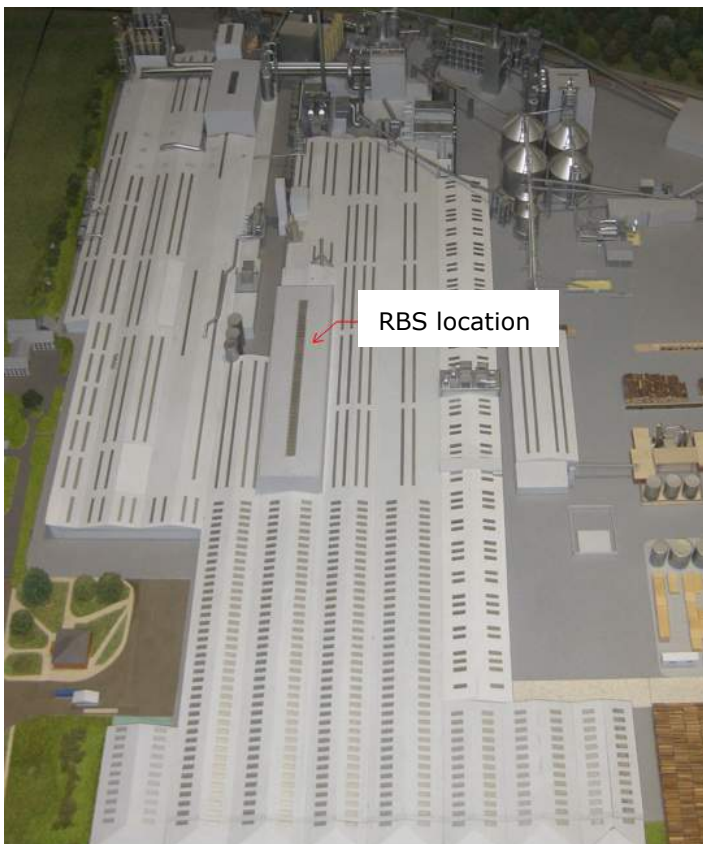
that currently occupies the site. The location of the RBS within the existing factory is indicated in Figure 2.2 below.

Figure 2.2 RBS location within the existing factory.



The proposed warehouse will be approximately 125m x 30m in area. Figure 2.3 shows the new RBS relative to the existing portal frame factory building.

Figure 2.3 Proposed RBS relative to the existing factory.



The floor within the existing building will be reduced by approximately 2m to allow for installation of a piling mat using engineered fill with excavated material being removed off-site. Ground beams

and a suspended slab will be supported on piled foundations which are likely to comprise replacement method such as continuous flight auger (CFA) with finished floor levels approximately 0.8m below the existing floor level.

3. BACKGROUND INFORMATION

3.1 Introduction

Background information has been obtained from an online search of publicly available internet based sources which are referenced individually below, as well as a previous ground investigation report as described in Section 1.1.

3.2 Site History

Prior to the 1970s, the site was greenfield agricultural land and included a 17th century farm house which still forms part of the offices of Kronospan.

The construction of the first factory building commenced in 1971 and the company began operating in 1973. In the late 1980s, the company bought a factory adjacent to the original site. This has since been extended to provide the base for the company's 'Kronoplus' operation.

Aerial imagery from Google Pro shows limited visible evidence of development at the site from 2006 to 2020 with no changes to the proposed development area during this period.

3.3 Geology and Ground Conditions

The British Geological Survey (BGS) Geology of Britain Online Viewer¹ indicates the development is underlain by the following superficial geology:

- Glacial Till - typically cohesive in nature consisting of silt, sand and gravel in a clay matrix shown as underlying much or all of the proposed development area and extending northwards; and
- Glaciofluvial deposits - comprising predominantly sand and gravels near surface within other parts of the Kronospan

Bedrock is indicated as Carboniferous Pennine Lower Coal Measures Formation and Pennine Middle Coal Measures Formation (undifferentiated) which comprises mudstone, siltstone and sandstone.

The Coal Authority interactive map viewer² does not indicate that the proposed development is located within a coal mining reporting area.

3.4 Hydrogeology

DEFRA MAGIC map application³ indicates the bedrock is classified as a Secondary A aquifer.

Although not indicated on the DEFRA MAGIC map, it is anticipated that the glaciofluvial sands and gravels would be classified as a Secondary A aquifer and the glacial till as a Secondary (undifferentiated) aquifer.

The Groundsure.io application⁴ does not indicate that the site is situated within 1 km of a designated groundwater abstraction Source Protection Zone (SPZ).

¹ <https://mapapps.bgs.ac.uk/geologyofbritain/home.html>

² <https://mapapps2.bgs.ac.uk/coalauthority/home.html>

³ <https://magic.defra.gov.uk/magicmap.aspx>

⁴ <https://groundsure.io/#>

3.5 Hydrology

The Llangollen Canal is located approximately 325m west of the proposed RBS development area. The Afon Bradley is located immediately north of the Kronospan site, approximately 500m north of the proposed development area. This is connected to a surface water course to the west of the Llangollen Canal approximately 490m to the northwest of the proposed development at its closest point.

The DEFRA MAGIC database indicates the closest drinking water safeguarding zone for surface water is located west of the Kronospan site to the west of Llangollen Canal.

3.6 Landfill and Waste Management

The Groundsure.io application does not indicate there are any recorded historical or active landfill sites within 500m of the proposed development.

3.7 Environmentally Designated Sites

The DEFRA MAGIC map application indicates that a Site of Special Scientific Interest (SSSI) is located approximately 750m west of the proposed development associated with Chirk Castle.

3.8 Previous Investigations

This section provides a review of the information obtained within the following reports relating to ground conditions and contamination:

- Geotechnics Ltd, October 2017. Kronospan Storage Building Factual Report. Prepared for Kronospan Ltd.

This ground investigation was conducted between 22 August and 8 September 2017 by Geotechnics Ltd under the instruction of Ramboll. A total of eleven (11 No.) boreholes were drilled, three of which (BH08, BH10 and BH11) were located within the existing factory building in a similar area to the proposed RBS development with BH09 located to the south of the RBS, towards the western end. The remainder of the boreholes located in the external yard areas to the northwest of the RBS.

No contamination testing was undertaken during this investigation.

The following is based on BH08, BH10 and BH11 which were drilled to depths of 20.25m (BH10) to 25m (BH8 and BH11).

Monitoring well installations were installed into the exploratory holes, the following provides a summary of the wells installed:

Table 3.1: Summary of Additional Investigation

Location	Strata	Well Screen Depth (m bgl)
BH08	Made ground / glacial lacustrine clay and glaciofluvial gravels	3.0-6.0
BH10	Glacial clay and glaciofluvial gravels	3.0-6.0
BH11	Possible glaciofluvial sand and gravel	2.5-5.5

Ground Conditions

The ground conditions encountered during the Geotechnics 2017 ground investigation are summarised below:

Concrete (0.2m to 0.25m thickness) with reinforcing bar over predominantly gravel sub-base (to 0.60 to 0.70m bgl). Underlying this, made ground was encountered to 2.40m to 3.30m bgl in BH08 and BH11.

- BH08: very stiff sandy slightly gravelly clay (identified as possible made ground)
- BH11: very sandy slightly clayey fine to coarse gravel to 1.3m bgl over very stiff slightly sandy slightly gravelly clay.

No made ground was present underlying the sub-base in BH10.

Underlying superficial deposits were encountered to depths of between 20.25m and 25.0m bgl (base not proved).

Possible glaciolacustrine deposits were encountered in BH11 (2.4-8.5m bgl) comprising sandy very clayey fine to coarse gravels to 3.0m, over very gravelly slightly clayey fine to coarse sand to 5.3m and soft to firm clayey silt to 8.5m.

Glacial Till, which typically comprised laminated silty clay with occasional bands of clayey silt nearer surface, with beds of slightly to very sandy gravel in BH08 and BH10 with a slightly to very silty sand in BH11, and very stiff slightly sandy slightly gravelly clay towards the base of each exploratory hole. Bedrock was not encountered.

No visual or olfactory evidence of contamination was encountered within BH08 to BH11.

Shallow groundwater strikes were encountered as fast inflows in BH08, BH10 and BH11 as follows:

- BH08: encountered at 4.30m bgl rising to 3.30m bgl after 20 minutes in shallow glacial gravels
- BH10: encountered at 4.00m bgl rising to 2.50m bgl after 20 minutes in glacial clay (close to gravels at 4.1m bgl)
- BH11: encountered at 3.30m bgl rising to 2.30m bgl after 20 minutes in possible fluvioglacial sand

Four rounds of groundwater level monitoring were undertaken from 18 September to 12 October 2017 with only limited variation in water levels being recorded:

- BH08: 2.45 to 2.50m bgl (98.63 to 98.68m AOD)
- BH10: 2.20 to 2.30m bgl (98.82 to 98.92m AOD)
- BH11: 2.10 to 2.15m bgl (98.91 to 98.96m AOD)

Ground gas monitoring was also undertaken from 18 September to 12 October with the results for BH08, BH10 and BH11 summarised below:

- Methane (steady state): 0.0 to 0.3%
- Carbon dioxide (steady state): 0.0 to 1.6%
- Oxygen: 7.6 to 20.3%
- Flow rates: 0.0 litres / hour

4. GROUND INVESTIGATION

4.1 Design

Ground investigation for the proposed RBS development was undertaken by Geotechnics Ltd from 23 March to 16 April 2021 to obtain information on the ground and groundwater conditions at the site.

The Ground Investigation Factual Report prepared by Geotechnics Ltd is included as Appendix 1.

4.2 Ground Investigation Activities

The investigation comprised the following items of fieldwork relating to contamination:

Table 4.1: Summary of Additional Investigation

Method	Number	Depth (m bgl)	Reference
Cable percussion	3	7.60 – 23.30	HBW-BH101 to HBW-BH103
Dynamic sampling	5	4.00 – 5.00	HBW-WS101 to HBW-WS105

Monitoring installations to provide information on groundwater levels and ground gas were installed as follows:

Table 4.2: Monitoring Well Installations

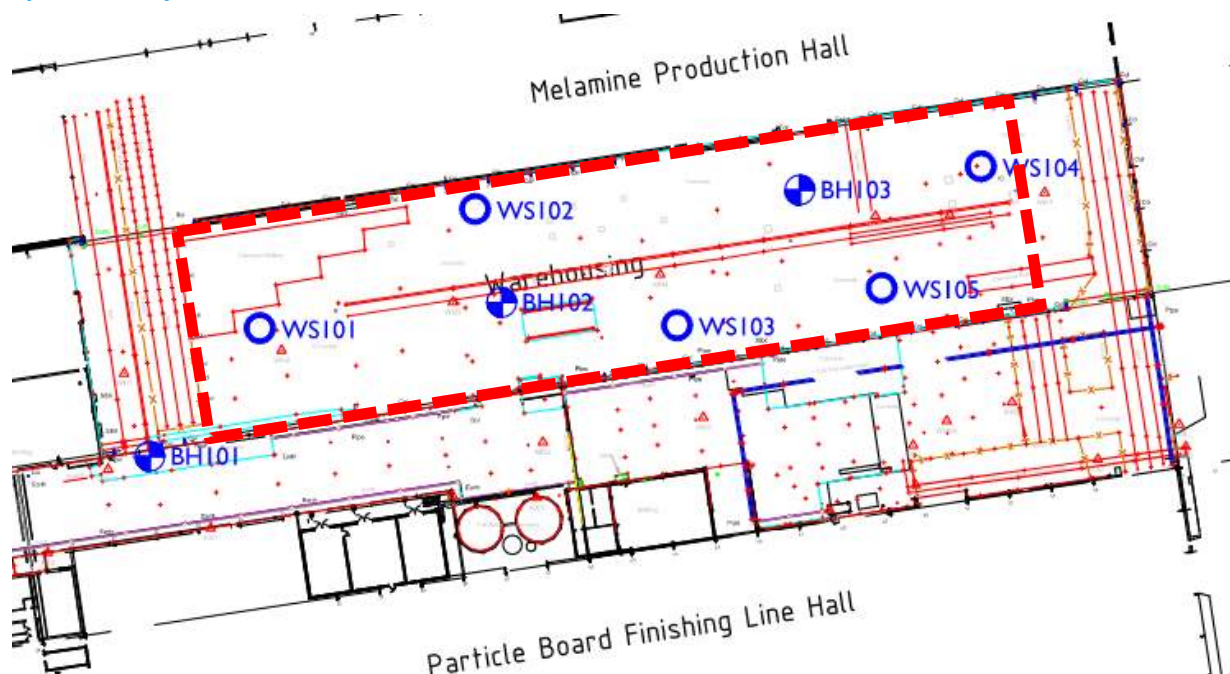
Method	Well Screen Strata	Depth (m bgl)
HBW-BH101	Glacial: Clay / sandy Gravel	3.0-5.0
HBW-BH101	Glacial: Very silty Sand	29.0-34.0
HBW-BH102	Glacial: sandy Clay / gravelly Clay / gravelly Sand	3.0-4.0
HBW-BH102	Glacial: very gravelly very silty Sand	12.7-14.0
HBW-BH103	Glacial: sandy silty Clay / sandy Gravel / silty Clay	18.0-21.0
HBW-WS101	Made ground / gravelly Sand	1.0-3.15
HBW-WS102	Made ground / clayey Sand and Gravel	1.0-3.0
HBW-WS103	Made ground / very sandy clayey Gravel	1.0-4.0
HBW-WS104	Made ground / very sandy clayey gravel	1.0-5.0
HBW-WS105	Sandy Silt / slightly gravelly Sand	4.0-6.45

Sampling and In-situ testing comprised of:

- Three Permeability Tests carried out in standpipes installed in Dynamic Sample boreholes; and
- Soil sampling for contamination and geotechnical laboratory testing.

The exploratory hole/pit locations and elevations were all surveyed. The exploratory hole locations are shown in Figure 4.1 and also in the Factual Report in Appendix 1.

Figure 4.1: 2021 Ground Investigation Exploratory Hole Location Plan (approximate development area indicated by dashed line)



4.3 Laboratory Analysis – Contamination

Samples for chemical testing were sent to Derwentside Environmental Testing Services (DETS) in Consett, County Durham who are a UKAS⁵ accredited laboratory. Schedules for chemical testing were prepared by Ramboll. The analytical results, together with details of the testing methods are included in Appendix 1.

The analytical suites for soil were developed on the basis of the previous and existing site uses.

4.3.1 Soil

A total of 19 no. soil samples were tested for parameters from the following suite:

- Metals (see list below)⁶;
- pH;
- Water soluble sulphate;
- Total organic carbon;
- USEPA⁷ speciated 16 polycyclic aromatic hydrocarbons (PAHs); and
- Petroleum hydrocarbons – as TPHCWG⁸.

In addition, the following testing was scheduled on selected soil samples:

⁵ United Kingdom Accreditation Service

⁶ Metals suite: arsenic, antimony, barium, boron, cadmium, chromium (III and VI), copper, lead, mercury, nickel, selenium, zinc and vanadium

⁷ United State Environmental Protection Agency

⁸ Total Petroleum Hydrocarbon Criteria Working Group

- Asbestos screening on 13 no. samples;
- Volatile organic compounds (VOCs) + tentatively identified compounds on 6 no. samples;
- Semi-volatile organic compounds (SVOCs) + tentatively identified compounds on 6 no. samples; and
- Formaldehyde on 10 no. samples

Groundwater

Groundwater sampling was undertaken initially in two phases due to access constraints and limited presence of groundwater in monitoring wells; 27 April and 7 May 2021.

Groundwater samples were obtained from the following wells:

- HBW-BH101 to HBW-BH103 (shallow and deep wells)
- HBW-WS102
- HBW-WS105

HBW-WS103 was dry and HBW-WS101 (both installed into made ground and fluvioglacial deposits) had insufficient water for sampling. HBW-WS104 was found to have been damaged and so water samples could not be retrieved from this well.

Groundwater samples were scheduled for the following testing:

- Metals (see list for soils);
- pH;
- Sulphate;
- Total organic carbon;
- PAHs;
- Petroleum hydrocarbons – as TPHCWG;
- Ammoniacal nitrogen;
- Electrical conductivity;
- Hardness; and
- Formaldehyde.

In addition, the following testing was scheduled on selected water samples:

- VOCs and SVOCs + tentatively identified compounds on 5 no. samples.

As only a limited water sample was recovered from HBW-WS102 on the 27 April 2021, only petroleum hydrocarbons and VOCs could be tested from this water sample. Therefore, HBW-WS102 was subsequently re-sampled on the 7 May 2021 which allowed for sufficient water to be obtained to undertake the full proposed chemical testing suite.

Based on chemical testing results obtained from the initial testing at HBW-BH102 which identified the presence of petroleum hydrocarbons in samples from the shallow and deep monitoring well, further water samples were obtained from both of these wells on 16 June 2021 for additional chemical testing. The results have been discussed in Section 6.3.2.

4.4 Groundwater and Ground Gas Monitoring

Four rounds of monitoring to measure gas and groundwater levels have been undertaken by Geotechnics in April and May 2021.

The following parameters were recorded:

- Methane (%);
- Carbon dioxide (%);
- Oxygen (%);
- Carbon monoxide (ppm);
- Hydrogen sulphide (ppm);
- Gas flow rate (l/hr);
- Atmospheric pressure (m bar);
- Depth to water (m bgl); and
- Free product (light non-aqueous phase liquids).

Ground gas and groundwater monitoring and records are presented in the Factual Report in Appendix 1.

Soil arisings were screened by Geotechnics for volatile vapours using a photo-ionisation detector (PID).

5. GROUND CONDITIONS

5.1 Ground Conditions Encountered

An overview of the ground conditions encountered during the 2021 investigation undertaken by Geotechnics has been provided below. A full description of the ground conditions has been provided on the exploratory hole logs within the Factual Report in Appendix 1.

Table 5.1: Summary of Ground Conditions

Stratum	Thickness (Range)	Notes
Made Ground	2.0-2.7m	Ground surface is concrete. Made Ground typically described as clayey sandy Gravel to clayey gravelly Sand.
Fluvio-Glacial Deposits (FG)	1.1-2.9m	Typically described as a loose to medium dense clayey gravelly Sand to clayey sandy Gravel
Glacio-Lacustrine Deposits (GLD)	Up to 3.4m, locally absent	Typically described as soft to firm gravelly sandy Clay.
	7.5-13.2m	Typically described as very soft to soft, occasionally firm to stiff, gravelly sandy Clay to sandy clayey Silt.
Granular Glacial Till – Upper (GTG-U)	1.4-8.3m	Typically described as medium dense to very dense silty sandy Gravel to silty gravelly Sand with some cobbles. Varies in thickness – especially toward centre of site where the top of the stratum was encountered ~5m above the adopted design level.
Glacial Till (GTC)	9.4-10.1m where base proved	Typically described as stiff becoming very stiff to hard, sandy gravelly Clay. Base proved in HBW-BH101 and HBW-BH103.
Granular Glacial Till – Lower (GTG-L)	Base not proved	Very dense slightly gravelly, silty Sand (HBW-BH101 and HBW-BH103).

5.1.1 Ground Surface

Concrete was present at the ground surface in all exploratory holes to depths ranging from 0.05 to 0.31 m bgl. Underlying this is sub-base to depths of 0.5m (HBW-WS105) to 1.8m bgl (HBW-BH103) which comprises sandy silty Gravel, with gravels of mudstone, sandstone, limestone, concrete and granite or very gravelly Sand.

5.1.2 Made Ground

Made ground was encountered in all exploratory holes during the 2021 investigation up to 2.7m bgl.

The made ground was noted as comprising variable clay, silt sand and gravel content as follows:

- Gravelly clayey fine to medium Sand;
- Very sandy clayey Gravel;
- Very silty Sand and Gravel;

- Slightly sandy slightly gravelly Clay;
- Slightly clayey Gravel;
- Very sandy clayey or very clayey with gravel; or
- Slightly gravelly sandy silty Clay.

Gravels comprised mudstone, siltstone, sandstone and concrete. Cobbles were noted on the exploratory hole logs within the made ground in HBW-WS102, HBW-WS103 and HBW-WS105.

Fluvioglacial Deposits

The Fluvioglacial deposits were encountered as interbedded layers, within the upper portion of the Glacio-Lacustrine Deposits, underlying the made ground. They were typically described as loose to medium dense, occasionally very loose or dense, clayey gravelly Sands to clayey sandy Gravels. Gravels consisted of fine to coarse grained mudstones, siltstones and sandstones.

Glacio-Lacustrine Deposits

Glacio-Lacustrine Deposits were encountered in all boreholes within the development area. The shallower layers were interbedded with fluviglacial deposits to ~95.0m OD and was typically described as a soft to firm gravelly sandy Clay. Below 95.0m OD, the Glacio-Lacustrine Deposits were more uniform and typically described as a very soft to soft, occasionally firm, slightly gravelly, silty Clay. Laminations of clayey Silt were frequently described.

Granular Glacial Till -Upper

The Granular Glacial Till – Upper stratum was encountered underlying the Glacio-Lacustrine Deposits in all cable percussion boreholes. It was typically described as a medium dense to very dense sandy Gravel to gravelly Sand. The gravel consisted of sub angular to rounded fine to coarse grained siltstone, mudstone and sandstone fragments. A low cobble content was described in some boreholes.

Glacial Till

The Glacial Till was encountered in seven of the nine cable percussion boreholes within the development area. It was typically described as a stiff to very stiff gravelly sandy Clay. Gravels consisted of fine to coarse sub angular to rounded mudstone, siltstone and sandstone. Laminae were described in some of the boreholes.

The base of the stratum was only proven in two boreholes at 70.5m OD and 71.5m OD.

Granular Glacial Till -Lower

The Granular Glacial Till – Lower stratum was encountered underlying the Glacial Till in HBW-BH101 and HBW-BH103. It was typically described as a very dense slightly gravelly, very silty Sand. The base of this stratum was not proven.

5.2 Groundwater

The following groundwater strikes were encountered during the ground investigation as shown in Table 5.2.

Table 5.2: 2021 Investigation Groundwater Strikes

Exploratory Hole	Water Strike (rise after 20 mins) (m bgl)	Strata for Water Strike *
HBW-BH101	3.5 (2.8) 29.5 (28.5)	Glacial clay (GLD) Glacial sand (GTG-L)
HBW-BH102	3.0 (2.5)	Glacial clay (GLD)
HBW-BH103	2.5 (2.0) 30.3 (28.5)	Glacial sandy gravel (FG) Glacial sand (GTG-L)
HBW-WS101	2.5 (2.0)	Glacial gravelly sand FG)
HBW-WS102	2.0 (1.6)	Glacial sand and gravel (FG)
HBW-WS103	2.0 (1.8)	Made ground
HBW-WS104	2.9	Glacial very sandy gravel (FG)
HBW-WS105	4.0 (2.5)	Glacial sand (FG)
* Refer to Table 5.1 for strata abbreviations		

The groundwater level monitoring results have been summarised in Table 5.3.

Table 5.3: 2021 Investigation Groundwater Monitoring Data

Exploratory Hole	Strata	Monitoring Well Depth (m bgl)	Monitoring Dates			
			m bgl (m AOD)			
			27/04/ 2021	06/05/ 2021	14/05/ 2021	19/05 / 2021
HBW-BH101 (shallow)	Clay / sandy Gravel (GLD / FG)	3.0-5.0	2.02 (98.99)	2.10 (98.91)	2.05 (98.96)	2.10 (98.91)
HBW-BH101 (deep)	Very silty Sand (GTG-L)	29.0-34.0	15.45 (85.56)	15.10 (85.91)	15.25 (85.76)	15.12 (85.89)
HBW-BH102 (shallow)	sandy Clay / gravelly Clay / gravelly Sand (GLD / FG)	3.0-4.0	2.02 (98.98)	2.07 (98.93)	2.00 (99.00)	1.99 (99.01)
HBW-BH102 (deep)	very gravelly very silty Sand (GTG-U)	12.7-14.0	8.65 (92.35)	8.74 (92.26)	8.72 (92.28)	8.83 (92.17)
HBW-BH103	sandy silty Clay / sandy Gravel / silty Clay (GTG-U / GTC)	18.0-21.0	-	8.75 (92.05)	-	-
HBW-WS101	Made ground / gravelly Sand (MG / FG)	1.0-3.15	2.05 (98.96)	2.28 (98.73)	Dry	Dry
HBW-WS102	Made ground / clayey Sand and Gravel (MG / FG)	1.0-3.0	2.22 (98.78)	2.25 (98.75)	-	-

Exploratory Hole	Strata	Monitoring Well Depth (m bgl)	Monitoring Dates m bgl (m AOD)			
			27/04/ 2021	06/05/ 2021	14/05/ 2021	19/05 / 2021
HBW-WS103	Made ground / very sandy clayey Gravel (MG / FG)	1.0-4.0	Dry	Dry	Dry	Dry
HBW-WS105	Sandy Silt / slightly gravelly Sand (FG / GLD)	4.0-6.45	2.04 (98.96)	2.02 (98.98)	2.00 (99.00)	1.98 (99.02)
Monitoring well at HBW-WS104 has been damaged: unable to monitor.						

The groundwater monitoring indicates that there are potentially three separate groundwater bearing strata underlying the site associated with the made ground / fluvioglacial deposits, and the upper and lower granular Glacial Till separated by the cohesive Glacial Till.

Assessment of the groundwater flow directions by Ramboll for shallow wells installed into the made ground / fluvioglacial deposits in HBW-BH101, HBW-BH102, HBW-WS101, HBW-WS102 and HBW-WS105 based on the monitoring data provided above indicates that water flow was approximately northwards during the first round on the 27 April 2021 and north westerly during the second round on the 6 May 2021.

5.3 Visual and Olfactory Observations of Potential Contamination

The following olfactory evidence of contamination was noted in soil arisings during the ground investigation.

Table 5.3: 2021 Investigation Field Evidence of Potential Contamination

Exploratory Hole	Depth (m bgl)	Description
HBW-BH102	1.4-2.2	Made ground: slight hydrocarbon odour
	2.2-6.0	Glacial clay, sand and gravel: slight hydrocarbon odour
HBW-WS102	1.0-2.0	Made ground: slight hydrocarbon odour

No specific visual evidence of asbestos containing materials was noted by Geotechnics in arisings during the ground investigation.

An oily sheen was recorded by Geotechnics on groundwater from the shallow well in HBW-BH102 and in HBW-WS102 during water level monitoring on the 6 May 2021 although no floating free product was recorded during monitoring using an interface probe.

Drilling was suspended in HBW-BH101 at 3.45m bgl (sandy clay which overlies over a sandy gravel) and HBW-BH102 at 3.0m bgl (sandy clay) due to the contractor observing 'ground gas exiting these boreholes during drilling'. At both locations this was encountered at a similar depth to groundwater strikes and overlain by cohesive strata providing a confining layer.

Drilling resumed once monitoring was undertaken using a landfill gas analyser to confirm that flammable gases were not present. In HBW-BH101 and HBW-BH102 this appears to relate to

presence of ground gas flow, with no methane or carbon dioxide encountered above the lower instrument detection limit by Geotechnics during the site works.

6. GROUND CONTAMINATION – GENERIC QUANTITATIVE RISK ASSESSMENTS

6.1 Introduction

The results of the contamination testing from the ground investigation have been screened against the following generic assessment criteria (GAC) to allow for the interpretation of soil and groundwater chemical analyses:

- Human Health: Assessment criteria for a 'commercial' land use derived using data from Suitable 4 Use Levels (S4ULs) prepared by LQM/CIEH (2014)⁹ and DEFRA Category 4 Screening Levels (C4SLs) for Land Affected by Contamination¹⁰. The use of criteria for a 'commercial' land use is based on the low sensitivity of the proposed development and on-going industrial use of the site.
- Water Quality: Drinking Water Standards have been adopted as the primary criteria for assessing water quality based on the presence of various aquifers beneath and adjacent to the development area. Comparison has also been made against the published Environmental Quality Standards (EQS) for fresh water (specific pollutants) and inland surface waters (priority substances based on annual average EQS (AA-EQS) and maximum admissible concentration EQS (MAC-EQS)) or lower analytical detection limits where Drinking Water Standards are not available.
- Ground Gas: Health and Safety Executive in Workplace Exposure Limits HSE EH40/2005.

The assessment criteria outlined above for human health and water quality have been used to provide an initial screen of chemical test results and it is likely these assessment criteria will be conservative, particularly the use of published water quality standards. The findings from the assessment are shown below.

6.2 Human Health Assessment

6.2.1 Soil Contamination

The concentrations of all metals tested are below their respective assessment criteria for a commercial land use.

Concentrations of 'total' petroleum hydrocarbons (as sum of the aliphatic and aromatic TPHCWG fractions) were below the lower analytical detection limit in 16 no. of the samples tested.

Petroleum hydrocarbons were present in soil samples obtained from HBW-BH102 and HBW-WS102 as follows:

- HBW-BH102 at 2m: 2,400 mg/kg comprising C16-C35 aliphatics and C16-C35 aromatics (results are predominantly from the C21-C35 fractions)
- HBW-WS102 at 1.0m: 2,220 mg/kg comprising C8-C35 aliphatics and C10-C35 aromatics (results are predominantly from the C21-C35 fractions)
- HBW-WS102 at 2.0m: 2,900 mg/kg comprising C10-C35 aliphatics and C10-C35 aromatics (results are predominantly from the C21-C35 fractions)

⁹ Based on a sandy soil comprising 1% soil organic matter

¹⁰ C4SLs are based on a low level of toxicological concern (LLTC) for six contaminants; arsenic, benzene, benzo(a)pyrene, cadmium, chromium and lead. DEFRA have indicated that C4SLs are intended to be more pragmatic (whilst still strongly precautionary) compared to existing generic screening levels outlined above. C4SLs have been used where these particular contaminants exceed their respective GAC – the C4SL has been used for lead as it does not have an existing published GAC.

None of the results for aliphatic and aromatic fractions from the TPHCWG testing exceed their respective assessment criteria for a commercial land use.

No asbestos was identified by the laboratory on the samples screened. No visual evidence of asbestos was noted during the ground investigation.

Results for PAHs, VOCs and SVOCs were all below their respective lower analytical detection limit. Low concentrations of formaldehyde were obtained from two soil samples; 0.4 mg/kg from glacial clay in HBW-WS101 at 3.0m bgl and glacial sand in 1.4 mg/kg from HBW-WS105 at 3.0m bgl.

The current and future potential for exposure by workers to soil contaminants is considered low based on the existing and proposed presence of a concrete floor following construction.

Generic assessment criteria have not been published for construction workers for soil contaminants. The presence of contaminants can represent a risk to construction workers during excavations given their exposure to soils.

6.3 Groundwater Contamination

6.3.1 Inorganic Contaminants

No exceedances of the Drinking Water Standards have been obtained for inorganic contaminants in groundwater.

The result for copper (2.9 µg/l) in shallow groundwater from shallow glacial sand in HBW-WS105, the shallow (1.6 µg/l) and deep (1.1 µg/l) wells in HBW-BH101 and HBW-BH03 (1.3 µg/l) slightly exceeds the bioavailable long term mean EQS of 1 µg/l.

One exceedance of the bioavailable EQS for zinc (12.3 µg/l) from the deep monitoring well in HBW-BH101 at 68 µg/l. This well was installed into glacial sand from 29.0m to 34.0m bgl.

Potential metal bioavailability has been assessed for copper and zinc in groundwater using the Metal Bioavailability Assessment Tool (M-BAT) prepared by the Water Framework Directive UK Technical Advisory Group (2014)¹¹. The results from the M-BAT assessment indicate the calculated bioavailable concentration for copper would not exceed the bioavailable long term mean EQS. The result for zinc from the deep monitoring well in HBW-BH101 (13.1 µg/l after subtracting the background from the test results) marginally exceeds the bioavailable long term mean EQS (12.3 µg/l).

None of the results for ammoniacal nitrogen (as N) exceed the drinking water standard of 0.5 mg/l as ammonium (NH₄).

None of the groundwater results exceeded the 'high' standard EQS for rivers for total Ammonia (as N) based on an assumed water temperature of 12 °C and using the pH obtained for each sample from chemical testing. As increasing water temperature (along with pH) is one of the main factors that influence equilibrium between un-ionised and ionised ammonia and result in increased ammonia concentrations. Increasing the water temperature to 20 °C in the assessment still did not result in any exceedances.

¹¹ <https://www.wfduk.org/sites/default/files/Media/Environmental%20standards/MBAT%20UKTAG%20Method%20Statement.pdf>

6.3.2 Organic Contaminants

Low concentrations of polyaromatic hydrocarbons (USEPA 16 compounds) were encountered within water samples from HBW-WS102, HBW-BH101 and HBW-BH102. None of the results for PAHs exceed the Drinking Water Standards.

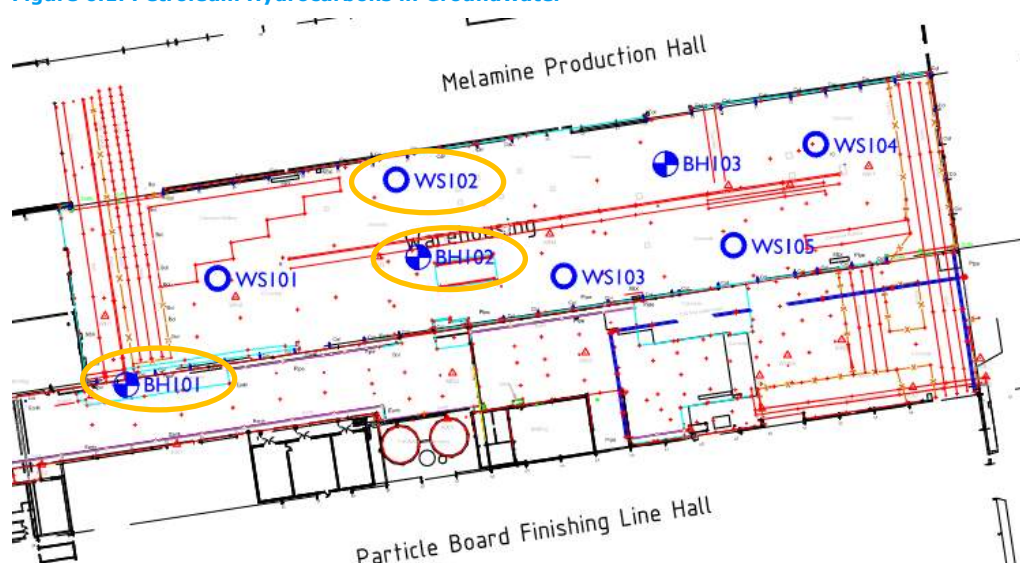
Fluoranthene in HBW-WS102 (0.33 µg/l) slightly exceeds the MAC-EQS of 0.12 µg/l. Fluorene, phenanthrene, pyrene and benzo(a)anthracene were also present at low concentrations within samples from HBW-WS102, HBW-BH101 (both wells) and HBW-BH102 although no water quality standards have been published for these contaminants.

The results for petroleum hydrocarbons (TPHCWG aliphatic and fractions) were below the lower detection limits in HBW-WS105. Results for petroleum hydrocarbons above the lower detection limit were obtained from glacial deposits in HBW-WS102, HBW-BH101 shallow well, and HBW-BH102 shallow and deep wells. The results have been summarised below.

Table 6.1: Petroleum Hydrocarbons in Groundwater

Hydrocarbons	HBW-WS102 (µg/l)	HBW-BH102 (s) (µg/l)	HBW-BH102 (d) (µg/l)	HBW-BH101 (s) (µg/l)
C10-12 Aliphatic	<1	<1	<1	<1
C12-C16 Aliphatic	<1	<1.0	<1.0	5.3
C16-C21 Aliphatic	3.7	<1.0	<1.0	8.0
C21-C35 Aliphatic	500	120	93	68
C10-12 Aromatic	<1	<1	<1	<1
C12-16 Aromatic	<1	<1	<1	<1
C16-21 Aromatic	12	<1.0	<1.0	1.8
C21-C35 Aromatic	990	110	90	47
Total (as sum of aliphatic / aromatic)	1,500	230	180	130
(s) = shallow well, (d) = deep well				

The following figure shows the locations where petroleum hydrocarbons have been identified in groundwater samples from the 2021 ground investigation.

Figure 6.1: Petroleum Hydrocarbons in Groundwater

Additional sampling and testing was undertaken at HBW-WSI02 due to limited sample being obtained from the first round. The results for petroleum hydrocarbons were below detection from the second round of testing.

Additional sampling and testing was also undertaken from the shallow and deep monitoring wells at HBW-BH102 to confirm the results for petroleum hydrocarbons from the first round of testing. The results obtained for petroleum hydrocarbons from the second set of samples have been summarised below.

Table 6.2: Petroleum Hydrocarbons in Groundwater from HBW-BH102 (16 June 2021)

Hydrocarbons	HBW-BH102 (s) (µg/l)	HBW-BH102 (d) (µg/l)
C10-12 Aliphatic	<1	360
C12-C16 Aliphatic	<1	15
C16-C21 Aliphatic	<1	<1.0
C21-C35 Aliphatic	<1	2.6
C10-12 Aromatic	<1	150
C16-21 Aromatic	<1	9.7
C21-C35 Aromatic	<1	6.0
Total (as sum of aliphatic / aromatic	<10	550

The additional testing did not identify petroleum hydrocarbons in the shallow well in the fluvio-glacial and glaciolacustrine deposits from HBW-BH102, but higher concentrations (550 µg/l) were obtained from the deeper well in the upper granular Glacial Till than from the first round of testing. The highest concentrations from HBW-BH102 were from the C10-C12 aliphatic and aromatic fractions which were below detection during the first round of testing. PAHs were all below the lower detection limit.

No UK water quality standards have been published for petroleum hydrocarbons.

The World Health Organization (WHO) provided guidelines for petroleum products in drinking water in 2008 for a number of hydrocarbon fractions which have been used for comparison purposes. No values have been provided for the C16-C35 aliphatic fractions, but results obtained from HBW-WS102 and HBW-BH102 exceed the WHO guide value of 90 µg/l for the C21-C35 aromatic fractions.

The results obtained from the second round of testing HBW-BH102 for C10-C12 aliphatic and aromatic fractions both exceed the WHO guide values of 300 µg/l and 90 µg/l respectively.

An oily sheen was recorded by Geotechnics on groundwater from the shallow well in HBW-BH102 and in HBW-WS102 during water level monitoring on the 6 May 2021.

Slight hydrocarbon odours were identified in soil arisings during the site works from made ground and shallow glacial deposits from 1.4m to 6.0m bgl in HBW-BH012 with a hydrocarbon sheen noted on groundwater from the shallow well. No evidence of contamination was encountered in deeper strata or groundwater from the deeper well in HBW-BH102. Glacial clay (7.5m in thickness) is present between the shallow and deeper wells and water level monitoring does not indicate they are likely to be in hydraulic connection.

Formaldehyde in groundwater was encountered in upper granular Glacial Till from HBW-BH103 and HBW-BH102 (second round of testing in June 2021) at 29 µg/l and 23 µg/l respectively which would exceed the annual average EQS (5 µg/l) but not the maximum allowable concentration EQS (50 µg/l) permitting standards for freshwaters in England.

The results for VOCs and SVOCs in groundwater were all below the lower detection limits.

7. GROUND GAS RISK ASSESSMENT

7.1 Methodology

The results of the gas monitoring have been assessed using guidance provided within BS8485:2015+A1:2019¹² although this guidance is based on considering risks to new buildings rather than existing buildings, it has been used to screen the results to provide an indication of whether further detailed assessment could be required.

7.2 Ground Gas During Site Works

As indicated in Section 5.3, flow of gas from the ground water encountered during drilling within HBW-BH101 at 3.45m bgl and HBW-BH103 at 3.0m bgl both within superficial deposits.

Monitoring of the gas arising from the borehole was undertaken by the contractor to confirm whether flammable gases were present. At both locations methane or carbon dioxide was not encountered above the lower instrument detection limit, with the following results obtained for oxygen and carbon monoxide:

- HBW-BH101: 12% oxygen and 4 ppm carbon monoxide.
- HBW-BH102: 19.4% oxygen and 1 ppm carbon monoxide.

7.3 Ground Gas Monitoring Data

Results from four rounds of gas monitoring undertaken in April and May 2021 have been summarised in the following table for wells installed during the Geotechnics ground investigation.

Gas screening values (GSV) have been derived for methane and carbon dioxide based on peak gas results and steady state flow rates in accordance with guidance provided in BS8485:2015+A1:2019 and BS8576:2013¹³. Where results are below the lower detection limit, these have been set at the detection limit (e.g. 0.1% for methane and carbon dioxide and 0.1 litres / hour for flow rates).

The monitoring sheets are provided in Appendix 1.

¹² BS8485:2015+A1:2019. Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings

¹³ BS8576:2013. Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs)

Table 7.1: Ground Gas Monitoring Data

Well ID	Well Response Zone (m bgl)	Date	Water Depth (m bgl)	Methane (% v/v)		Carbon Dioxide (%)		Flow Rate (l/hr)		Oxygen (%)		Hydrogen Sulphide (ppm)	Carbon Monoxide (ppm)	Methane - GSV (l/hr)	Carbon Dioxide GSV (l/hr)
				Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady				
HBW-BH101 (s)	3.0-5.0	27/04	2.02	0.0	0.0	0.2	0.1	0.0	0.0	21.3	21.2	0.0	0.0	<0.0001	0.0001
		06/05	2.10	0.0	0.0	0.4	0.4	-7.7	-5.6	20.4	20.4	1.0	0.0	-0.0056	-0.0224
		14/05	2.05	0.0	0.0	0.6	0.6	4.2	4.2	20.7	17.7	1.0	1.0	0.0042	0.0252
		19/05	2.10	0.0	0.0	0.7	0.7	0.0	0.0	20.7	15.8	0.0	1.0	<0.0001	0.0007
HBW-BH101 (d)	29.0-34.0	27/04	15.45	0.0	0.0	0.9	0.9	0.0	-1.7	20.5	17.2	0.0	5.0	-0.0017	-0.0153
		06/05	15.10	0.0	0.0	0.6	0.6	0.0	-1.7	20.3	18.3	1.0	2.0	-0.0017	-0.0102
		14/05	15.25	0.1	0.0	0.5	0.5	-0.4	-0.4	20.6	18.8	1.0	3.0	-0.0004	-0.002
		19/05	15.12	0.0	0.0	0.7	0.6	0.0	0.0	20.2	18.5	1.0	2.0	<0.0001	0.0006
HBW-BH102 (s)	3.0-4.0	27/04	2.02	0.0	0.0	0.5	0.4	-0.2	-0.2	20.9	18.9	0.0	0.0	-0.0002	-0.0008
		06/05	2.07	0.0	0.0	0.4	0.4	0.1	0.1	20.5	9.3	0.0	0.0	<0.0001	0.0004
		14/05	2.00	0.1	0.1	0.8	0.8	1.9	1.8	20.4	16.8	1.0	1.0	0.0018	0.0144
		19/05	1.99	0.0	0.0	0.7	0.7	0.0	0.0	20.7	17.6	0.0	1.0	<0.0001	0.0007
HBW-BH102 (d)	12.7-14.0	27/04	8.65	0.0	0.0	9.2	9.2	0.0	0.0	1.1	3.0	0.0	2.0	<0.0001	0.0092
		06/05	8.74	0.0	0.0	10.1	10.1	0.0	0.0	20.6	3.4	1.0	1.0	<0.0001	0.0101
		14/05	8.72	0.1	0.0	9.5	9.5	0.2	0.2	20.5	14.2	1.0	1.0	0.0002	0.019
		19/05	8.83	0.0	0.0	11.5	11.5	0.0	0.0	20.6	2.1	1.0	0.0	<0.0001	0.0115
HBW-BH103	18.0-21.0	27/04	-	-	-	-	-	-	-	-	-	-	-	-	-
		06/05	8.75	0.0	0.0	1.1	0.8	0.0	0.0	20.9	2.5	0.0	0.0	0	0.0008
		14/05	8.75	0.0	0.0	1.1	0.8	0.0	0.0	20.9	2.5	1.0	0.0	0	0.0008
		19/05	-	-	-	-	-	-	-	-	-	-	-	-	-

Well ID	Well Response Zone (m bgl)	Date	Water Depth (m bgl)	Methane (% v/v)		Carbon Dioxide (%)		Flow Rate (l/hr)		Oxygen (%)		Hydrogen Sulphide (ppm)	Carbon Monoxide (ppm)	Methane - GSV (l/hr)	Carbon Dioxide GSV (l/hr)
				Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady				
HBW-WS101	1.0-3.15	27/04	2.05	0.0	0.0	6.0	6.0	0.0	0.0	20.5	14.8	0.0	0.0	<0.0001	0.006
		06/05	2.28	0.0	0.0	1.9	1.9	0.0	0.0	20.5	18.8	1.0	0.0	<0.0001	0.0019
		14/05	Dry	0.0	0.0	4.6	4.6	0.1	0.1	20.5	15.7	1.0	0.0	<0.0001	0.0046
		19/05	Dry	0.0	0.0	3.1	3.1	0.0	0.0	20.6	18.1	0.0	0.0	<0.0001	0.0031
HBW-WS102	1.0-3.0	27/04	2.22	0.0	0.0	7.5	7.4	0.0	0.0	20.5	10.5	0.0	0.0	<0.0001	0.0074
		06/05	2.25	0.0	0.0	7.5	7.5	0.0	0.0	21.1	12.2	0.0	0.0	<0.0001	0.0075
		14/05	-	-	-	-	-	-	-	-	-	-	-	-	-
		19/05	-	-	-	-	-	-	-	-	-	-	-	-	-
HBW-WS103	1.0-4.0	27/04	Dry	0.0	0.0	1.3	1.3	0.0	0.0	20.9	19.7	0.0	0.0	<0.0001	0.0013
		06/05	Dry	0.0	0.0	1.3	1.3	0.0	0.0	20.0	9.5	0.0	0.0	<0.0001	0.0013
		14/05	Dry	0.1	0.0	1.1	1.1	0.0	0.0	20.7	19.5	1.0	0.0	<0.0001	0.0011
		19/05	Dry	0.0	0.0	0.6	0.6	0.0	0.0	20.8	20.4	0.0	0.0	<0.0001	0.0006
HBW-WS104	1.0-5.5	27/04	-	-	-	-	-	-	-	-	-	-	-	-	-
		06/05	-	0.0	0.0	2.5	2.2	0.0	0.0	20.7	8.8	0.0	0.0	<0.0001	0.0022
		14/05	-	0.0	0.0	2.3	2.2	0.0	0.0	20.7	18.8	0.0	0.0	<0.0001	0.0022
		19/05	-	-	-	-	-	-	-	-	-	-	-	-	-
HBW-WS105	4.0-6.45	27/04	2.04	0.0	0.0	0.2	0.2	0.0	0.0	21.1	21.1	0.0	0.0	<0.0001	0.0002
		06/05	2.02	0.0	0.0	0.5	0.3	-4.5	-3.9	20.7	20.7	0.0	1.0	-0.0039	-0.0117
		14/05	2.00	0.0	0.0	0.3	0.3	0.0	0.0	20.9	20.7	1.0	1.0	<0.0001	0.0003
		19/05	1.98	0.0	0.0	0.3	0.3	0.0	0.0	20.7	20.7	0.0	0.0	<0.0001	0.0003
(s) = shallow well, (d) = deep well, - no monitoring data															

The monitoring results and GSV obtained from HBW-BH101 to HBW-BH103 and HBW-WS105 have not been considered further within the assessment as the well screens were flooded by groundwater during each of the monitoring rounds and, therefore, the data for ground gases and flow rates is unlikely to be representative of the ground gas regime.

The GSV derived for methane and carbon dioxide are all <0.07 litres / hour (Characteristic Situation 1) in BS8485:2015+A1:2019 which is indicative of a very low hazard from ground gas.

Slightly higher peak results for carbon dioxide (>5%) have been obtained from HBW-WS101 (6%) during the first round of monitoring and both monitoring rounds in HBW-WS102 (7.5%). The carbon dioxide in HBW-WS102 could be associated with the presence of petroleum hydrocarbons which was encountered in soils and shallow groundwater.

Workplace Exposure Assessment

The gas monitoring results for carbon dioxide, carbon monoxide and hydrogen sulphide have been assessed against the short term and long term workplace exposure limits as indicated by the Health and Safety Executive in Workplace Exposure Limits HSE EH40/2005.

The results of this assessment for shallow wells installed into HBW-WS101 to HBW-WS104 are summarised in Table 7.2

Table 7.2: Summary of Gas Monitoring Assessment

Substance	Long Term Workplace Exposure Limit (8-hour TWA reference period - ppm)	Short Term Workplace Exposure Limit (15-minute reference period - ppm)	No. of wells with Long Term Exceedances	No. of Wells with Short Term Exceedances	Comments
Carbon Monoxide	30	200	0	0	No exceedances
Hydrogen Sulphide	5	10	0	0	No exceedances
Carbon Dioxide	5000 (0.5%)	15000 (1.5%)	4	3	HBW-WS101, HBW-WS102 and HBW-WS104

Exceedances of the short term and long term workplace exposure assessment limits for carbon dioxide have been recorded from shallow monitoring wells.

Oxygen deficiency (<19.5% as indicated in BS6164:2019) has also been encountered in shallow well installed into HBW-WS101 to HBW-WS104.

No exceedances of the lower explosive limit (5%) have been obtained for methane and results were at or below the lower instrument detection limit (<0.1%).

7.4 Volatile Vapours

The following results have been obtained from volatile vapour monitoring using a PID during the ground gas monitoring visits.

Table 7.3: Summary of Results for Volatile Vapours from Monitoring Wells

Well ID	Well Response Zone (m bgl)	Date	Water Depth (m bgl)	Peak (ppm)	Steady (ppm)
HBW-BH101 (s)	3.0-5.0	27/04	2.02	6.0	1.9
		06/05	2.10	4.8	1.1
		14/05	2.05	5.6	1.5
		19/05	2.10	3.7	1.3
HBW-BH101 (d)	29.0-34.0	27/04	15.45	8.3	7.5
		06/05	15.10	8.3	7.5
		14/05	15.25	8.4	8.1
		19/05	15.12	8.0	7.7
HBW-BH102 (s)	3.0-4.0	27/04	2.02	3.6	3.5
		06/05	2.07	3.6	3.6
		14/05	2.00	3.5	3.5
		19/05	1.99	3.4	3.2
HBW-BH102 (d)	12.7-14.0	27/04	8.65	2.3	0.7
		06/05	8.74	0.8	0.8
		14/05	8.72	0.9	0.8
		19/05	8.83	1.1	0.5
HBW-BH103	18.0-21.0	27/04	-	-	-
		06/05	8.75	2.8	2.8
		14/05	8.75	2.8	2.8
		19/05	-	-	-
HBW-WS101	1.0-3.15	27/04	2.05	1.8	0.6
		06/05	2.28	0.4	2.0
		14/05	Dry	1.7	0.5
		19/05	Dry	1.4	0.6
HBW-WS102	1.0-3.0	27/04	2.22	1.1	1.1
		06/05	2.25	1.1	1.0
		14/05	-	-	-
		19/05	-	-	-
HBW-WS103	1.0-4.0	27/04	Dry	0.7	0.4
		06/05	Dry	0.8	0.4
		14/05	Dry	0.5	0.3
		19/05	Dry	0.7	0.4
HBW-WS104	1.0-5.5	27/04	-	-	-
		06/05	-	2.0	0.6
		14/05	-	2.1	0.4
		19/05	-	-	-
HBW-WS105	4.0-6.45	27/04	2.04	1.5	0.4
		06/05	2.02	0.6	0.4
		14/05	2.00	0.8	0.4
		19/05	1.98	0.4	0.4

Well ID	Well Response Zone (m bgl)	Date	Water Depth (m bgl)	Peak (ppm)	Steady (ppm)
(s) = shallow well, (d) = deep well, ppm = parts per million, - no monitoring data					

Volatile Vapours

None of the results for volatile vapours obtained from PID would exceed the guidance values indicated by the HSE in EH40/2005 Workplace exposure limits (2020) for aliphatic and aromatic hydrocarbons (when converted to mg/m³).

None of the results for volatile organic compounds (petroleum hydrocarbons) obtained from groundwater testing exceed the SoBRA generic assessment criteria for vapours for a commercial land use.

8. GROUNDWATER DQRA

8.1 Introduction

Following the tiered approach which is described in Land Contamination Risk Management (April 2021)¹⁴, this section provides a detailed quantitative risk assessment (DQRA) for those contaminants identified from the generic assessment above for groundwater, in particular petroleum hydrocarbons which do not have water quality standards.

Therefore, a DQRA has been undertaken to further consider the risks from migration of contaminants in groundwater offsite.

The potential for leaching of soil contaminants to groundwater and subsequent migration off-site for material remaining in-situ has not been included within this assessment on the basis that the majority of existing underlying shallow soils within the unsaturated zone to approximately 2m depth are due to be excavated and removed as part of the proposed development which should be close to shallow groundwater levels. Engineered fill will be used to form the development platform.

In addition, although petroleum hydrocarbons were also present in shallow groundwater from BH101, this borehole is located outside (to the southwest) of the development area and the direction of groundwater flow does not indicate this is likely to originate from the development area. No evidence of contamination was identified within shallow soils in BH101.

Approach for the DQRA

The DQRA has been based on the following:

- Environment Agency, October 2006. Guidance Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination; and
- Environment Agency, January 2013. Hydrogeological Risk Assessment for Land Contamination Remedial Targets Worksheets (version 3.2).

The Remedial Target Worksheets (RTW) use analytical models to quantify the fate and transport of contaminants migrating through the subsurface. The spreadsheet back-calculates the groundwater concentration/s allowable at source that will remain protective of a specified compliance point (controlled waters receptor). The concentrations derived in the RTW model are provided as 'Remedial Targets' which can also be used as site specific remedial targets for groundwater. The remedial targets derived are then compared to the groundwater concentrations obtained from the chemical testing at the site to identify potential risks.

The following assumptions have been made for the purpose of the DQRA:

- The ground conditions along the groundwater flow path are homogeneous and isotropic;
- Source areas have been modelled as constant / steady state sources; and
- Attenuation of contaminants, where appropriate, includes retardation, degradation, dilution and dispersion within groundwater.

Vertical dispersion within the model has been simulated in one direction only and degradation has only been applied to the dissolved phase.

Aerobic degradation rates have been used within the assessment as gas monitoring has identified the presence of carbon dioxide but methane has been at or below the lower instrument detection limit.

¹⁴ <https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm>

The compliance point for contaminants in groundwater has been based on 250m distance which is the closest site boundary in the direction of groundwater flow. Ground investigations indicate strata across the Kronospan site to be variable. Ground investigation undertaken by Geotechnics in 2017 for the Storage Building included boreholes within the area northwest of the factory building, adjacent to the existing railway lines, and indicated the shallow granular glaciofluvial deposits are very thin (0.1 to 0.6m) or absent in that area. Therefore, this assessment is likely to be conservative.

RTM Model Input Parameters

Model input parameters relating to the contaminants of concern and aquifer properties have been provided in Appendix 2.

8.2 DQRA Results

The concentrations of contaminants detected in groundwater samples have been screened against remedial targets derived from the RTW models for shallow groundwater in the glaciofluvial deposits (at WS102 and BH102) and deeper groundwater in the granular upper Glacial Till (at BH102).

The results of the DQRA are shown on the individual RTW spreadsheets provided in Appendix 2 and a summary has been presented in the tables below.

Table 8-1: DQRA Remedial Targets for Shallow Groundwater in Glaciofluvial Deposits

Contaminant	GAC (µg/l) *	Level 3 Remedial Target (µg/l)	Highest Concentration from Groundwater Testing (µg/l)	Number of Results Exceeding Remedial Targets
C12-16 Aliphatic	0.001	16,700	5.3	0
C16-21 Aliphatic	0.001	675	8	0
C21-35 Aliphatic	0.001	1,090	500	0
C16-21 Aromatic	0.001	392	12	0
C21-35 Aromatic	0.001	1,090	990	0
* Lower analytical detection limit				

Table 8-2: DQRA Remedial Targets for Deep Groundwater in Granular Upper Glacial Till

Contaminant	GAC (µg/l) *	Level 3 Remedial Target (µg/l)	Highest Concentration from Groundwater Testing (µg/l)	Number of Results Exceeding Remedial Targets
C10-12 Aliphatic	0.001	817	360	0
C12-16 Aliphatic	0.001	513	15	0
C21-35 Aliphatic	0.001	208	2.6	0
C10-12 Aromatic	0.001	817	150	0
C16-21 Aromatic	0.001	774	9.7	0
C21-35 Aromatic	0.001	208	6.0	0
* Lower analytical detection limit				

No exceedances of the remedial targets have been obtained for petroleum hydrocarbons in groundwater.

9. SOIL WASTE CLASSIFICATION

9.1 Methodology

A preliminary waste classification has been undertaken using HazWasteOnline™ to assess whether the soil sample results from the additional investigation undertaken in 2021 are likely to be hazardous or non-hazardous.

Assessment was undertaken for European Waste Catalogue (EWC) categories 17 05 04 (soil and stones than those mentioned in 17 05 03) and/or 17 05 03 (soil and stones containing hazardous substances).

The results from HBW-WS102 (1.0m and 2.0m) and HBW-BH102 (2.0m) were identified as potentially hazardous due to petroleum hydrocarbons.

The waste assessment has been based on using the following assumptions in HazwasteOnline taking into account information obtained on the ground conditions and testing:

- Petroleum hydrocarbons – were assessed as 'TPH (C6 to C40) petroleum group' both with and without 'confirmation TPH has NOT arisen from diesel or petrol';
- Assumes test of HP3(i) 'flammable' test does not apply as this relates to flammable liquids (relates to samples with petroleum hydrocarbons);
- Results for metals were assessed with no moisture correction as HazWasteOnline guidance indicates moisture correction should not be used when there is a mixture of wet and dry results.
- PAHs, chromium VI and selenium were all below the lower analytical detection limits and, therefore, these were not included in the assessment.

No asbestos was identified from screening of soil samples by the laboratory.

10. CONTAMINATED LAND RISK ASSESSMENT

10.1 Conceptual Site Model

The information presented in the previous sections of this report have been collated and evaluated to derive a conceptual site model.

10.1.1 Sources

The potential contamination sources are summarised in Table 9.1.

Table 9.1: Potential Sources

Source	Receptors and Contaminants of Concern
Made Ground / Superficial Deposits	Soil Human health: No exceedances of assessment criteria for site workers, potential for exposure to construction workers during excavations.
	Water Environment Groundwater and surface water: Marginally elevated zinc from deep glacial sand in groundwater from HBW-BH101. Petroleum hydrocarbons in groundwater from shallow glacial deposits in HBW-BH101, HBW-BH102 and HBW-WS102 and deeper granular glacial deposits in HBW-BH102. Formaldehyde in HBW-BH103 and deep well from HBW-BH102.
	Ground Gas Human health: Elevated carbon dioxide when compared to workplace exposure limits. Results for methane and carbon dioxide are consistent with Characteristic Situation 1 very low hazard potential in BS8485:2015+A1:2019.

10.1.2 Receptors

The site-specific receptors that could potentially be affected by the contamination hazards are summarised in Table 9.2.

Table 9.2: Potential Receptors

Receptor	Description
ON SITE	
Human health	Site users, construction and service maintenance workers.
Controlled waters	Groundwater: Glaciofluvial sands and gravels are classified as a Secondary A aquifer, the glacial till is a Secondary (undifferentiated) aquifer and the bedrock is classified as a Secondary A aquifer. Surface Water: No surface water features are located within the proposed development area.
Buried concrete	Foundations introduced during the development works.
Plants in areas of landscaping	No soft landscaping is proposed.
OFF SITE	
Human health	Off site users or residents (closest approximately 250m to the east).
Controlled waters	Groundwater: Glaciofluvial sands and gravels would be classified as a Secondary A aquifer and the glacial till as a Secondary (undifferentiated) aquifer, bedrock is classified as a Secondary A aquifer.

Receptor	Description
	Surface Water: The Llangollen Canal is located approximately 325m west of the proposed RBS but not anticipated to be in hydraulic connection with shallow groundwater. The Afon Bradley is located immediately north of the Kronospan site, approximately 500m north of the proposed development area, and connected to a surface water course to the west of the Llangollen Canal approximately 490m to the northwest of the proposed development.

10.1.3 Pathways

In order for the contaminants identified in this site investigation to reach potential receptors, there has to be a viable pathway for the contaminant. Potential pathways were identified within the preliminary conceptual site model and are discussed further in Table 9.3 in relation to the identified source impacts and receptors identified.

Table 9.3: Potential Pathways

Receptor	Pathway
Human Health	Direct contact with contaminants in soils (site users, construction and maintenance workers).
	Inhalation of dusts and vapours (site users on and off-site, construction and maintenance workers).
	Migration of ground gas or vapours into buildings or confined spaces (site users, construction and maintenance workers) including due to preferential pathways.
Controlled Waters	Leaching and vertical migration of soil contaminants to groundwater in drift deposits or bedrock.
	Introduction of preferential pathways for contaminant migration due to foundations or services.
	Lateral migration of contaminants via groundwater or run-off to surface water courses.
Buried concrete and drinking water pipes, plants in areas of soft landscaping	Direct contact with contaminants in soils.

10.2 Qualitative Risk Assessment

Potential pollutant linkages are identified using the source-pathway-receptor framework detailed above. An assessment of the potential significance of each linkage is then made by consideration of the likely magnitude and mobility of the source, the sensitivity of the receptor and nature of the migration/exposure pathways.

This qualitative risk assessment has been undertaken in accordance with the methodology provided in the following document:

- NHBC/EA/CIEH (2008). Guidance for the Safe Development of Housing on Land Affected by Contamination. R&D Publication 66.

Table 9.4 below summarises the pollutant linkages and risk ratings associated with the proposed development. The potential risks are based on the assumption that no mitigation measures are implemented for contamination. The risk assessment considers information from the additional investigation undertaken by Geotechnics Ltd in 2021.

Table 9.4: Risk Assessment

Potential Source	Pathway	Potential Receptor	Probability	Consequence	Risk Classification
Made Ground / Superficial Deposits	Ingestion, Inhalation and/or dermal contact	Construction / Maintenance Workers	Low	Medium	Moderate to Low – based on the potential for workers to be exposed to contaminants in soils during excavations or ground works as part of the development works.
		Current and Future Site Users	Unlikely	Medium	Low – existing and future use comprises hard cover so potential for exposure to soil contaminants is highly unlikely.
		Off-site	Unlikely	Medium	Low – development is located within an existing building and not near to the site boundary, limited potential for dust or vapours migration during ground works.
	Migration of gas or vapours into confined spaces	Construction / Maintenance Workers	Low	Severe	Moderate –elevated levels of carbon dioxide which could represent a risk in confined spaces if introduced. Low risk to workers at the ground surface.
		Existing and Future Site Users	Unlikely	Medium	Low – gas monitoring and vapour results are low with very low potential for exposure. Risk similar to existing situation following construction.
		Off-Site	Unlikely	Medium	Low – very low gas generation potential, potential for increasing risks of lateral gas migration following construction and similar to existing situation.
	Chemical attack	Buried concrete	Low	Mild	Low – results for water soluble sulphate are low an appropriate design chemical class for buried concrete will be adopted during construction.

Potential Source	Pathway	Potential Receptor	Probability	Consequence	Risk Classification
	Vertical migration to aquifers	Groundwater – drift deposits and bedrock	Low	Medium	Moderate to Low – petroleum hydrocarbons have been identified in shallow groundwater from three monitoring wells in particular HBW-WS102 and also in shallower soils from HBW-WS102 and HBW-BH102. Petroleum hydrocarbons and formaldehyde have also been encountered in groundwater from the upper granular glacial till groundwater at HBW-BH102 and formaldehyde in HBW-BH103. This indicates there is an existing impact to shallow and deeper groundwater in the development area. However, the majority of the existing shallow soils within development area will be excavated and removed as part of the development reducing or removing the potential for further impact to shallow groundwater. Foundations for structures are likely to comprise replacement piles such as CFA. It is unlikely that new preferential pathways will be introduced for groundwater migration, as piled foundations will be in intimate contact with surrounding strata.
	Lateral migration to surface water	Groundwater – drift deposits	Low	Medium	Moderate to Low – elevated concentrations of contaminants have been encountered in groundwater, but no surface water courses are located close to the proposed development (>250m) and DQRA does not indicate an unacceptable risk should be present from petroleum hydrocarbons.

11. CONCLUSIONS AND RECOMMENDATIONS

11.1.1 Field Evidence of Potential Contamination

Olfactory evidence of contamination was noted in soil arisings during the ground investigation from made ground to glaciolacustrine deposits (1.4-6.0m bgl) in HBW-BH102 and made ground in HBW-WS102 (1.0-2.0m bgl) as slight hydrocarbon odours.

An oily sheen was recorded by Geotechnics on groundwater from the shallow well installed at HBW-BH102 within the glaciolacustrine and fluvioglacial deposits and at HBW-WS102 installed into the made ground and fluvioglacial deposits. No floating free product was recorded during monitoring using an interface probe.

Drilling was suspended in HBW-BH101 at 3.45m bgl in the glaciolacustrine deposits and HBW-BH103 at 3.0m bgl in the fluvioglacial deposits due to the contractor observing 'ground gas exiting these boreholes during drilling'. At both locations this was encountered at a similar depth to groundwater strikes. No methane or carbon dioxide was encountered in either borehole above the lower instrument detection limit by Geotechnics during the site works and drilling resumed once monitoring was undertaken to confirm that flammable gases were not present.

No visual evidence of asbestos containing materials was noted by Geotechnics in arisings during the ground investigation.

11.1.2 Human Health

The existing and proposed development is considered to be a low sensitivity land use in terms of potential risks from contamination to site users as the development area will be covered by concrete floor and comprises a large open space inside the existing Kronospan factory.

No exceedances of the assessment criteria for commercial land use for human health have been obtained from soil or groundwater testing.

It is not considered that remediation of soil contamination is required to protect either future site users or the users of neighbouring land.

A higher risk could exist to construction workers who could come into contact with soil and / or groundwater contamination during excavations.

11.1.3 Controlled Waters

A number of exceedances of water quality standards have been obtained from groundwater testing for metals, petroleum hydrocarbons and formaldehyde in shallow and deeper glacial deposits indicating there is an existing impact to groundwater.

Marginally elevated concentrations of zinc above the EQS has been obtained from groundwater at HBW-BH101 from the lower granular Glacial Till.

Petroleum hydrocarbons have been identified in groundwater samples from glacial deposits in HBW-WS102, HBW-BH101 (shallow well), and HBW-BH102 (shallow and deep wells). The highest concentrations (1,500 µg/l) were obtained from groundwater in the made ground / fluvioglacial deposits in HBW-WS102 comprising mostly C21-35 aliphatic and aromatic fractions.

However, the results for petroleum hydrocarbons were below detection during a second round of testing from HBW-WS102.

Petroleum hydrocarbons were identified in shallow wells (screened in the glaciolacustrine and fluvioglacial deposits) and deep wells (screened in the upper granular Glacial Till) at HBW-BH102 during the first round of testing. An additional set of samples were obtained from HBW-BH102 for testing which only identified petroleum hydrocarbons in groundwater within the deeper strata with the highest concentrations associated with the C10-C12 aliphatic and aromatic fractions which were not present within any other samples tested.

Results for formaldehyde in groundwater were mostly below the lower detection limit. However, formaldehyde was present within groundwater in the upper granular Glacial Till from HBW-BH103 and HBW-BH102 (during the second round of testing in June 2021) which exceeded the annual average EQS but not the maximum allowable concentration EQS.

The source of the contamination has not been confirmed, although evidence of contamination was identified during the ground investigation within shallower unsaturated soils as indicated in Section 10.1.1 above. However, it is proposed to excavate and remove existing soils to approximately 2m depth and use engineered fill to form the development platform which will reduce the potential for further impact to shallow groundwater.

Foundations for structures are likely to comprise replacement piles such as CFA. It is unlikely that new preferential pathways will be introduced for groundwater migration, as piled foundations will be in intimate contact with surrounding strata.

Monitoring indicates groundwater flow within shallow strata is approximately north or north westerly. The nearest surface water course within this direction is the Afon Bradley which is located approximately 490m from the proposed development area.

As petroleum hydrocarbons have been identified within groundwater from a number of wells, a controlled waters DQRA has been undertaken to further consider the risks from migration to the closest down-gradient site boundary located at 250m to the west / northwest. The results of this assessment do not indicate there should be a risk from off-site migration of petroleum hydrocarbons in groundwater.

Although petroleum hydrocarbons have also been encountered within shallow soils, further assessment of the risks from leaching of soil contaminants to groundwater and subsequent migration has not been undertaken on the basis that much of the existing shallow soils within the unsaturated zone will be removed during the construction works. This would also provide the opportunity to remove any additional deeper areas of soil contamination should this be identified during excavations.

The potential for contaminants encountered in groundwater migrating from the development area to surface water is considered low.

Appropriate mitigation measures should still be implemented during the excavation, stockpiling and placement of materials to ensure run-off is properly managed, especially if there are any surface water drains in the development area.

11.1.4 Ground Gas and Vapours

Results obtained from ground gas monitoring for methane and carbon dioxide are considered to be low with very low flow rates obtained from wells in the unsaturated zone

The results would be consistent with Characteristic Situation 1 in BS8485:2015+A1:2019 which does not indicate that protection measures are required. In addition, it is anticipated the building should provide a high degree of attenuation from the concrete floor and the large internal space and the majority of existing underlying soils will be replaced with engineered fill during construction.

The proposed foundation solutions should not result in new pathways for gas migration through low permeability strata to near surface. The risk of increasing the potential for lateral gas migration is considered to be very low.

Exceedances of the workplace exposure limits have been obtained for carbon dioxide along with the potential for oxygen deficiency and a risk could exist to construction or maintenance workers if confined spaces associated with excavations are introduced.

11.1.5 Soil Waste

Where possible excavated material should be re-used in the construction works as the most sustainable approach. However, where material is not suitable for re-use or is surplus to requirements, this will need to be removed off-site to a licensed facility for disposal or recycling.

Assessment of the soil waste classifications using HazWasteOnline™ identified three samples from HBW-WS102 and HBW-BH102 as potentially hazardous due to petroleum hydrocarbons. All other soil samples were characterised as being non-hazardous.

It will still be necessary to confirm the waste classification of any materials removed off-site for disposal.

11.1.6 Recommendations

No remediation of soil or groundwater is considered to be required based on the results from the groundwater DQRA and as development proposals involve excavating up to approximately 2m depth which would remove much of the existing soils within the unsaturated zone, including any shallow areas of contamination.

It is recommended that a watching brief should be implemented for excavations during construction in case deeper areas of contamination are present. If any additional areas of contamination were to be encountered, these should be delineated and removed during the construction works, in particular if any free product is encountered within soils or as a measurable thickness on groundwater.

A contaminated land management strategy (rather than a remediation strategy) should be prepared outlining the requirements for identifying and dealing with contamination during the construction works. This strategy would also provide other requirements associated with the proposed development such as the re-use and / or removal of material from site, site controls during construction, decommissioning of monitoring wells, and acceptability criteria for imported material to ensure this material is chemically suitable. The strategy would need to be prepared

prior to commencement of construction, although it would be implemented as part of the construction works.

The planning conditions include the requirement for a piling risk assessment to consider potential risks from contamination based on the foundation proposals. This could be included within the contaminated land management strategy.

It will also be necessary to verify various activities during the construction works to demonstrate that the measures outlined within the contaminated land mitigation strategy have been implemented properly, including the excavation and removal of existing soils along with the delineation and removal of any other areas of contamination if identified. Therefore, a verification report should be prepared on completion of the construction works.

A verification plan should be provided outlining the information that will need to be obtained to complete a verification report. The plan should define the activities to be undertaken including any tests or measurements to be taken during construction. The verification plan could be included in the contaminated land management strategy.

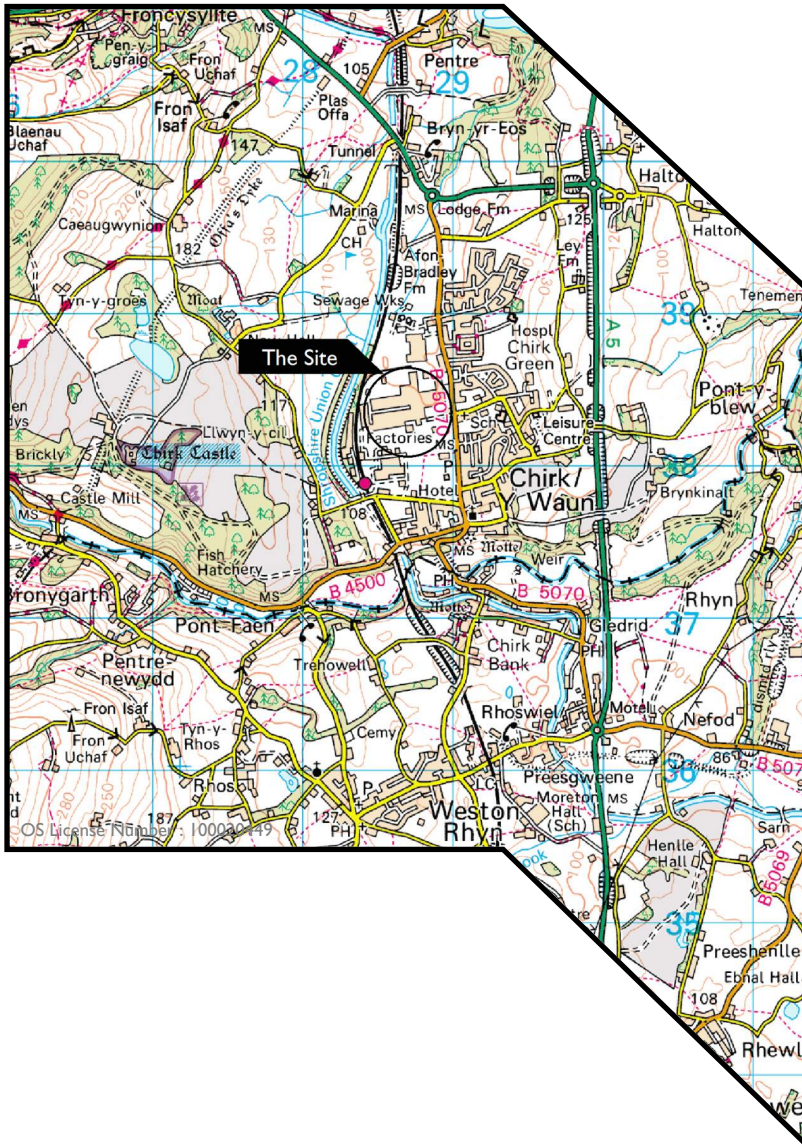
APPENDIX 1

GEOTECHNICS (2021) GROUND INVESTIGATION FACTUAL REPORT

Ground Investigation



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KRONOSPAN RAW BOARD STORAGE

Factual Report

for
Kronospan Limited

Engineer : Ramboll UK Limited

Project Number PN214198

June 2021

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Ground Investigation
at

Factual Report

KRONOSPAN RAW BOARD STORAGE

for
Kronospan Limited

Engineer :
Ramboll UK Limited

Project No:
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1.0 INTRODUCTION

A geotechnical and geo-environmental investigation was undertaken by Geotechnics Limited at the site of proposed development works within the Kronospan factory complex at Chirk, North Wales. The investigation was carried out to the instructions of the Engineer, Ramboll UK on behalf of the Client, Kronospan Limited. This report describes the work undertaken and presents the data obtained.

2.0 OBJECT AND SCOPE OF THE INVESTIGATION

The object of the investigation was to obtain information on the ground and groundwater conditions relating to the design of the proposed works within the limitations posed by trial hole numbers, locations, depths, methods adopted and the scope of approved in situ and laboratory testing. The investigation comprised concrete coring, cable percussion boreholes and dynamic sample boreholes, in situ and laboratory testing and reporting. A Factual Report was also commissioned.

3.0 PRESENTATION

A description of the site and a summary of the procedures followed during the investigation process are presented in Sections 4 to 6. The factual data so obtained are presented in Appendices 2 to 8 of this report. Attention is drawn to the General Notes and Investigation Procedures presented in Appendix 9 to aid an understanding of the procedures followed and the context in which the report should be read.

In addition, data in electronic format in accordance with "The Electronic Transfer of Geotechnical Data from Ground Investigations" published by the AGS (the AGS Format) are presented separately together with a copy of the report in electronic PDF format.

4.0 THE SITE

4.1 Location

The site is located within the Kronospan factory complex in Chirk, approximately 13km south-south west of Wrexham. The approximate Ordnance Survey National Grid Reference for the centre of the site is SJ 286 383 and an extract from the relevant 1:50,000 Scale O.S. Map is included as Appendix 1.

4.2 Description

The site lies within the Melamine Production Hall warehouse area of the Kronospan manufacturing complex. The site is roughly rectangular in shape with maximum dimensions of approximately 200m (east to west) and 80m (north to south). The site is level and comprises reinforced concrete slabs.

A exploratory hole was carried out outside of the main warehouse area, in the adjacent yard area.

The site is bounded to the west by railway lines. To the north, south and east lie further buildings and yard areas of the Kronospan complex.

4.3 Site Geology

The 1:50,000 scale map of Wrexham published by the British Geological Survey, Sheet 121 dated 1994, shows the site to be underlain by superficial drift deposits of Glacial Sand and Gravel, although Glacial Till is indicated close to the northern and eastern edges of the site. The underlying solid strata are indicated to comprise Carboniferous Productive Coal Measure rocks of the Bettisfield Formation (now part of the Pennine Lower Coal Measures Formation).

Made Ground is not noted on the geological map consulted, however a thickness of Made Ground would be expected given the industrial setting of the site.

4.4 Hydrogeology

The British Geological Survey GeolIndex website, <https://magic.defra.gov.uk/magicmap.aspx>, accessed on 30th April 2021, shows that the Pennine Lower Coal Measures Formation is classed as a Secondary A Aquifer.

The BGS GeolIndex website, <http://mapapps2.bgs.ac.uk/geoindex/home.html>, accessed on 30th April 2021, shows the Pennine Lower Coal Measures Formation to be a moderately productive aquifer with moderate yields.

5.0 PROCEDURE

5.1 Commissioning

The work was awarded following submission of a tender for work designed by the Engineer for ground investigation of the site in accordance with the Client's requirements.

5.2 General

The procedures followed in this site investigation are based on *BS 5930: 2015 – Code of Practice for Site Investigations* and *BS 10175:2011 - Investigation of Potentially Contaminated Sites*. The soils and rocks encountered have been described in accordance with BS5930:2015 and BS EN ISO 14688-1:2002+A1:2013 and BS EN ISO 14689-1:2003.

The Exploratory Hole locations were specified by the Engineer and their approximate positions are shown on the Exploratory Hole Location Plan in Appendix 8. The co-ordinates and levels shown on the Exploratory Hole Records were measured using a Leica Total Station GPS survey device. The depths quoted on the exploratory hole records are in metres below ground level.

Prior to the investigation, a survey was carried out by CMS Surveys Limited utilising Ground Penetrating Radar (GRP) to check for the presence of buried services at the proposed exploratory hole locations.

At each exploratory hole location an inspection pit was excavated using hand tools to a depth of 1.20m below ground level to check for the presence of underground services. Prior to and on completion of the excavation, the location was scanned using a cable avoidance tool (CAT). As concrete was present at ground level, across the site, 350mm diameter coring was used to advance the exploratory holes through

the concrete and facilitate the excavation of the inspection pits.

Aquifer protection measures were employed when advancing the Cable Percussion Boreholes in order to preclude the creation of a pathway for contamination to migrate down towards the underlying aquifer. These protection measures comprised using 250mm diameter casing and tools to drill to the base of the Made Ground, then by installing a 1m thick bentonite plug, prior to reducing to 200mm diameter casing and tools and re-commencing drilling.

5.3 Cable Percussion Boreholes

Three (3 No.) 250mm diameter boreholes (numbered HBW-BH101 to HBW-BH103) were sunk by Cable Percussion Tool techniques to depths ranging between 21.00m and 35.50m below ground level. The work was carried out between 23rd March and 16th April 2021.

Representative disturbed (D and B) and driven open-tube thin-walled (UT) samples of the soils encountered were obtained at regular intervals. Standard Penetration Tests (SPTs) were undertaken at the depths indicated on the borehole records in accordance with BS EN ISO 22476-3:2005+A1:2011 to obtain a measure of the engineering properties of the proved strata. In addition, Environmental Soil samples (ES) were recovered at the depths indicated on the Cable Percussion Borehole Records, presented in Appendix 2.

On encountering groundwater, boring operations were suspended for 20 minutes in order to record any rise in water level. Full details of groundwater observations are included on the Cable Percussion Borehole Records. It should be noted that the addition of water to the borehole as part of the drilling process may have masked the presence of groundwater in the borehole. Where water was added it has been noted on the Cable Percussion Borehole Records.

On completion, standpipes were installed in each of the Cable Percussion Boreholes (see Section 5.6).

5.4 Dynamic Sample Boreholes

Five (5 No.) Dynamic Sample Boreholes (numbered HBW-WS101 to HBW-WS105) were undertaken at the site to depths ranging between 6.00m and 6.45m below ground level. The work was carried out

between 23rd and 26th April 2021.

The Dynamic Samples were taken using the super-heavy Dynamic Probe apparatus which drives lined steel tubes into the ground in 1m lengths. Samples were retrieved in the plastic liners. The retrieved liners were split and the recovered soils described before being sub-sampled into ES, D and B samples as shown on the Dynamic Sample Borehole Records. The holes were cased and progress depends on the nature of the strata penetrated. Full details of the casing used are included on the Dynamic Sample Borehole Records. In Appendix 3.

Standard Penetration Tests (SPTs) were undertaken at the depths indicated on the borehole records in accordance with BS EN ISO 22476-3:2005+A1:2011 to obtain a measure of the engineering properties of the proved strata.

Groundwater observations are included on the Borehole Records where appropriate and any rise in water level was recorded over 20 minutes whilst drilling operations were suspended.

On completion, standpipes were installed in each of the Dynamic Sample Boreholes (see Section 5.6).

5.5 Photo Ionisation Detection (PID) Meter Readings

Photo Ionisation Detection (PID) tests were undertaken during the investigation by testing the headspace of the ES soil samples taken. The tests were carried out using a suitably calibrated Tiger PID Meter fitted with a 10.6eV UV lamp. The results of the PID tests are presented on the relevant borehole records with the readings reported as Volatile Organic Compounds (VOCs) recorded in parts per million.

5.6 Instrumentation and Monitoring

Long-term monitoring of the gas and groundwater levels was made possible by the installation of standpipes as follows:

Exploratory Hole/Standpipe diameter	Standpipe Slotted Pipe & Filter Zone (m)
HBW-BH101/ 33mm	3.00 to 5.00
HBW-BH101/ 50mm	29.00 to 34.00

HBW-BH102/ 33mm	3.00 to 4.00
HBW-BH102/ 50mm	12.70 to 14.00
HBW-BH103/ 50mm	18.00 to 21.00
HBW-WS101/ 33mm	1.00 to 3.15
HBW-WS102/ 33mm	1.00 to 3.00
HBW-WS103/ 33mm	1.00 to 4.00
HBW-WS104/ 33mm	1.00 to 5.50
HBW-WS105/ 33mm	4.00 to 6.45

Monitoring of the gas and groundwater levels at the site commenced on 27th April 2021 with three further visits on 07th, 14th and 21st May 2021.

On each of the monitoring visits a record of the groundwater level in the standpipes was obtained, as well as this wells were checked for the presence of Light Non-Aqueous Phase Liquids (LNAPLs) using an interface meter. On the first and second visit where water was recorded, samples were obtained (where possible) following the purging of water in the standpipe. In addition to the groundwater levels, the following parameters were measured and recorded in each standpipe using a GA5000 Gas Analyser:

- Concentrations (% Vol) of CH₄, O₂, CO₂, along with (% LEL) CH₄ and (ppm) H₂S, CO
- Flow Rate
- Barometric Pressure
- Air Temperature
- Light Non-Aqueous Phase Liquids (LNAPLs)

The results of the monitoring are presented in Appendix 4.

6.0 LABORATORY TESTING

6.1 Geotechnical

The laboratory testing schedule was specified by the Engineer. Unless otherwise stated, the tests were carried out at the laboratories of Professional Soils Laboratory Limited (UKAS Accredited Laboratory, Number 4043) and were undertaken in accordance with the appropriate Standards as indicated below and are detailed on the results sheets in Appendix 5 together with the test result as well as the test method and accreditation. Any descriptions, opinions

and interpretations are outside the scope of UKAS accreditation.

The tests undertaken can be summarised as follows:-

BS 1377:1990

Test No.		Test Description
Part 2		
3.2	17 No.	Moisture Content Determination
4.3 & 5.3	17 No.	Liquid and Plastic Limit Determination
9.2 & 9.3	17 No.	Mechanical Analysis - Sieving
9.4	17 No.	Mechanical Analysis - Sedimentation

Part 7

8	7 No.	Shear Strength Measurement - 100mm diameter (Single Stage) Quick Undrained Triaxial Compression Test
---	-------	--

The following testing was carried out at the laboratories of Derwentside Environmental Testing Services Limited (UKAS Accredited Laboratory, Number 2139).

BRE Special Digest I Suite

19 No.	Suites comprising:-
	Soluble Sulphate
	Acid Soluble Sulphate
	Total Sulphur
	Soluble Magnesium
	Ammonium
	Nitrate
	Chloride
	pH

6.2 Contamination

Selected samples of soil and groundwater were tested at the laboratories of Derwentside Environmental Testing Services Limited (UKAS Accredited Laboratory, Number 2139) for a number of determinands in order to check on potential site contamination. The determinands were selected by the Engineer and are detailed on the results sheets in Appendix 6 (Soil) and Appendix 7 (Groundwater) together with the test result as well as the test method, accreditation and detection limit.

Signed for and on behalf of Geotechnics Limited.

Prepared by:

Joshua Noble
BSc, FGS
Engineer

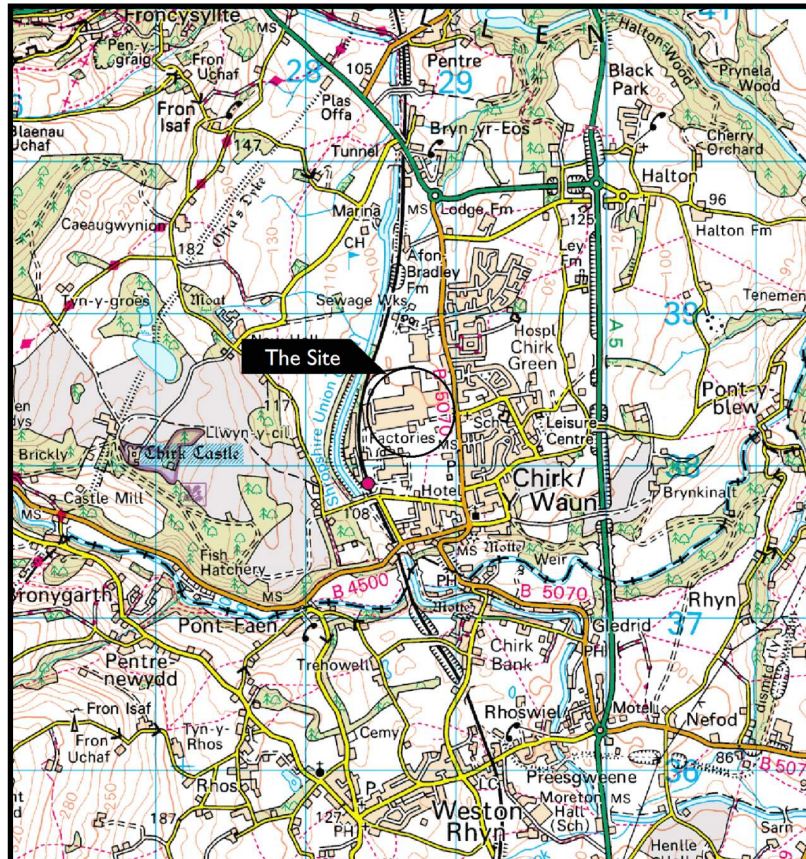
Reviewed by:

Aaron Field
BSc, MSc, FGS
Senior Engineer

APPENDIX I

Site Location Plan

SITE LOCATION PLAN



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Ground Investigation
at
KRONOSPAN RAW BOARD STORAGE
for
Kronospan Limited

GEOTECHNICS
geotechnical and geoenvironmental specialists

APPENDIX 2

Cable Percussion Borehole Records

BOREHOLE RECORD - Cable Percussion

Project **KRONOSPAN RAW BOARD STORAGE** Engineer **RAMBOLL UK** Borehole Project No **HBW-BH101**
 Client **KRONOSPAN LIMITED** National Grid Coordinates **328647.1 E 338374.6 N** Ground Level **101.01 m OD**

Sampling			Properties			Strata			Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD		
0.20- 0.60	B					MADE GROUND: Grey concrete.	G.L.		101.01		
0.20	D					MADE GROUND: Greyish brown very sandy slightly clayey angular to subangular fine to coarse gravel of sandstone and concrete.	0.20		100.81		
0.20	ES		PID=0.0ppm				0.60		100.41		
0.20											
0.50	D					MADE GROUND: Brownish grey gravelly clayey fine to medium sand. Gravel is angular to subangular fine to coarse of mudstone, siltstone, sandstone and concrete. Below 1.20m, very dense.					
0.50	ES		PID=0.0ppm								
0.60- 1.20	B										
1.00	D										
1.00	ES		PID=0.0ppm								
1.00											
1.20- 1.65	B	(DRY)			C50/282						
1.20- 1.63											
1.80	D										
2.00- 2.45	B										
2.00	ES	1.70 (DRY)			C50/178						
2.00- 2.33			PID=0.0ppm			Very stiff grey mottled brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse of mudstone, siltstone and sandstone.	2.50		98.51		
2.00							2.70		98.31		
2.80	D										
3.00	ES										
3.00- 3.45	UT39	3.00 (DRY)	PID=0.0ppm			Soft to firm locally laminated brown mottled grey slightly sandy CLAY.					
3.00											
3.50	D										
3.80	D						3.80		97.21		
4.00- 4.45	B	3.00 (DRY)			C30	Medium dense to dense greyish brown sandy slightly silty angular to subrounded fine to coarse GRAVEL of mudstone, siltstone and sandstone.					
4.00- 4.45											
						Below 4.80m, grey mottled brown.					
4.80	D										
5.00- 5.45	B	5.00 (3.60)			C42	Below 5.00m, dense.					
5.00- 5.45											
						Soft to firm grey slightly sandy slightly gravelly silty CLAY.	5.40		95.61		
6.00	D										
6.50- 6.95	#	6.00 (5.70)			S5						
6.50- 6.95	B										
7.50	D										
8.00- 8.45	UT31	7.70 (4.50)									
8.50	D										
9.00	D										
9.50- 9.95	B										
9.50- 9.95	D	9.20 (3.20)			S6	Between 9.50m and 9.95m, mottled brown.					

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.20	0.35	Concrete Core	SMS	G.L.			31/03/21	08:00	3.50	3.00	2.80	20		Fast inflow, not sealed.
1.20	0.35	Inspection Pit	SL/JL	8.50	7.50	4.50	31/03/21	18:00						
8.50	0.25	Cable Percussion	SL/JL	8.50	7.50	5.30	06/04/21	08:00	29.50	28.50	15.20	20		Fast inflow, not sealed.
21.50	0.20	Cable Percussion	SL/JL	21.50	12.90	20.50	01/04/21	18:00						
35.00	0.15	Cable Percussion	SL/JL	21.50	20.50	13.20	07/04/21	08:00						
				32.50	32.50	17.40	07/04/21	18:00						

Remarks **ES** sample = 1x 1L plastic tub, 2x 258ml amber jars and 1x 60ml glass jar. Water was added to assist boring between 3.50m and 34.00m. Drilling suspended between at 3.45m depth due to observed ground gas exiting the borehole. Measured ground gas concentrations of 12% Oxygen and 4ppm Carbon Monoxide. Drilling resumed once monitoring was completed. A 33mm standpipe was installed to 5.00m with a geowrapped slotted section from 3.00m to 5.00m with flush lockable protective cover and a 50mm standpipe was installed to 34.00m with a geowrapped slotted section from 29.00m to 34.00m with flush lockable protective cover.

Logged by **WH** Figure **1 of 4** 19/07/2021

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

geotechnics

BOREHOLE RECORD - Cable Percussion

Project **KRONOSPAN RAW BOARD STORAGE** Engineer **RAMBOLL UK** Borehole Project No **HBW-BH101**
 Client **KRONOSPAN LIMITED** National Grid Coordinates **328647.1 E** **338374.6 N** Ground Level **101.01 m OD**
 Scale **1:50**

Sampling			Properties			Strata			Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD		
10.50	D										
11.00-11.45	B										
11.00-11.45	UT41	10.70 (2.70)									
11.50-11.95	B										
11.50-11.95	UT43	11.50 (3.20)									
12.00-12.45	#				S6						
12.00-12.45	B	12.00 (3.90)									
13.00	D										
13.50-13.95	UT49	13.50 (4.70)									
14.00	D										
14.50	D										
15.00-15.45	B				S8						
15.00-15.45	D	15.00 (3.80)									
16.00	D										
16.50-16.95	UT60	16.50 (4.50)									
17.00	D										
17.50	D										
18.00-18.45	#				S9						
18.00-18.45	B	18.00 (5.70)				Loose greyish brown sandy slightly silty angular to subrounded fine to coarse GRAVEL of mudstone, siltstone and sandstone. Low cobble content.	18.00				83.01
18.00-18.45											
19.00	D										
19.50-19.95	B				C33						
19.50-19.95		19.50 (6.50)				Below 19.50m, dense.					

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	In Mins	Depth Sealed	Remarks on Groundwater
				32.50	32.50	15.20	08/04/21	08:00						
				35.00	34.50	20.20	08/04/21	18:00						

Remarks **AB** Backfill details from base of hole: bentonite seal up to 34.00m, gravel filter up to 29.00m, bentonite seal up to 5.00m, gravel filter up to 3.00m, bentonite seal up to 0.20m, concrete up to ground level.
 Chiselling: 1.20-2.40m for 150 minutes, slow drilling. and 20.30-21.00m for 95 minutes, slow drilling. and 22.90-23.20m for 45 minutes and 26.10-26.30m for 33 minutes and 34.00-34.50m for 65 minutes, slow drilling..
 Symbols and abbreviations are explained on the accompanying key sheet.
 All dimensions are in metres. Logged in accordance with BS5930:2015 + A1:2020
 Logged by **WH**
 Figure **2 of 4**
 19/07/2021
geotechnics

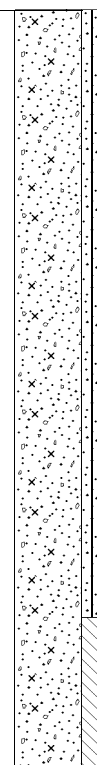
BOREHOLE RECORD - Cable Percussion

Project **KRONOSPAN RAW BOARD STORAGE** Engineer **RAMBOLL UK** Borehole Project No **HBW-BH101**
 Client **KRONOSPAN LIMITED** National Grid Coordinates **328647.1 E 338374.6 N** Ground Level **101.01 m OD**

Sampling			Properties			Strata		Scale 1:50							
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD						
20.10	D					Firm reddish brown slightly sandy gravelly CLAY with occasional laminae of sand. Gravel is subangular to subrounded fine to coarse of mudstone, siltstone and sandstone.	20.10		80.91						
20.50	D														
21.00-21.45	UT100	20.50 (12.50)													
21.50	D					Stiff reddish brown slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to coarse of mudstone, siltstone, sandstone and coal. At 21.50m, slightly gravelly, sandy. Some pockets (up to 50mm) of silt.	21.50		79.51						
22.00	D														
22.50-22.95	B					Between 22.50m and 22.60m, band of clayey fine sand.	22.60		78.41						
22.50-22.78	D	22.50 (18.60)			S50/126										
						Very stiff reddish brown slightly sandy slightly gravelly silty CLAY with occasional pockets (up to 20mm) of yellowish brown fine sand. Gravel is subangular to rounded fine to coarse of mudstone, siltstone, sandstone and coal.									
23.50	D														
24.00-24.45	UT100	24.00 (23.30)													
24.50	D														
25.00	D														
25.50-25.95	B														
25.50-25.95	D	25.50 (24.90)			S40										
26.50	D														
27.00-27.45	UT100	27.00 (26.40)													
27.50	D														
28.00	D														
28.50-28.90	#	28.50 (27.70)			S50/253	Very stiff reddish brown mottled brown and black slightly sandy silty CLAY with occasional laminae of brown silt.	28.20		72.81						
28.50-28.95	B														
29.50	D					Very dense thinly laminated reddish brown slightly gravelly very silty fine to coarse SAND.	29.50		71.51						
30.00-30.43	#	30.00 (15.50)			S50/275										
Boring			Progress			Groundwater									
Depth	Hole Dia	Technique		Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	In Mins	Depth Sealed	Remarks on Groundwater
Remarks															
Symbols and abbreviations are explained on the accompanying key sheet.															
All dimensions are in metres.															
Logged in accordance with BS5930:2015 + A1:2020															
Logged by WH															
Figure 3 of 4															
19/07/2021															

BOREHOLE RECORD - Cable Percussion

Project **KRONOSPAN RAW BOARD STORAGE** Engineer **RAMBOLL UK** Borehole Project No **HBW-BH101**
 Client **KRONOSPAN LIMITED** National Grid Coordinates **328647.1 E 338374.6 N** Ground Level **101.01 m OD**

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD	
30.00-30.45	B								66.01	
31.00	D									
31.50-31.89	#	31.50 (16.60)			S50/242					
31.50-31.95	B									
32.50	D									
33.00-33.45	B									
33.00-33.41	D	33.00 (10.80)			S50/262					
34.00	D									
34.50-34.95	UT100	34.50 (20.20)								
35.00	D									
						End of Borehole	35.00			

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks 

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Logged by **WH**

Figure **4 of 4**
19/07/2021



Remarks	ES sample = 1x 1L plastic tub, 2x 258ml amber jars and 1x 60ml glass jar. Water was added to assist boring between 8.50m and 20.00m. Drilling suspended at 3.00m due to observed ground gas exiting the borehole. Measured ground gas concentrations of 19.4% Oxygen and 1ppm Carbon Monoxide. Drilling resumed once monitoring was completed. A 50mm standpipe was installed to 4.00m with a geowrapped slotted section from 3.00m to 4.00m with flush lockable protective cover and a 33mm standpipe was installed to 14.00m with a geowrapped slotted section from 12.70m to 14.00m with flush lockable protective cover. Logged in accordance with BS5930:2015 + A1:2020	Logged by WH Figure 1 of 3 19/07/2021
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BOREHOLE RECORD - Cable Percussion

Project	KRONOSPAN RAW BOARD STORAGE	Engineer	RAMBOLL UK	Borehole Project No	HBW-BH102 PN214198
Client	KRONOSPAN LIMITED	National Grid Coordinates	328696.9 E 338396.7 N	Ground Level	101.00 m OD

Sampling			Properties			Strata	Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
10.50	D								
11.00-11.45	B								
11.00-11.45	UT37	10.90 (3.70)							
11.50-11.95	B								
11.50-11.95	UT39	11.50 (2.00)							
12.00-12.45	#				S7				
12.00-12.45	B	12.00 (2.40)							
13.00	D					Medium dense greyish brown very gravelly very silty fine to coarse SAND. Gravel is angular to subangular fine to medium of mudstone, siltstone and sandstone.	12.70		88.30
13.50-13.95	#				S12				
13.50-13.95	B	13.50 (2.90)							
14.50	D					Medium dense brown gravelly silty fine to medium SAND. Gravel is subangular to subrounded fine to coarse of mudstone, siltstone and sandstone. Between 15.00m and 15.45m, slightly gravelly, slightly silty.	14.50		86.50
15.00-15.45	B				S20				
15.00-15.45	D	15.00 (2.80)							
16.00	D					Dense becoming very dense greyish brown very sandy slightly silty subrounded to rounded fine to coarse GRAVEL of mudstone, siltstone and sandstone. Medium cobble content.	16.00		85.00
16.50-16.95	#				S40				
16.50-16.95	B	16.50 (3.80)							
17.50	D								
18.00-18.40	#				S50/ 246				
18.00-18.45	B	18.00 (4.60)							
19.00	D								
19.50-19.59	#				S50/43				
19.50-19.59	B	19.50 (5.90)							

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
				21.00 0.00	20.00	9.10	14/04/21 14/04/21	08:00 18:00						

Remarks  Backfill details from base of hole: bentonite seal up to 14.00m, gravel fill up to 12.70m, bentonite seal up to 4.00m, gravel fill up to 3.00m, bentonite seal up to 0.20m, concrete up to ground level.
Chiselling: 1.20-2.20m for 160 minutes and 19.00-2.00m for 130 minutes, slow progress. and 20.00-21.00m for 125 minutes.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Logged by WH
Figure 2 of 3
19/07/2021



BOREHOLE RECORD - Cable Percussion

Project **KRONOSPAN RAW BOARD STORAGE** Engineer **RAMBOLL UK** Borehole Project No **HBW-BH102**
 Client **KRONOSPAN LIMITED** National Grid Coordinates **328696.9 E** **338396.7 N** Ground Level **101.00 m OD**

Sampling			Properties			Strata			Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD		
20.50	D										
21.00	D					End of Borehole	21.00		80.00		

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

BOREHOLE RECORD - Cable Percussion

Project KRONOSPAN RAW BOARD STORAGE

Engineer RAMBOLL UK

Borehole Project No HBW-BH103
PN214198

Client KRONOSPAN LIMITED

National Grid Coordinates 328739.1 E
338412.2 N

Ground Level 100.80 m OD

Sampling			Properties			Strata			Scale 1:50					
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD					
0.00- 0.50	B					MADE GROUND: Grey concrete.	G.L.		100.80					
0.20	D						0.25		100.55					
0.20	ES		PID=0.0ppm			MADE GROUND: Brown very sandy silty angular to subangular fine to coarse gravel of mudstone, sandstone and limestone.								
0.50	B													
0.50	D		PID=0.1ppm			Below 1.20m, very dense.								
0.50	ES													
1.00	D		PID=0.1ppm											
1.00	ES													
1.20- 1.65	B	(DRY)			C50/220									
1.20- 1.57														
1.80	D					MADE GROUND: Medium dense greyish brown very silty medium to coarse sand and subangular medium to coarse gravel of mudstone, sandstone and limestone. Between 2.00m and 2.45m, locally grading to silty medium to coarse sand and angular to subangular fine to medium gravel.	1.80		99.00					
2.00- 2.45	B													
2.00	ES	2.00 (DRY)	PID=0.0ppm		C50/233		2.50		98.30					
2.00- 2.38														
2.00						Medium dense grey sandy slightly silty subrounded to rounded fine to medium GRAVEL of mudstone, sandstone, limestone and quartzite.								
2.80	D				C12									
3.00- 3.45	B													
3.00	ES	3.00 (2.20)	PID=0.0ppm			Firm brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse of mudstone and sandstone.	3.60		97.20					
3.00- 3.45						Grey slightly silty fine to medium SAND.	4.00		96.80					
3.00							4.40		96.40					
3.80	D					Medium dense grey very gravelly silty medium to coarse SAND. Gravel is subangular to rounded fine to coarse of mudstone, siltstone, sandstone and quartzite.								
4.00- 4.45	UT63	4.00 (2.50)			S16									
4.50	D													
4.80	D													
5.00- 5.45	B													
5.00- 5.45	D	4.80 (3.30)												
							5.60		95.20					
						Soft to firm grey slightly sandy silty CLAY.								
6.00	D													
6.50- 6.95	UT36	6.30 (5.80)												
7.00	D													
7.50	D					Below 7.40m, occasional bands (up to 75mm) of fine to medium sand.								
8.00- 8.45	#	7.70 (5.30)			S10									
8.00- 8.45	B													
9.00	D													
9.50- 9.95	B													
9.50- 9.95	UT31	9.20 (4.80)												
10.00-10.45	#	10.00 (5.30)			S8									
Boring			Progress			Groundwater								
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.25	0.35	Concrete Core	SMS	G.L.			23/03/21	08:00	2.50	2.00	2.30	20		Fast inflow.
1.20	0.35	Inspection Pit	SL/JL	1.65	1.20	DRY	23/03/21	18:00	30.30	28.50	13.50	20		Fast inflow.
9.50	0.25	Cable Percussion	SL/JL	1.65	1.20	DRY	24/03/21	08:00						
21.00	0.20	Cable Percussion	SL/JL	8.00	7.70	5.80	24/03/21	18:00						
35.50	0.15	Cable Percussion	SL/JL	8.00	7.70	5.30	25/03/21	08:00						
				19.50	19.50	6.70	25/03/21	18:00						
Remarks Inspection pit hand excavated to 1.20m depth and no services were found. ES sample = 1x 1L plastic tub, 2x 258ml amber jars and 1x 60ml glass jar. Water was added to assist boring between 2.50m and 19.50m. A 50mm standpipe was installed to 21.00m with a geowrapped slotted section from 18.00m to 21.00m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 21.00m, gravel filter up to 18.00m, bentonite seal up to 0.20m, concrete up to ground level. Chiselling: 1.20-2.50m for 230 minutes, slow drilling. and 19.50-20.20m for 120 minutes, Logged in accordance with BS5930:2015 + A1:2020														
Symbols and abbreviations are explained on the accompanying key sheet. All dimensions are in metres.										Logged by EPS/JD Figure 1 of 4 19/07/2021 				

BOREHOLE RECORD - Cable Percussion

Project **KRONOSPAN RAW BOARD STORAGE** Engineer **RAMBOLL UK** Borehole Project No **HBW-BH103**
 Client **KRONOSPAN LIMITED** National Grid Coordinates **328739.1 E 338412.2 N** Ground Level **100.80 m OD**

Sampling			Properties			Strata			Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD		
10.00-10.45	B										
10.80	D										
11.00-11.45	B										
11.00-11.45	D	10.70 (4.30)			S8						
12.00	D										
12.50-12.95	UT47	12.00 (5.70)									
13.00	D										
13.50	D										
14.00-14.45	B										
14.00-14.45	D	13.70 (6.00)			S8						
15.00	D										
15.50-15.95	UT41	15.00 (7.70)									
16.00	D										
16.50	D										
17.00-17.45	B										
17.00-17.45	D	16.50 (4.80)			S9						
18.00	D										
18.50-18.95	UT100	18.00 (5.50)									
19.00	D										
19.50	D										
20.00-20.45	#	20.00 (9.70)			S35						

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
				19.50	19.50	8.80	26/03/21	08:00						
				25.50	25.50	24.30	26/03/21	18:00						
				25.50	25.50	24.90	29/03/21	08:00						
				35.50	34.50	20.90	29/03/21	18:00						

Remarks **slow drilling. and 26.50-26.80m for 70 minutes and 34.30-34.70m for 60 minutes Slow drilling.**

Logged by **EPS/JD**

Figure **2 of 4**
19/07/2021

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015 + A1:2020

geotechnics

Sampling			Properties			Strata					Scale 1:50				
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description					Depth	Legend	Level m OD		
20.00-20.45	B					Very stiff reddish brown slightly sandy slightly gravelly silty CLAY. Gravel is angular to subangular fine to coarse of mudstone, siltstone, sandstone and coal.					20.20		80.60		
21.00	D														
21.50-21.95	UT100	21.00 (11.50)													
22.00	D														
22.50	D														
23.00-23.45	B														
23.00-23.37	D	22.50 (18.00)			S50/218										
24.00	D														
24.50-24.95	UT100	24.00 (23.80)				Very stiff reddish brown slightly gravelly sandy CLAY. Gravel is angular to subrounded fine to coarse of mudstone, sandstone and siltstone.					25.50		75.30		
25.00	D														
25.50	D														
26.00-26.45	B														
26.00-26.35	D	25.50 (24.90)			S50/203	Very stiff reddish brown slightly sandy slightly gravelly CLAY. Gravel is angular fine to coarse of coal.					27.00		73.80		
27.00	D														
27.50-27.95	UT100	27.00 (26.30)													
28.00	D														
28.50	D					Below 28.50m, very sandy. Between 28.50m and 29.00m, mottled grey.									
29.00-29.45	B														
29.00-29.45	D	28.50 (28.30)			S50/295	Below 29.00m, mottling absent.									
30.00	D														
Boring					Progress					Groundwater					
Depth	Hole Dia	Technique		Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	In Mins	Depth Sealed	Remarks on Groundwater
Remarks															
Symbols and abbreviations are explained on the accompanying key sheet.															
All dimensions are in metres.															
Logged in accordance with BS5930:2015 + A1:2020															
Logged by EPS/JD															
Figure 3 of 4															
19/07/2021															

BOREHOLE RECORD - Cable Percussion

Project **KRONOSPAN RAW BOARD STORAGE** Engineer **RAMBOLL UK** Borehole Project No **HBW-BH103**
 Client **KRONOSPAN LIMITED** National Grid Coordinates **328739.1 E 338412.2 N** Ground Level **100.80 m OD**

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD	
30.30 30.50-30.95 30.50-30.94	D B D	30.00 (13.50)			S50/ 287	Very dense brown silty fine to coarse SAND.	30.30		70.50	
31.50	D									
32.00-32.45 32.00-32.40	B D	31.50 (14.30)			S50/ 247					
33.00	D									
33.50-33.95 33.50-33.95	B D	33.00 (15.20)			S50/ 295					
34.50	D									
35.00-35.45	UT100	34.50 (19.40)								
35.50	D					End of Borehole	35.50		65.30	

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Logged by **EPS/JD**

Figure **4 of 4**
19/07/2021

Fieldwork Results - SPT Results Summary

Project KRONOSPAN RAW BOARD STORAGE

Project No PN214198

Client Kronospan Limited

Hole	Depth m bgl	Level m OD	Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N'					
					0-75 (mm)	75-150 (mm)	0-75 (mm)	75-150 (mm)	150-225 (mm)	225-300 (mm)		10	20	30	40	50	
HBW-BH101	1.20	99.81	C	-	7	12	15	19	16	-/57	50/282						>
HBW-BH101	2.00	99.01	C	-	9	14	17	22	11/28		50/178						>
HBW-BH101	4.00	97.01	C	-	2	3	5	7	8	10	30				*		
HBW-BH101	5.00	96.01	C	-	3	5	9	14	11	8	42					*	
HBW-BH101	6.50	94.51	S	-	1	-	1	1	1	2	5	*					
HBW-BH101	9.50	91.51	S	-	1	1	1	2	1	2	6	*					
HBW-BH101	12.00	89.01	S	-	1	1	1	1	2	2	6	*					
HBW-BH101	15.00	86.01	S	-	1	1	1	2	2	3	8	*					
HBW-BH101	18.00	83.01	S	-	1	1	1	2	3	3	9	*					
HBW-BH101	19.50	81.51	C	-	2	3	5	7	9	12	33				*		
HBW-BH101	22.50	78.51	S	-	6	17	28	22/51			50/126						>
HBW-BH101	25.50	75.51	S	-	3	5	7	8	11	14	40					*	
HBW-BH101	28.50	72.51	S	-	4	7	11	13	17	9/28	50/253						>
HBW-BH101	30.00	71.01	S	-	5	8	10	13	16	11/50	50/275						>
HBW-BH101	31.50	69.51	S	0	6	9	11	15	18	6/17	50/242						>
HBW-BH101	33.00	68.01	S	-	6	9	11	13	16	10/37	50/262						>
Driller			Steve Lowery				Remarks										
Hammer No.			AR2636														
Energy Ratio, Er (%)			60.00														
Calibration Date			11/01/2021														

-/- Blows/penetration (mm) after seating

-*/- Total blows/penetration (mm)

SWP Penetration under own weight (mm)

S - Standard Penetration Test (SPT)

C - SPT with cone

L - Split Spoon with liner used

GEOTECHNICS

Fieldwork Results - SPT Results Summary

Project KRONOSPAN RAW BOARD STORAGE

Project No PN214198

Client Kronospan Limited

Hole	Depth m bgl	Level m OD	Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N'					
					0-75 (mm)	75-150 (mm)	0-75 (mm)	75-150 (mm)	150-225 (mm)	225-300 (mm)		10	20	30	40	50	
HBW-BH102	1.20	99.80	C	-	9	6	11	17	22/28		50/178						>
HBW-BH102	2.00	99.00	C	-	4	7	9	11	12	15	47						*
HBW-BH102	4.00	97.00	S	-	1	1	1	1	1	1	4	*					
HBW-BH102	5.00	96.00	S	-	1	1	2	2	2	2	8	*					
HBW-BH102	6.50	94.50	S	-	1	-	-	-	1	-	1	*					
HBW-BH102	9.50	91.50	S	-	1	1	1	1	2	2	6	*					
HBW-BH102	12.00	89.00	S	-	1	1	1	2	2	2	7	*					
HBW-BH102	13.50	87.50	S	-	2	3	3	2	3	4	12	*					
HBW-BH102	15.00	86.00	S	-	6	5	4	5	5	6	20		*				
HBW-BH102	16.50	84.50	S	-	3	5	7	9	11	13	40				*		
HBW-BH102	18.00	83.00	S	-	5	9	11	14	17	8/21	50/246						>
HBW-BH102	19.50	81.50	S	-	25/51		50/43				50/43						>
Driller			Steve Lowery				Remarks										
Hammer No.			AR2636														
Energy Ratio, Er (%)			60.00														
Calibration Date			11/01/2021														

-/- Blows/penetration (mm) after seating

-*/- Total blows/penetration (mm)

SWP Penetration under own weight (mm)

S - Standard Penetration Test (SPT)

C - SPT with cone

L - Split Spoon with liner used

GEOTECHNICS

Fieldwork Results - SPT Results Summary

Project KRONOSPAN RAW BOARD STORAGE

Project No PN214198

Client Kronospan Limited

Hole	Depth m bgl	Level m OD	Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N'				
					0-75 (mm)	75-150 (mm)	0-75 (mm)	75-150 (mm)	150-225 (mm)	225-300 (mm)		10	20	30	40	50
HBW-BH103	1.20	99.60	C	-	7	10	12	16	22/70		50/220					>
HBW-BH103	2.00	98.80	C	-	7	9	11	15	19	5/8	50/233					>
HBW-BH103	3.00	97.80	C	-	2	3	4	4	2	2	12	*				
HBW-BH103	5.00	95.80	S	-	2	3	3	4	4	5	16		*			
HBW-BH103	8.00	92.80	S	-	1	2	2	3	2	3	10	*				
HBW-BH103	10.00	90.80	S	-	1	1	2	1	2	3	8	*				
HBW-BH103	11.00	89.80	S	-	1	1	2	1	2	3	8	*				
HBW-BH103	14.00	86.80	S	-	2	2	2	2	2	2	8	*				
HBW-BH103	17.00	83.80	S	-	2	2	2	2	2	3	9	*				
HBW-BH103	20.00	80.80	S	-	5	7	11	7	8	9	35			*		
HBW-BH103	23.00	77.80	S	-	7	14	15	17	18/68		50/218					>
HBW-BH103	26.00	74.80	S	-	7	10	15	19	16/53		50/203					>
HBW-BH103	29.00	71.80	S	-	5	7	10	11	13	16/70	50/295					>
HBW-BH103	30.50	70.30	S	-	3	5	7	9	16	18/62	50/287					>
HBW-BH103	32.00	68.80	S	-	5	7	10	14	17	9/22	50/247					>
HBW-BH103	33.50	67.30	S	-	3	7	9	11	14	16/70	50/295					>
Driller			Steve Lowery				Remarks									
Hammer No.			AR2636													
Energy Ratio, Er (%)			60.00													
Calibration Date			11/01/2021													

-/- Blows/penetration (mm) after seating

-*/- Total blows/penetration (mm)

SWP Penetration under own weight (mm)

S - Standard Penetration Test (SPT)

C - SPT with cone

L - Split Spoon with liner used

GEOTECHNICS

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

ARCHWAY ENGINEERING (UK) LTD
AINLEYS INDUSTRIAL ESTATE
ELLAND
WEST YORKSHIRE
HX5 9JP

SPT Hammer Ref: AR2636
Test Date: 11/01/2021
Report Date: 11/01/2021
File Name: AR2636.spt
Test Operator: JL

Instrumented Rod Data

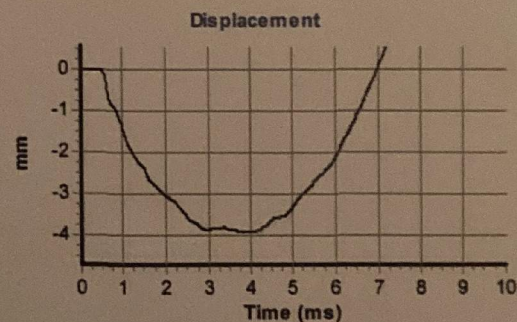
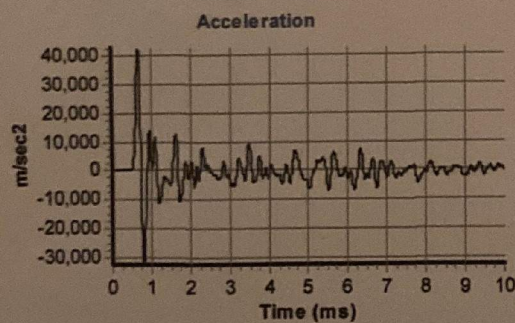
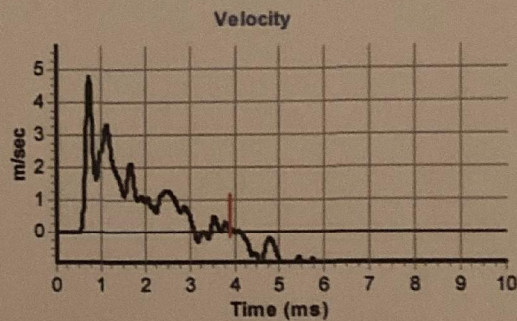
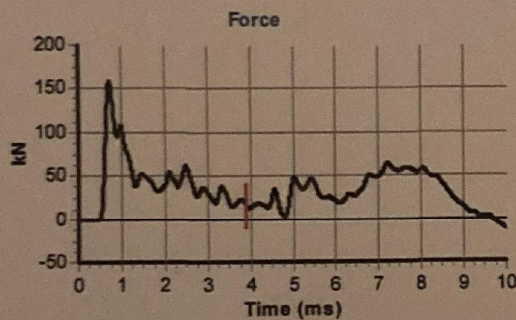
Diameter d_r (mm): 54
Wall Thickness t_r (mm): 6.3
Assumed Modulus E_a (GPa): 208
Accelerometer No.1: 7080
Accelerometer No.2: 11609

SPT Hammer Information

Hammer Mass m (kg): 63.5
Falling Height h (mm): 760
SPT String Length L (m): 10.0

Comments / Location

STEVE LOWRY DRILLING - 73779



Calculations

Area of Rod A (mm^2): 944
Theoretical Energy E_{theor} (J): 473
Measured Energy E_{meas} (J): 284

Energy Ratio E_r (%):

60

Signed: J. LOCK

Title: FITTER

The recommended calibration interval is 12 months

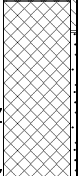
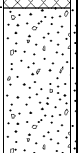
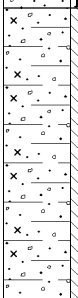
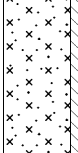
APPENDIX 3

Dynamic Sample Borehole Records

[illegible]

BOREHOLE RECORD - Dynamic Sampler

Project **KRONOSPAN RAW BOARD STORAGE** Engineer **RAMBOLL UK** Borehole Project No **HBW-WS102**
 Client **KRONOSPAN LIMITED** National Grid Coordinates **328693.1 E 338409.5 N** Ground Level **101.00 m OD**

Sampling			Properties			Strata		Scale 1:50		
Depth		Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
							MADE GROUND: Grey concrete.	G.L.		101.00
0.28- 0.80	B						MADE GROUND: Brown sandy angular to subangular fine to coarse gravel of mudstone, sandstone and limestone. Low cobble content.	0.28		100.72
0.28	ES					PID=0.1ppm				
0.28							MADE GROUND: Grey very sandy slightly clayey angular to subangular fine to coarse gravel of mudstone, siltstone and sandstone. Low cobble content. Below 1.00m, slight hydrocarbon odour. Below 1.20m, dense.	0.80		100.20
0.30	D					PID=0.0ppm				
0.50	ES					PID=0.6ppm				
0.50						TR= 90%				
0.80- 1.20	B						Dense brown clayey medium to coarse SAND and subangular to subrounded fine to coarse GRAVEL of mudstone, siltstone and quartzite.	2.00		99.00
0.90	D					TR= 80%				
1.00	ES									
1.00										
1.20- 2.00	B									
1.20	D	1.20 (DRY)				S43				
1.20- 1.65	B									
2.00- 3.00	D	2.00 (2.00)				S34				
2.00	ES									
2.00										
2.00										
3.00- 3.45	D	3.00 (2.00)				S12				
3.00	ES						Firm thinly laminated brown slightly sandy slightly gravelly silty CLAY. Gravel is subangular to rounded fine to medium of mudstone, siltstone and sandstone.	3.00		98.00
3.00						TR= NR%				
3.00						PID=1.9ppm				
4.00- 5.00	B									
4.00- 5.00	D	4.00 (2.00)				S11				
4.00- 4.45	D									
4.50	D									
5.00- 5.45	D	5.00 (2.00)				S10	Loose to medium dense grey gravelly fine to coarse SAND. Gravel is subangular to rounded fine to coarse of mudstone, siltstone and sandstone.	5.00		96.00
5.05- 5.40	D					TR= 60%				
5.00- 6.00										
5.40- 5.70	D						Soft grey slightly sandy SILT.	5.40		95.60
5.70- 6.00	D									
6.00- 6.45		6.00 (2.00)				S7				
							End of Borehole	6.45		94.55

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.28	0.35	Concrete Core	SMS	G.L.			26/03/21	08:00	2.00		1.60	20		Fast inflow, not sealed.
1.20	0.35	Inspection Pit	JR/J	6.45	6.00	1.60	26/03/21	18:00						
6.45	0.10	Dynamic Sampler	JR/J											

Remarks **INS** Inspection pit hand excavated to 1.20m depth and no services were found.
AGS sample = 1x 1L plastic tub, 2x 258ml amber jars and 1x 60ml glass jar.
 A 33mm standpipe was installed to 3.00m with a geowrapped slotted section from 1.00m to 3.00m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 3.00m, gravel filter up to 1.00m, bentonite seal up to 0.20m, concrete up to ground level.

Logged by **JD**
 Figure **1 of 1**
 19/07/2021

geotechnics

Sampling			Properties			Strata		Scale 1:50				
Depth		Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD		
0.27-0.55		BES	1.20 (DRY)	PID=0.0ppm	S39	MADE GROUND: Grey concrete.	6.L.		101.01			
0.27-0.55		D				MADE GROUND: Brown sandy silty angular to subangular fine to coarse gravel of mudstone and limestone	0.27		100.74			
0.55-1.20		BES				MADE GROUND: Greyish brown very sandy very clayey with subangular to rounded fine to coarse gravel of mudstone, siltstone and limestone. Low cobble content. Below 1.20m, medium cobble content.	0.55		100.46			
0.55-1.20		D					PID=0.1ppm					
0.55-1.20		ES										
1.20-2.00		B							TR= 100%			
1.20-2.00		D										
1.20-2.00		B										
2.00-3.00		D				S26						
2.00-2.45		ES										
2.00-2.45		D	PID=0.0ppm									
2.70-3.00		D										
3.00-4.00		B		TR= 100%								
3.00-4.00		D			S19							
3.00-3.45		ES										
3.00-3.45		D				TR= 100%						
4.00-4.90		B	S9									
4.00-5.00		D										
4.00-4.45		D		Firm brownish grey slightly sandy SILT.								
4.50		D										
4.90-5.00		D			TR= 90%							
5.00-6.00		B				S8						
5.00-6.00		D	Grey sandy subrounded to rounded fine to coarse GRAVEL of mudstone, siltstone, sandstone and quartzite.									
5.00-5.45		D					Soft to firm grey slightly sandy CLAY.					
5.50		D		S9								
6.00-6.45		D						End of Borehole				
					6.45				94.56			

BOREHOLE RECORD - Dynamic Sampler

Project **KRONOSPAN RAW BOARD STORAGE** Engineer **RAMBOLL UK** Borehole Project No **HBW-WS104**
 Client **KRONOSPAN LIMITED** National Grid Coordinates **328764.5 E 338415.5 N** Ground Level **100.80 m OD**

Sampling			Properties			Strata			Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD		
0.25- 0.80	B					MADE GROUND: Grey reinforced concrete.	G.L.		100.80		
0.30	D						0.25		100.55		
0.30	ES		PID=0.0ppm			MADE GROUND: Brown very gravelly silty fine to medium sand. Gravel is angular to subangular fine to coarse of granite.					
0.80- 1.00	B						0.80		100.00		
0.90	D					MADE GROUND: Grey very gravelly slightly silty fine to medium sand. Gravel is angular to subangular fine to coarse of granite.	1.00		99.80		
0.90	ES		PID=0.0ppm								
1.00- 1.80	B		TR= 100%		S43	MADE GROUND: Stiff to very stiff grey mottled brown slightly gravelly sandy silty clay. Gravel is angular to subangular fine to coarse of granite and sandstone.					
1.20- 2.00	D	1.20 (DRY)									
1.20- 1.65	D										
1.80- 2.00	D		TR= 90%		S24						
1.80- 2.00	ES		PID=0.0ppm								
2.00- 3.00											
2.00- 2.45	D	2.00 (DRY)									
2.10- 2.80	B										
2.80- 3.00	D						2.80		98.00		
2.80- 3.00	ES		TR= 50%		S10	Loose dark grey mottled light grey very sandy clayey angular to subangular fine to medium gravel of mudstone and siltstone.					
3.00- 4.00	D	3.00 (2.90)	PID=0.0ppm								
3.50- 4.00	ES		PID=0.0ppm								
4.00- 4.45	D	4.00 (2.90)			S15	Below 4.00m, firm to stiff.					
4.00- 5.00	D		TR= 80%								
4.20- 4.50	D										
4.50- 5.00	ES										
5.00- 5.45	#	5.00 (2.90)			S15						
5.00- 6.00	D		TR= 70%								
5.30- 5.60	D										
5.60- 6.00	D										
						Stiff grey slightly sandy CLAY.	5.60		95.20		
						End of Borehole	6.00		94.80		

Boring				Progress					Groundwater				
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	In Mins	Depth Sealed
0.25	0.35	Concrete Core	SMS	G.L.			23/03/21	08:00	2.90				
1.20	0.35	Inspection Pit	JR/J	6.00		2.90	23/03/21	18:00					
6.00	0.10	Dynamic Sampler	JR/J										

Remarks **INS** Inspection pit hand excavated to 1.20m depth and no services were found.
AGS sample = 1x 1L plastic tub, 2x 258ml amber jars and 1x 60ml glass jar.
 A 33mm standpipe was installed to 5.50m with a geowrapped slotted section from 1.00m to 5.50m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 5.50m, gravel filter up to 1.00m, bentonite seal up to 0.20m, concrete up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Logged by **EPS**
 Figure **1 of 1**
 19/07/2021

geotechnics

Sampling			Properties			Strata			Scale 1:50														
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD														
0.31- 0.50 0.31 0.31 0.40 0.50- 1.20 0.50 0.50 0.60 1.00 1.00 1.20- 2.00 1.20 2.00 1.20- 1.65 2.00- 2.70 2.00 3.00 2.00- 2.45 2.00 2.00 3.00- 4.00 3.00 4.00 3.00- 3.45 3.00 3.00 4.00- 4.60 4.00 5.00 4.00- 4.45 4.60- 5.00 5.00- 6.00 5.00 6.00 5.00- 5.45 6.00- 6.45	B ES D B ES D ES B D B D ES B D ES D B D D	1.20 (DRY) 2.00 (DRY) 3.00 (DRY) 4.00 (4.00) 5.00 (3.00) 6.00 (3.00)	PID=0.0ppm PID=0.1ppm PID=0.1ppm TR= 100% TR= 80% PID=0.1ppm TR= 35% PID=0.0ppm TR= 60% TR= 100%	S20 S12 S10 S16 S10	MADE GROUND: Grey concrete.	6. L.		101.00															
					MADE GROUND: Brown sandy slightly silty angular to subangular fine to coarse gravel of mudstone, sandstone and limestone.	0.31 0.50		100.69 100.50															
					MADE GROUND: Greyish brown very sandy clayey angular to subangular fine to coarse gravel of mudstone, sandstone and limestone. High cobble content. Below 1.20m, medium dense.																		
					Medium dense grey very gravelly silty medium to coarse SAND. Gravel is angular to subrounded fine to coarse of mudstone and sandstone.	2.70		98.30															
					Loose to medium dense grey slightly gravelly fine to coarse SAND. Gravel is subrounded to rounded fine to coarse of mudstone, siltstone and quartzite.	4.00		97.00															
					Firm grey sandy SILT.	4.60		96.40															
					Medium dense grey slightly gravelly fine to coarse SAND. Gravel is subrounded to rounded fine to coarse of mudstone, siltstone and quartzite.	5.00		96.00															
					Firm grey sandy SILT.	6.00		95.00															
					End of Borehole	6.45		94.55															
					Boring						Progress						Groundwater						
					Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater				
					0.31 1.20 6.45	0.35 0.35 0.10	Concrete Core Inspection Pit Dynamic Sampler	SMS JR/J JR/J	6. L. 6.45	6.00	3.00	25/03/21 25/03/21	08:00 18:00	4.00		2.50	20		Fast inflow.				
					Remarks															Logged by		JD	
					AGS Inspection pit hand excavated to 1.20m depth and no services were found. ES sample = 1x 1L plastic tub, 2x 258ml amber jars and 1x 60ml glass jar. A 33mm standpipe was installed to 6.45m with a geowrapped slotted section from 4.00m to 6.45m with upright lockable protective cover. Backfill details from base of hole: sand filter up to 4.00m, bentonite seal up to 0.20m, concrete up to ground level.															Figure		1 of 1 19/07/2021	
					Symbols and abbreviations are explained on the accompanying key sheet.																		
All dimensions are in metres.															Logged in accordance with BS5930:2015 + A1:2020								

Fieldwork Results - SPT Results Summary

Project KRONOSPAN RAW BOARD STORAGE

Project No PN214198

Client Kronospan Limited

Hole	Depth m bgl	Level m OD	Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N'					
					0-75 (mm)	75-150 (mm)	0-75 (mm)	75-150 (mm)	150-225 (mm)	225-300 (mm)		10	20	30	40	50	
HBW-WS101	1.20	99.81	S	-	14	1	8	8	16	14	46					*	
HBW-WS101	2.00	99.01	S	-	6	5	4	3	4	3	14		*				
HBW-WS101	3.00	98.01	S	-	3	2	2	2	2	2	8	*					
HBW-WS101	4.00	97.01	S	-	5	6	6	4	5	6	21			*			
HBW-WS101	5.00	96.01	S	-	3	2	2	2	2	2	8	*					
HBW-WS101	6.00	95.01	S	-	3	2	2	2	2	2	8	*					
							Remarks										

-/- Blows/penetration (mm) after seating

-*/- Total blows/penetration (mm)

SWP Penetration under own weight (mm)

S - Standard Penetration Test (SPT)

C - SPT with cone

L - Split Spoon with liner used

GEOTECHNICS



Fieldwork Results - SPT Results Summary

Project KRONOSPAN RAW BOARD STORAGE

Project No PN214198

Client Kronospan Limited

Hole	Depth m bgl	Level m OD	Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N'					
					0-75 (mm)	75-150 (mm)	0-75 (mm)	75-150 (mm)	150-225 (mm)	225-300 (mm)		10	20	30	40	50	
HBW-WS104	1.20	99.60	S	-	5	7	7	8	8	20	43					*	
HBW-WS104	2.00	98.80	S	-	3	4	4	6	7	7	24			*			
HBW-WS104	3.00	97.80	S	-	4	4	4	4	1	1	10	*					
HBW-WS104	4.00	96.80	S	-	3	3	4	3	3	5	15		*				
HBW-WS104	5.00	95.80	S	-	3	2	4	3	3	5	15		*				
							Remarks										

Fieldwork Results - SPT Results Summary

Project KRONOSPAN RAW BOARD STORAGE

Project No PN214198

Client Kronospan Limited

Hole	Depth m bgl	Level m OD	Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N'				
					0-75 (mm)	75-150 (mm)	0-75 (mm)	75-150 (mm)	150-225 (mm)	225-300 (mm)		10	20	30	40	50
HBW-WS105	1.20	99.80	S	-	3	4	5	5	4	6	20		*			
HBW-WS105	2.00	99.00	S	-	3	3	4	5	4	4	17		*			
HBW-WS105	3.00	98.00	S	-	2	2	3	3	3	3	12		*			
HBW-WS105	4.00	97.00	S	-	1	1	2	2	3	3	10		*			
HBW-WS105	5.00	96.00	S	-	2	4	3	4	4	5	16		*			
HBW-WS105	6.00	95.00	S	-	2	2	3	2	2	3	10		*			
							Remarks									

-/- Blows/penetration (mm) after seating

-*/- Total blows/penetration (mm)

SWP Penetration under own weight (mm)

S - Standard Penetration Test (SPT)

C - SPT with cone

L - Split Spoon with liner used

GEOTECHNICS

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

ARCHWAY ENGINEERING (UK) LTD
AINLEYS INDUSTRIAL ESTATE
ELLAND
WEST YORKSHIRE
HX5 9JP

SPT Hammer Ref: DART478
Test Date: 29/10/2020
Report Date: 29/10/2020
File Name: DART478.spt
Test Operator: JL

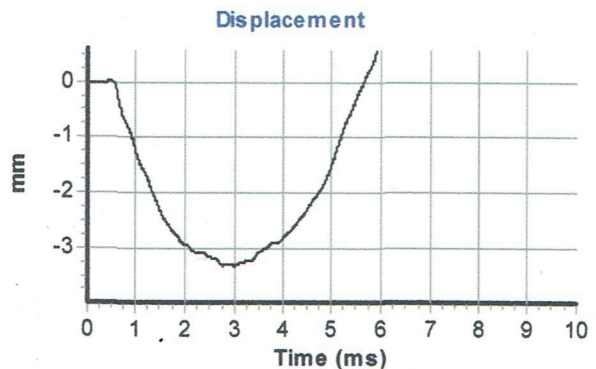
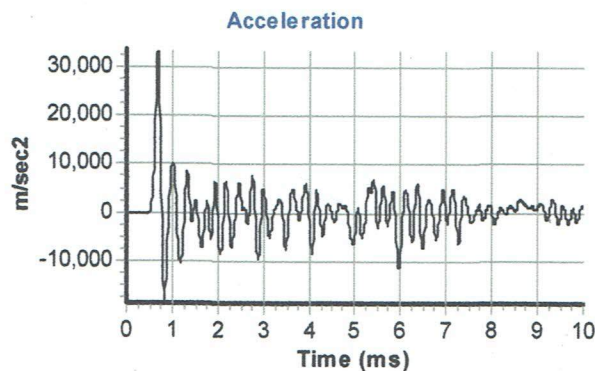
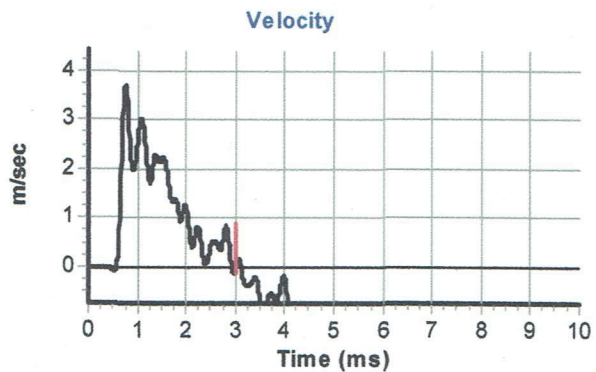
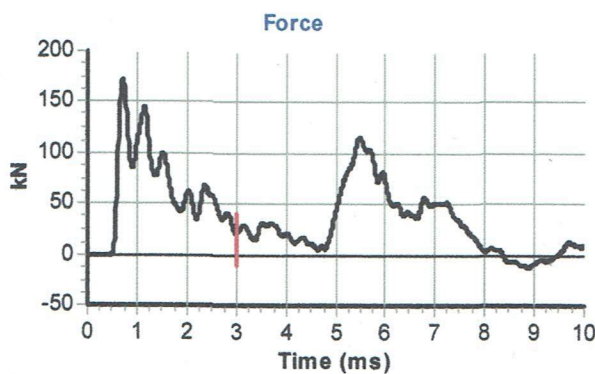
Instrumented Rod Data

Diameter d_r (mm): 54
Wall Thickness t_r (mm): 6.2
Assumed Modulus E_a (GPa): 210
Accelerometer No.1: 7080
Accelerometer No.2: 11609

SPT Hammer Information

Hammer Mass m (kg): 63.5
Falling Height h (mm): 760
SPT String Length L (m): 10.0

Comments / Location



Calculations

Area of Rod A (mm^2): 931
Theoretical Energy E_{theor} (J): 473
Measured Energy E_{meas} (J): 352

Energy Ratio E_r (%): **74**

Signed: S. HOWARTH
Title: FITTER

The recommended calibration interval is 12 months

APPENDIX 4

Monitoring Results

FIELDWORK – Water Level Monitoring

Project KRONOSPAN RAW BOARD STORAGE

Project No PN214198

Client Kronospan Limited

Sheet No 1

Borehole		HBW-BH101		HBW-BH101		HBW-BH102		HBW-BH102		HBW-BH103		HBW-WS101	
Instrument (dia. mm)		S (33mm)		S (50mm)		S (50mm)		S (33mm)		S (50mm)		S (33mm)	
Depth to Base (m)		5.00		34.00		4.00 (Note 1)		14.00		21.00 (Note 2)		3.15	
Filter Zone (m)		3.00-5.00		29.00-34.00		3.00-4.00		12.70-14.00		18.00-21.00		1.00-3.15	
Level		101.01 m OD		101.01 m OD		101.00 m OD		101.00 m OD		100.80 m OD		101.01 m OD	
Date	Time	Depth (m)	Level	Depth (m)	Level	Depth (m)	Level	Depth (m)	Level	Depth (m)	Level	Depth (m)	Level
27 Apr 2021		2.02	98.99	15.45	85.56	2.02	98.98	8.65	92.35			2.05	98.96
6 May 2021		2.10	98.91	15.10	85.91	2.07	98.93	8.74	92.26	8.75	92.05	2.28	98.73
14 May 2021		2.05	98.96	15.25	85.76	2.00	99.00	8.72	92.28	8.76	92.04	DRY	
19 May 2021		2.10	98.91	15.12	85.89	1.99	99.01	8.83	92.17			DRY	
3 Jun 2021						1.94	99.06	8.59	92.41				

Remarks Note 1 - 06/05/2021 - Oily sheen on groundwater.

Note 2 - 27/04/2021 - No access to borehole.

19/05/2021 - No access to borehole.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

GEOTECHNICS
geotechnical and geoenvironmental specialists

FIELDWORK – Water Level Monitoring

Project KRONOSPAN RAW BOARD STORAGE

Project No PN214198

Client Kronospan Limited

Sheet No 2

Borehole		HBW-WS102		HBW-WS103		HBW-WS104		HBW-WS105					
Instrument (dia. mm)		S (33mm)		S (33mm)		S (33mm)		S (33mm)					
Depth to Base (m)		3.00 (Note 3)		4.00		5.50 (Note 4)		6.45					
Filter Zone (m)		1.00-3.00		1.00-4.00		1.00-5.50		4.00-6.45					
Level		101.00 m OD		101.01 m OD		100.80 m OD		101.00 m OD					
Date	Time	Depth (m)	Level	Depth (m)	Level	Depth (m)	Level	Depth (m)	Level	Depth (m)	Level	Depth (m)	Level
27 Apr 2021		2.22	98.78	DRY				2.04	98.96				
6 May 2021		2.25	98.75	DRY				2.02	98.98				
14 May 2021				DRY				2.00	99.00				
19 May 2021				DRY				1.98	99.02				

Remarks Note 3 - 06/05/2021 - Oily sheen on groundwater.

Symbols and abbreviations are explained on the accompanying key sheet.

14/05/2021 - No access to borehole.

19/05/2021 - No access to borehole.

Note 4 - 27/04/2021 - No access to borehole.

06/05/2021 & 14/05/2021 - Unable to sample water due to blockage in pipe.

All dimensions are in metres.

19/05/2021 - No access to borehole.

GEOTECHNICS
geotechnical and geoenvironmental specialists

FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

PN214198

HBW-BH101

(P1)

Client **Kronospan Limited**

1 (1 of 4)

Installation Details

Installation Type Standpipe

33mm

Depth to Base	5.00m
---------------	-------

Flush lockable protective cover

Filter Zone	3.00 - 5.00m
-------------	--------------

101.01 m OD

Date Installed 8 April 2021

[illegible]

Remarks



Form 003/1

FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

PN214198

HBW-BH101

(P1)

Client Kronospan Limited

1 (2 of 4)

Installation Details

Installation Type Standpipe

33mm

Depth to Base 5.00m

Flush lockable protective cover

Filter Zone 3.00 - 5.00m

101.01 m OD

Date Installed 8 April 2021

[illegible]

Remarks



Form 003/1

FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

PN214198

HBW-BH101

(P1)

Client **Kronospan Limited**

1 (3 of 4)

Installation Details

Installation Type Standpipe

33mm

Depth to Base 5.00m

Flush lockable protective cover

Filter Zone 3.00 - 5.00m

101.01 m OD

Date Installed 8 April 2021

[illegible]

Remarks



Form 003/1

FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

Project No

PN214198

Borehole

HBW-BH101

(P1)

Client Kronospan Limited

Sheet No.

1 (4 of 4)

Installation Details

Installation Type	Standpipe
Depth to Base	5.00m
Filter Zone	3.00 - 5.00m
Date Installed	8 April 2021

Diameter	33mm
Cover Type	Flush lockable protective cover
Ground Level	101.01 m OD

Date	Time	Equipment Used	Monitored by	Remarks
		0	0	
27-Apr-2021		GA5000	JA	
6-May-2021		GA5000	JA	
14-May-2021		GA5000	JA	
19-May-2021		GA5000	JA	

Remarks



Form 003/1

FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

PN214198

HBW-BH101

(P2)

Client **Kronospan Limited**

1 (1 of 4)

Installation Details

Installation Type Standpipe

50mm

Depth to Base 34.00m

Flush lockable protective cover

Filter Zone 29.00 - 34.00m

101.01 m OD

Date Installed 8 April 2021

[illegible]

Remarks



Form 003/1

FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

PN214198

HBW-BH101

(P2)

Client **Kronospan Limited**

1 (2 of 4)

Installation Details

Installation Type Standpipe

50mm

Depth to Base 34.00m

Flush lockable protective cover

Filter Zone	29.00 - 34.00m
-------------	----------------

101.01 m OD

Date Installed 8 April 2021

[illegible]

Remarks



Form 003/1

FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

PN214198

HBW-BH101

(P2)

Client Kronospan Limited

1 (3 of 4)

Installation Details

Installation Type Standpipe

Depth to Base 34.00m

Filter Zone	29.00 - 34.00m
-------------	----------------

Date Installed 8 April 2021

50mm

Flush lockable protective cover

101.01 m OD

[illegible]

Remarks



Form 003/1

FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

Project No

PN214198

Borehole

HBW-BH101

(P2)

Client Kronospan Limited

Sheet No.

1 (4 of 4)

Installation Details

Installation Type	Standpipe	Diameter	50mm
Depth to Base	34.00m	Cover Type	Flush lockable protective cover
Filter Zone	29.00 - 34.00m	Ground Level	101.01 m OD
Date Installed	8 April 2021		

Date	Time	Equipment Used	Monitored by	Remarks
		()	()	
27-Apr-2021		GA5000	JA	
6-May-2021		GA5000	JA	
14-May-2021		GA5000	JA	
19-May-2021		GA5000	JA	

Remarks

geotechnics

FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

PN214198

HBW-BH102

(P1)

Client **Kronospan Limited**

1 (1 of 4)

Installation Details

Installation Type	Standpipe
Depth to Base	4.00m
Filter Zone	3.00 - 4.00m
Date Installed	15 April 2021

Diameter	50mm
Cover Type	Flush lockable protective cover
Ground Level	101.00 m OD

[illegible]

Remarks 06/05/2021 - Oily sheen on groundwater.



Form 003/1

FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

PN214198

HBW-BH102

(P1)

Client **Kronospan Limited**

1 (2 of 4)

Installation Details

Installation Type Standpipe

50mm

Depth to Base 4.00m

Flush lockable protective cover

Filter Zone 3.00 - 4.00m

101.00 m OD

Date Installed 15 April 2021

[illegible]

Remarks 06/05/2021 - oily sheen on groundwater.



Form 003/1

FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

PN214198

HBW-BH102

(P1)

Client **Kronospan Limited**

1 (3 of 4)

Installation Details

Installation Type Standpipe

Depth to Base 4.00m

Filter Zone 3.00 - 4.00m

Date Installed 15 April 2021

50mm

Flush lockable protective cover

101.00 m OD

Date	Time	Flow Rate (Peak) (l/hr)	Flow Rate (Steady) (l/hr)	PID Reading (ppm)	PID Peak (ppm)	Wind ()	Cloud ()	Rain ()	Remarks
27-Apr-2021		-0.2	-0.2	3.5	3.6	Still	None	Dry	
6-May-2021		0.1	0.1	3.6	3.6	Still	None	Dry	
14-May-2021		1.9	1.8	3.5	3.5	Still	None	Dry	
19-May-2021		0.0	0.0	3.2	3.4	Still	None	Dry	
3-Jun-2021		1.8	1.4			Still	None	Dry	

Remarks 06/05/2021 - Oily sheen on groundwater.



Form 003/1

FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

Project No

PN214198

Borehole

HBW-BH102

(P1)

Client Kronospan Limited

Sheet No.

1 (4 of 4)

Installation Details

Installation Type Standpipe
Depth to Base 4.00m
Filter Zone 3.00 - 4.00m
Date Installed 15 April 2021

Diameter 50mm
Cover Type Flush lockable protective cover
Ground Level 101.00 m OD

Date	Time	Equipment Used	Monitored by	Remarks
		()	()	
27-Apr-2021		GA5000	JA	
6-May-2021		GA5000	JA	
14-May-2021		GA5000	JA	
19-May-2021		GA5000	JA	
3-Jun-2021		GA5000	JA, RW	

Remarks 06/05/2021 - Oily sheen on groundwater.

geotechnics

FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

PN214198

HBW-BH102 (P2)

1 (3 of 4)

Client **Kronospan Limited**

Installation Details

Diameter 33mm

Cover Type	Flush lockable protective cover
------------	---------------------------------

Ground Level 101.00 m OD

[illegible]

FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

Project No

PN214198

Borehole

HBW-BH102

(P2)

Client Kronospan Limited

Sheet No.

1 (4 of 4)

Installation Details

Installation Type	Standpipe	Diameter	33mm
Depth to Base	14.00m	Cover Type	Flush lockable protective cover
Filter Zone	12.70 - 14.00m	Ground Level	101.00 m OD
Date Installed	15 April 2021		

Date	Time	Equipment Used	Monitored by	Remarks
		()	()	
27-Apr-2021		GA5000	JA	
6-May-2021		GA5000	JA	
14-May-2021		GA5000	JA	
19-May-2021		GA5000	JA	
3-Jun-2021		GA5000	JA, RW	

Remarks



FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

Project No PN214198

Borehole HBW-BH103

Client **Kronospan Limited**

Sheet No. 1 (1 of 4)

Installation Details

Installation Type Standpipe

Diameter 50mm

Depth to Base	21.00m
---------------	--------

Cover Type	Flush lockable protective cover
-------------------	--

Filter Zone	18.00 - 21.00m
-------------	----------------

Ground Level	100.80 m OD
--------------	-------------

Date Installed 29 March 2021

[illegible]

Remarks	27/04/2021 - No access to borehole. 19/05/2021 - No access to borehole.
---------	--



Form 003/1

FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

Project No PN214198

Borehole HBW-BH103

Client **Kronospan Limited**

Sheet No. 1 (2 of 4)

Installation Details

Installation Type	Standpipe	Diameter	50mm
Depth to Base	21.00m	Cover Type	Flush lockable protective cover
Filter Zone	18.00 - 21.00m	Ground Level	100.80 m OD
Date Installed	29 March 2021		

[illegible]

Remarks	27/04/2021 - No access to borehole. 19/05/2021 - No access to borehole.
---------	--



Form 003/1

FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

Project No PN214198
Borehole HBW-BH103
Sheet No. 1 (3 of 4)

Client **Kronospan Limited**

Installation Details

Installation Type	Standpipe	Diameter	50mm
Depth to Base	21.00m	Cover Type	Flush lockable protective cover
Filter Zone	18.00 - 21.00m	Ground Level	100.80 m OD
Date Installed	29 March 2021		

Date	Time	Flow Rate (Peak) (l/hr)	Flow Rate (Steady) (l/hr)	PID Reading (ppm)	PID Peak (ppm)	Wind ()	Cloud ()	Rain ()	Remarks
6-May-2021		0.0	0.0	2.8	2.8	Still	None	Dry	
14-May-2021		0.0	0.0	2.8	2.8	Still	None	Dry	

Remarks	27/04/2021 - No access to borehole. 19/05/2021 - No access to borehole.
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Form 003/1

FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

Project No PN214198
Borehole HBW-BH103
Sheet No. 1 (4 of 4)

Client **Kronospan Limited**

Installation Details

Installation Type	Standpipe	Diameter	50mm
Depth to Base	21.00m	Cover Type	Flush lockable protective cover
Filter Zone	18.00 - 21.00m	Ground Level	100.80 m OD
Date Installed	29 March 2021		

Date	Time	Equipment Used	Monitored by	Remarks
6-May-2021		GA5000	JA	
14-May-2021		GA5000	JA	

Remarks	27/04/2021 - No access to borehole. 19/05/2021 - No access to borehole.
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FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

Project No PN214198
Borehole HBW-WS101
Sheet No. 1 (2 of 4)

Client **Kronospan Limited**

Installation Details

Installation Type	standpipe	Diameter	33mm
Depth to Base	3.15m	Cover Type	Flush lockable protective cover
Filter Zone	1.00 - 3.15m	Ground Level	101.01 m OD
Date Installed	26 March 2021		

[illegible]

Remarks

FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

Project No PN214198
Borehole HBW-WS101
Sheet No. 1 (3 of 4)

Client **Kronospan Limited**

Installation Details

Installation Type	standpipe	Diameter	33mm
Depth to Base	3.15m	Cover Type	Flush lockable protective cover
Filter Zone	1.00 - 3.15m	Ground Level	101.01 m OD
Date Installed	26 March 2021		

Date	Time	Flow Rate (Peak) (l/hr)	Flow Rate (Steady) (l/hr)	PID Reading (ppm)	PID Peak (ppm)	Wind ()	Cloud ()	Rain ()	Remarks
27-Apr-2021		0.0	0.0	0.6	1.8	Still	None	Dry	
6-May-2021		0.0	0.0	0.4	2.7	Still	None	Dry	
14-May-2021		0.1	0.1	0.5	1.7	Still	None	Dry	
19-May-2021		0.0	0.0	0.6	1.4	Still	None	Dry	

Remarks

FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

Project No PN214198
Borehole HBW-WS101
Sheet No. 1 (4 of 4)

Client **Kronospan Limited**

Installation Details

Installation Type	standpipe	Diameter	33mm
Depth to Base	3.15m	Cover Type	Flush lockable protective cover
Filter Zone	1.00 - 3.15m	Ground Level	101.01 m OD
Date Installed	26 March 2021		

Date	Time	Equipment Used	Monitored by	Remarks
		0	0	
27-Apr-2021		GA5000	JA	
6-May-2021		GA5000	JA	
14-May-2021		GA5000	JA	
19-May-2021		GA5000	JA	

Remarks

FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

Project No PN214198
Borehole HBW-WS102
Sheet No. 1 (1 of 4)

Client **Kronospan Limited**

Installation Details

Installation Type	standpipe	Diameter	33mm
Depth to Base	3.00m	Cover Type	Flush lockable protective cover
Filter Zone	1.00 - 3.00m	Ground Level	101.00 m OD
Date Installed	26 March 2021		

[illegible]

Remarks	06/05/2021 - Oily sheen on groundwater. 14/05/2021 - No access to borehole. 19/05/2021 - No access to borehole.
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FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

Project No PN214198
Borehole HBW-WS102
Sheet No. 1 (2 of 4)

Client **Kronospan Limited**

Installation Details

Installation Type	standpipe	Diameter	33mm
Depth to Base	3.00m	Cover Type	Flush lockable protective cover
Filter Zone	1.00 - 3.00m	Ground Level	101.00 m OD
Date Installed	26 March 2021		

[illegible]

Remarks	06/05/2021 - Oily sheen on groundwater. 14/05/2021 - No access to borehole. 19/05/2021 - No access to borehole.
---------	---



FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

Project No PN214198
Borehole HBW-WS102
Sheet No. 1 (3 of 4)

Client **Kronospan Limited**

Installation Details

Installation Type	standpipe	Diameter	33mm
Depth to Base	3.00m	Cover Type	Flush lockable protective cover
Filter Zone	1.00 - 3.00m	Ground Level	101.00 m OD
Date Installed	26 March 2021		

Date	Time	Flow Rate (Peak) (l/hr)	Flow Rate (Steady) (l/hr)	PID Reading (ppm)	PID Peak (ppm)	Wind ()	Cloud ()	Rain ()	Remarks
27-Apr-2021		0.0	0.0	1.1	1.1	Still	None	Dry	
6-May-2021		0.0	0.0	1.0	1.1	Still	None	Dry	

Remarks	06/05/2021 - Oily sheen on groundwater. 14/05/2021 - No access to borehole. 19/05/2021 - No access to borehole.
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Form 003/1

FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

Project No PN214198
Borehole HBW-WS102
Sheet No. 1 (4 of 4)

Client **Kronospan Limited**

Installation Details

Installation Type	standpipe	Diameter	33mm
Depth to Base	3.00m	Cover Type	Flush lockable protective cover
Filter Zone	1.00 - 3.00m	Ground Level	101.00 m OD
Date Installed	26 March 2021		

Date	Time	Equipment Used	Monitored by	Remarks
27-Apr-2021		GA5000	JA	
6-May-2021		GA5000	JA	

Remarks	06/05/2021 - Oily sheen on groundwater. 14/05/2021 - No access to borehole. 19/05/2021 - No access to borehole.
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FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

Project No PN214198
Borehole HBW-WS103
Sheet No. 1 (1 of 4)

Client **Kronospan Limited**

Installation Details

Installation Type	standpipe	Diameter	33mm
Depth to Base	4.00m	Cover Type	Flush lockable protective cover
Filter Zone	1.00 - 4.00m	Ground Level	101.01 m OD
Date Installed	25 March 2021		

[illegible]

Remarks

FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

Project No PN214198
Borehole HBW-WS103
Sheet No. 1 (2 of 4)

Client **Kronospan Limited**

Installation Details

Installation Type	standpipe	Diameter	33mm
Depth to Base	4.00m	Cover Type	Flush lockable protective cover
Filter Zone	1.00 - 4.00m	Ground Level	101.01 m OD
Date Installed	25 March 2021		

[illegible]

Remarks

FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

Project No PN214198
Borehole HBW-WS103
Sheet No. 1 (3 of 4)

Client **Kronospan Limited**

Installation Details

Installation Type	standpipe	Diameter	33mm
Depth to Base	4.00m	Cover Type	Flush lockable protective cover
Filter Zone	1.00 - 4.00m	Ground Level	101.01 m OD
Date Installed	25 March 2021		

[illegible]

Remarks

FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

Project No PN214198
Borehole HBW-WS104
Sheet No. 1 (1 of 4)

Client **Kronospan Limited**

Installation Details

Installation Type	standpipe	Diameter	33mm
Depth to Base	5.50m	Cover Type	Flush lockable protective cover
Filter Zone	1.00 - 5.50m	Ground Level	100.80 m OD
Date Installed	25 March 2021		

Date	Time	Depth to Water (m bgl)	Current Hole Depth (m bgl)	Depth to Oil (LNAPL) (m bgl)	Water Sample Taken (Yes/No)	Methane (Peak) CH4 (% VOL)	Methane (Steady) CH4 (% VOL)	Carbon Dioxide (Peak) (% VOL)	Remarks
6-May-2021					No	0.0	0.0	2.5	
14-May-2021					No	0.0	0.0	2.3	

Remarks	27/04/2021 - No access to borehole. 06/05/2021 & 14/05/2021 - Unable to sample water due to blockage in pipe. 19/05/2021 - No access to borehole.
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FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

Project No PN214198
Borehole HBW-WS104
Sheet No. 1 (2 of 4)

Client **Kronospan Limited**

Installation Details

Installation Type	standpipe	Diameter	33mm
Depth to Base	5.50m	Cover Type	Flush lockable protective cover
Filter Zone	1.00 - 5.50m	Ground Level	100.80 m OD
Date Installed	25 March 2021		

[illegible]

Remarks	27/04/2021 - No access to borehole. 06/05/2021 & 14/05/2021 - Unable to sample water due to blockage in pipe. 19/05/2021 - No access to borehole.
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Form 003/1

FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

Project No PN214198
Borehole HBW-WS104
Sheet No. 1 (3 of 4)

Client **Kronospan Limited**

Installation Details

Installation Type	standpipe	Diameter	33mm
Depth to Base	5.50m	Cover Type	Flush lockable protective cover
Filter Zone	1.00 - 5.50m	Ground Level	100.80 m OD
Date Installed	25 March 2021		

Date	Time	Flow Rate (Peak) (l/hr)	Flow Rate (Steady) (l/hr)	PID Reading (ppm)	PID Peak (ppm)	Wind ()	Cloud ()	Rain ()	Remarks
6-May-2021		0.0	0.0	0.6	2.0	Still	None	Dry	
14-May-2021		0.0	0.0	0.4	2.1	Still	None	Dry	

Remarks	27/04/2021 - No access to borehole. 06/05/2021 & 14/05/2021 - Unable to sample water due to blockage in pipe. 19/05/2021 - No access to borehole.
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FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

Project No PN214198
Borehole HBW-WS104
Sheet No. 1 (4 of 4)

Client **Kronospan Limited**

Installation Details

Installation Type	standpipe	Diameter	33mm
Depth to Base	5.50m	Cover Type	Flush lockable protective cover
Filter Zone	1.00 - 5.50m	Ground Level	100.80 m OD
Date Installed	25 March 2021		

Date	Time	Equipment Used	Monitored by	Remarks
6-May-2021		GA5000	JA	
14-May-2021		GA5000	JA	

Remarks	27/04/2021 - No access to borehole. 06/05/2021 & 14/05/2021 - Unable to sample water due to blockage in pipe. 19/05/2021 - No access to borehole.
---------	---



FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

Project No PN214198

Borehole HBW-WS105

Client **Kronospan Limited**

Sheet No. 1 (1 of 4)

Installation Details

Installation Type	standpipe	Diameter	33mm
Depth to Base	6.45m	Cover Type	Upright lockable protective cover
Filter Zone	4.00 - 6.45m	Ground Level	101.00 m OD
Date Installed	25 March 2021		

[illegible]

Remarks

FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

Project No PN214198

Borehole HBW-WS105

Client **Kronospan Limited**

Sheet No. 1 (2 of 4)

Installation Details

Installation Type	standpipe	Diameter	33mm
Depth to Base	6.45m	Cover Type	Upright lockable protective cover
Filter Zone	4.00 - 6.45m	Ground Level	101.00 m OD
Date Installed	25 March 2021		

[illegible]

Remarks

geotechnics

FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

Project No PN214198
Borehole HBW-WS105
Sheet No. 1 (3 of 4)

Client **Kronospan Limited**

Installation Details

Installation Type	standpipe	Diameter	33mm
Depth to Base	6.45m	Cover Type	Upright lockable protective cover
Filter Zone	4.00 - 6.45m	Ground Level	101.00 m OD
Date Installed	25 March 2021		

Date	Time	Flow Rate (Peak) (l/hr)	Flow Rate (Steady) (l/hr)	PID Reading (ppm)	PID Peak (ppm)	Wind ()	Cloud ()	Rain ()	Remarks
27-Apr-2021		0.0	0.0	0.4	1.5	Still	None	Dry	
6-May-2021		-4.5	-3.9	0.4	0.6	Still	None	Dry	
14-May-2021		0.0	0.0	0.4	0.8	Still	None	Dry	
19-May-2021		0.0	0.0	0.4	0.4	Still	None	Dry	

Remarks

FIELDWORK - Insitu Gas Monitoring - Instrument Record

Project KRONOSPAN RAW BOARD STORAGE

Project No PN214198
Borehole HBW-WS105
Sheet No. 1 (4 of 4)

Client **Kronospan Limited**

Installation Details

Installation Type	standpipe	Diameter	33mm
Depth to Base	6.45m	Cover Type	Upright lockable protective cover
Filter Zone	4.00 - 6.45m	Ground Level	101.00 m OD
Date Installed	25 March 2021		

Date	Time	Equipment Used	Monitored by	Remarks
		0	0	
27-Apr-2021		GA5000	JA	
6-May-2021		GA5000	JA	
14-May-2021		GA5000	JA	
19-May-2021		GA5000	JA	

Remarks

APPENDIX 5

Laboratory Test Results - Geotechnical



LABORATORY REPORT



4043

Contract Number: PSL21/3246

Report Date: 07 May 2021
Client's Reference: PN214198
Client Name: Geotechnics
203 Torrington Avenue
Tile Hill
Coventry
CV4 9UT

For the attention of: Joshua Noble

Contract Title: Kronospan High Bay Warehouse
Date Received: 21/4/2021
Date Commenced: 21/4/2021
Date Completed: 7/5/2021

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins
(Director)

R Berriman
(Quality Manager)

S Royle
(Laboratory Manager)

L Knight
(Assistant Laboratory Manager)


S Eyre
(Senior Technician)

T Watkins
(Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
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Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
HBW-BH101	ES	0.50		MADE GROUND: Brownish grey very sandy slightly clayey fine to coarse gravel.
HBW-BH101	UT	3.00	3.45	Soft to firm low strength brown mottled grey slightly sandy CLAY.
HBW-BH101	B	4.00	4.45	Greyish brown sandy slightly silty fine to coarse GRAVEL.
HBW-BH101	UT	11.00	11.45	Firm low strength brown slightly sandy slightly gravelly silty CLAY.
HBW-BH101	B	19.50	19.95	Greyish brown sandy slightly silty fine to coarse GRAVEL.
HBW-BH101	UT	24.00	24.45	Very stiff very high strength reddish brown slightly sandy slightly gravelly silty CLAY.
HBW-BH101	B	28.50	28.95	Very stiff reddish brown mottled brown and black slightly sandy silty CLAY.
HBW-BH101	B	33.00	33.45	Reddish brown slightly gravelly very silty fine to coarse SAND.
HBW-BH102	B	0.60	1.20	MADE GROUND: Greyish brown sandy clayey fine to coarse gravel.
HBW-BH102	B	2.00	2.45	MADE GROUND: Greyish brown very sandy clayey fine to coarse gravel.
HBW-BH102	UT	3.00	3.45	Very stiff greyish brown slightly gravelly sandy CLAY.
HBW-BH102	UT	8.00	8.45	Stiff to very stiff medium strength grey slightly sandy silty CLAY.
HBW-BH102	B	13.50	13.95	Greyish brown very gravelly very silty fine to coarse SAND.
HBW-BH102	B	16.50	16.95	Greyish brown very sandy slightly silty fine to coarse GRAVEL with a medium cobble content.
HBW-BH102	B	19.50	19.95	Greyish brown very sandy slightly silty fine to coarse GRAVEL.
HBW-BH103	B	0.50		MADE GROUND: Brown very sandy silty fine to coarse gravel.
HBW-BH103	B	2.00	2.45	MADE GROUND: Greyish brown very silty medium to coarse sand and fine to medium gravel.
HBW-BH103	B	3.00	3.45	Grey sandy slightly silty fine to medium GRAVEL.
HBW-BH103	B	5.00	5.45	Grey very gravelly silty medium to coarse SAND.



4043



Kronospan High Bay Warehouse

Contract No:

PSL21/3246

Client Ref:

PN214198

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
HBW-BH103	UT	9.50	9.95	Soft to firm low strength grey slightly sandy silty CLAY.
HBW-BH103	UT	15.50	15.95	Soft to firm low strength grey slightly sandy silty CLAY.
HBW-BH103	B	20.00	20.45	Very stiff reddish brown slightly sandy slightly gravelly silty CLAY.
HBW-BH103	UT	21.50	21.95	Very stiff very high strength brown slightly sandy slightly gravelly silty CLAY.
HBW-BH103	UT	24.50	24.95	Very stiff very high strength reddish brown slightly gravelly sandy silty CLAY.
HBW-BH103	B	29.00	29.45	Very stiff reddish brown slightly sandy slightly gravelly CLAY.
HBW-BH103	B	33.50	33.95	Brown silty fine to coarse SAND.
HBW-WS101	B	0.55	1.20	MADE GROUND: Very stiff brownish grey slightly sandy slightly gravelly clay with pockets of gravel.
HBW-WS101	B	3.15	4.00	Firm brownish grey slightly sandy CLAY.
HBW-WS101	B	5.40	6.00	Firm grey slightly sandy slightly gravelly clayey SILT.
HBW-WS102	B	0.80	1.20	MADE GROUND: Grey sandy slightly clayey fine to coarse gravel
HBW-WS102	B	2.00	3.00	Brown clayey medium to coarse SAND and fine to coarse GRAVEL.
HBW-WS102	B	4.00	5.00	Firm brown slightly sandy slightly gravelly silty CLAY.
HBW-WS103	B	0.55	1.20	MADE GROUND: Greyish brown very sandy very clayey fine to coarse gravel.
HBW-WS103	B	3.00	4.00	Grey very sandy clayey fine to medium GRAVEL.
HBW-WS103	B	5.00	6.00	Soft to firm grey slightly sandy CLAY.
HBW-WS104	B	1.00	1.80	MADE GROUND: Stiff to very stiff grey mottled brown slightly gravelly sandy silty clay.
HBW-WS104	D	2.80	3.00	Dark grey mottled light grey very sandy clayey fine to medium GRAVEL.
HBW-WS105	B	0.50	1.20	MADE GROUND: Greyish brown very sandy clayey fine to coarse gravel with a high cobble content.



4043

PSL

Professional Soils Laboratory

Kronospan High Bay Warehouse

Contract No:

PSL21/3246

Client Ref:

PN214198

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

[illegible]

4043

PSL
Professional Soils Laboratory

Kronospan High Bay Warehouse

Contract No:

PSL21/3246

Client Ref:

PN214198

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

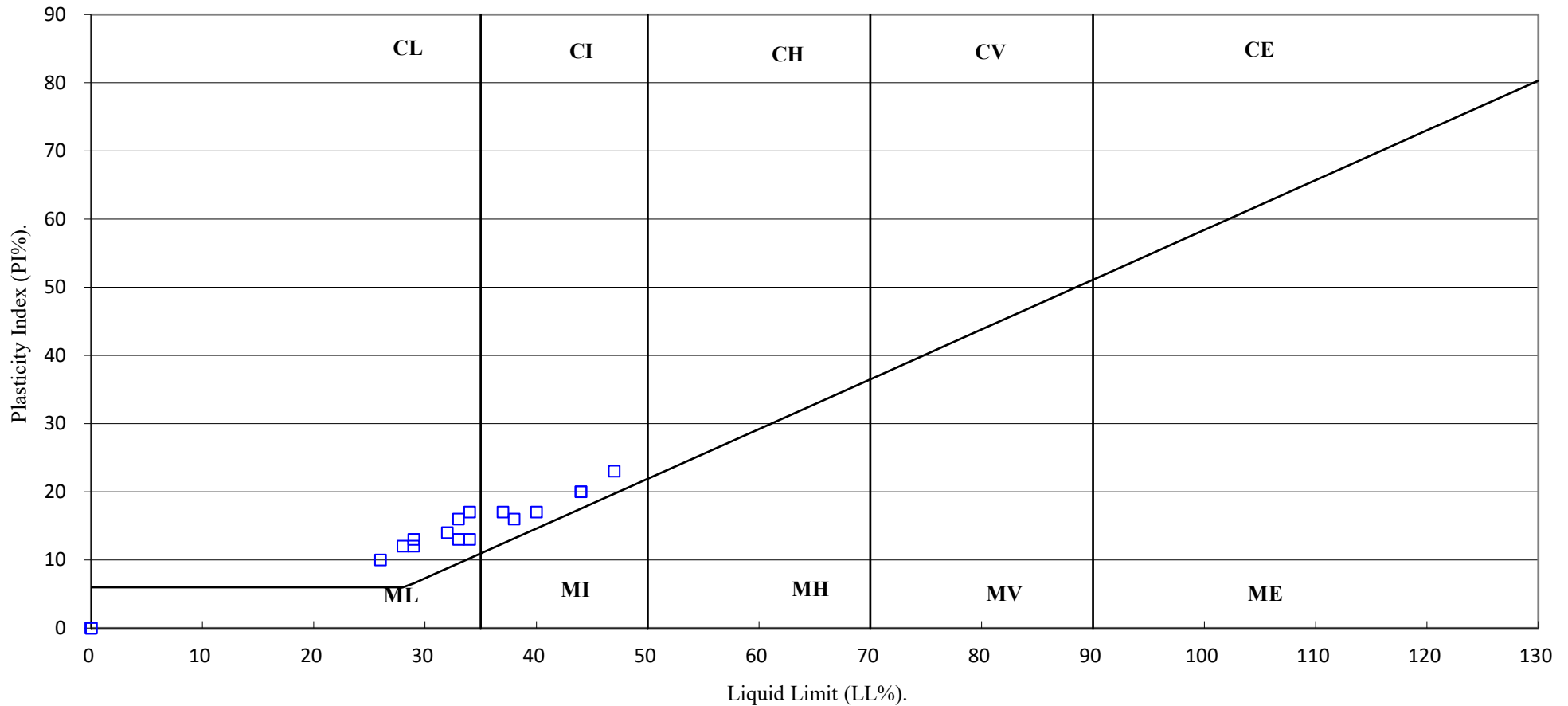
Hole Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m ³ Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
HBW-BH101	UT	3.00	3.45	29			44	24	20	100	Intermediate Plasticity CI
HBW-BH101	UT	11.00	11.45	20			32	18	14	92	Low Plasticity CL
HBW-BH101	UT	24.00	24.45	10			29	16	13	87	Low Plasticity CL
HBW-BH102	UT	3.00	3.45	15			34	17	17	93	Low Plasticity CL
HBW-BH102	UT	8.00	8.45	24			44	24	20	99	Intermediate Plasticity CI
HBW-BH103	UT	9.50	9.95	32			40	23	17	99	Intermediate Plasticity CI
HBW-BH103	UT	15.50	15.95	28			34	21	13	100	Low Plasticity CL
HBW-BH103	B	20.00	20.45	19			33	20	13	49	Low Plasticity CL
HBW-BH103	UT	21.50	21.95	19			38	22	16	95	Intermediate Plasticity CI
HBW-BH103	UT	24.50	24.95	13			37	20	17	82	Intermediate Plasticity CI
HBW-BH103	B	33.50	33.95	24				NP			
HBW-WS101	B	0.55	1.20	11			28	16	12	81	Low Plasticity CL
HBW-WS101	B	3.15	4.00	30			47	24	23	98	Intermediate Plasticity CI
HBW-WS103	B	0.55	1.20	11			29	17	12	32	Low Plasticity CL
HBW-WS103	B	5.00	6.00	27			33	17	16	96	Low Plasticity CL
HBW-WS104	B	1.00	1.80	10			26	16	10	27	Low Plasticity CL
HBW-WS104	D	2.80	3.00	9.8				NP			

SYMBOLS : NP : Non Plastic

* : Liquid Limit and Plastic Limit Wet Sieved.

		Kronospan High Bay Warehouse		Contract No:
				PSL21/3246
				Client Ref:
				PN214198

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



4043

PSL

Professional Soils Laboratory

Kronospan High Bay Warehouse

Contract No:

PSL21/3246

Client Ref:

PN214198

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

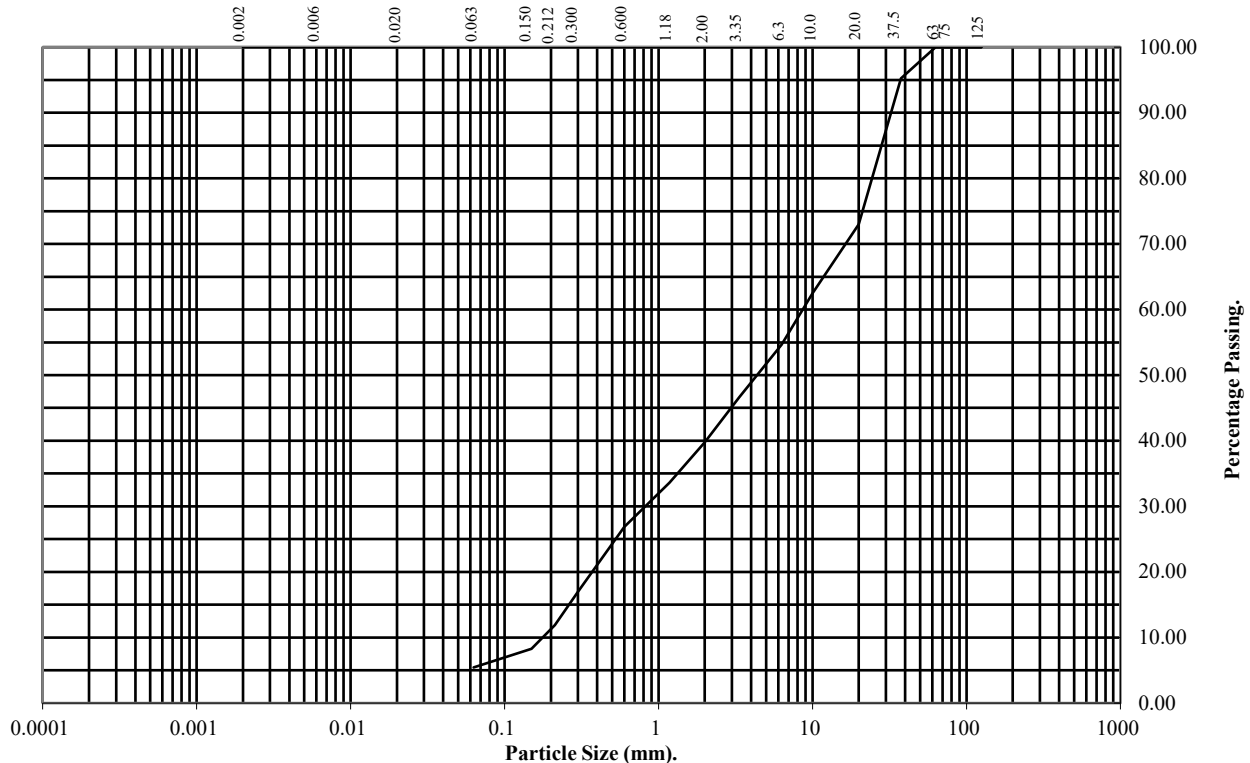
Hole Number: HBW-BH101

Top Depth (m): 0.50

Sample Number:

Base Depth(m):

Sample Type: ES



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	95
20	73
10	62
6.3	55
3.35	47
2	40
1.18	34
0.6	27
0.3	17
0.212	12
0.15	8
0.063	5

Soil Fraction	Total Percentage
Cobbles	0
Gravel	60
Sand	35
Silt/Clay	5

Remarks:

See Summary of Soil Descriptions



PSL
Professional Soils Laboratory

Kronospan High Bay Warehouse

Contract No:
PSL21/3246
Client Ref:
PN214198

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

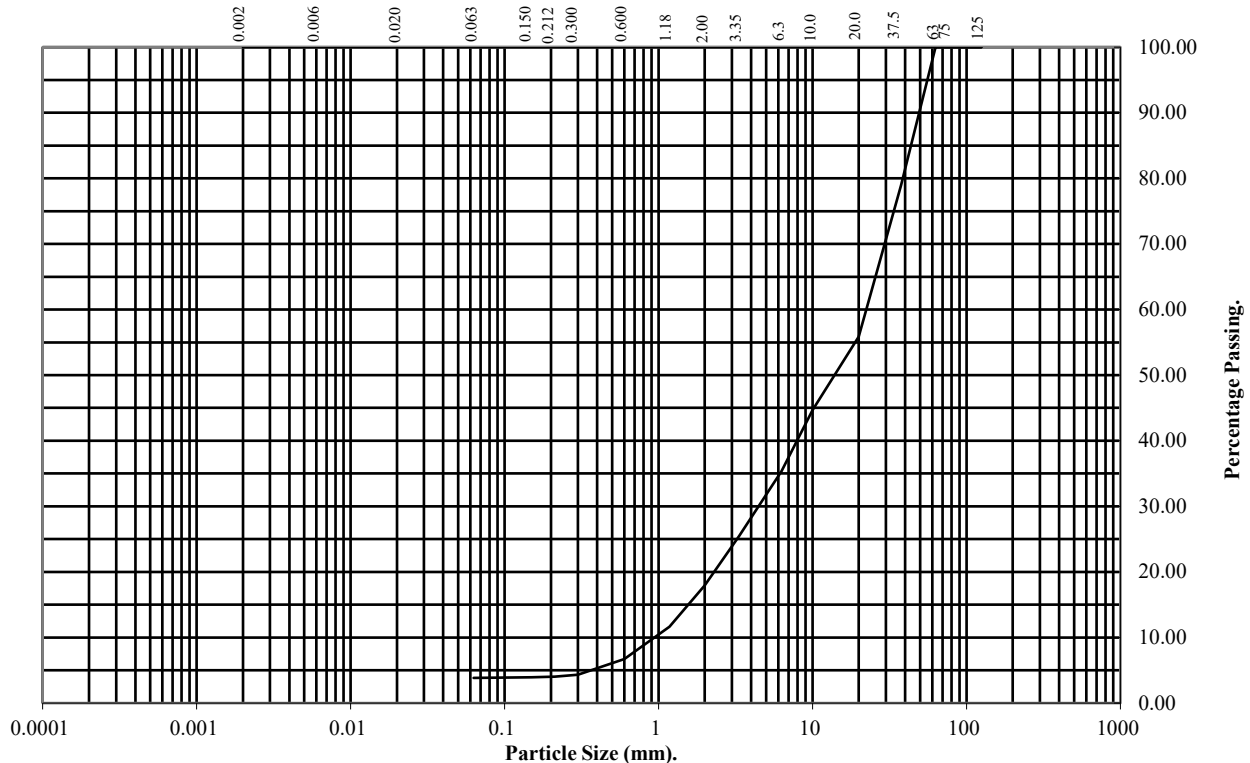
Hole Number: HBW-BH101

Top Depth (m): 4.00

Sample Number:

Base Depth(m): 4.45

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	79
20	56
10	45
6.3	35
3.35	25
2	18
1.18	12
0.6	7
0.3	4
0.212	4
0.15	4
0.063	4

Soil Fraction	Total Percentage
Cobbles	0
Gravel	82
Sand	14
Silt/Clay	4

Remarks:

See Summary of Soil Descriptions



PSL
Professional Soils Laboratory

Kronospan High Bay Warehouse

Contract No:
PSL21/3246
Client Ref:
PN214198

PARTICLE SIZE DISTRIBUTION TEST

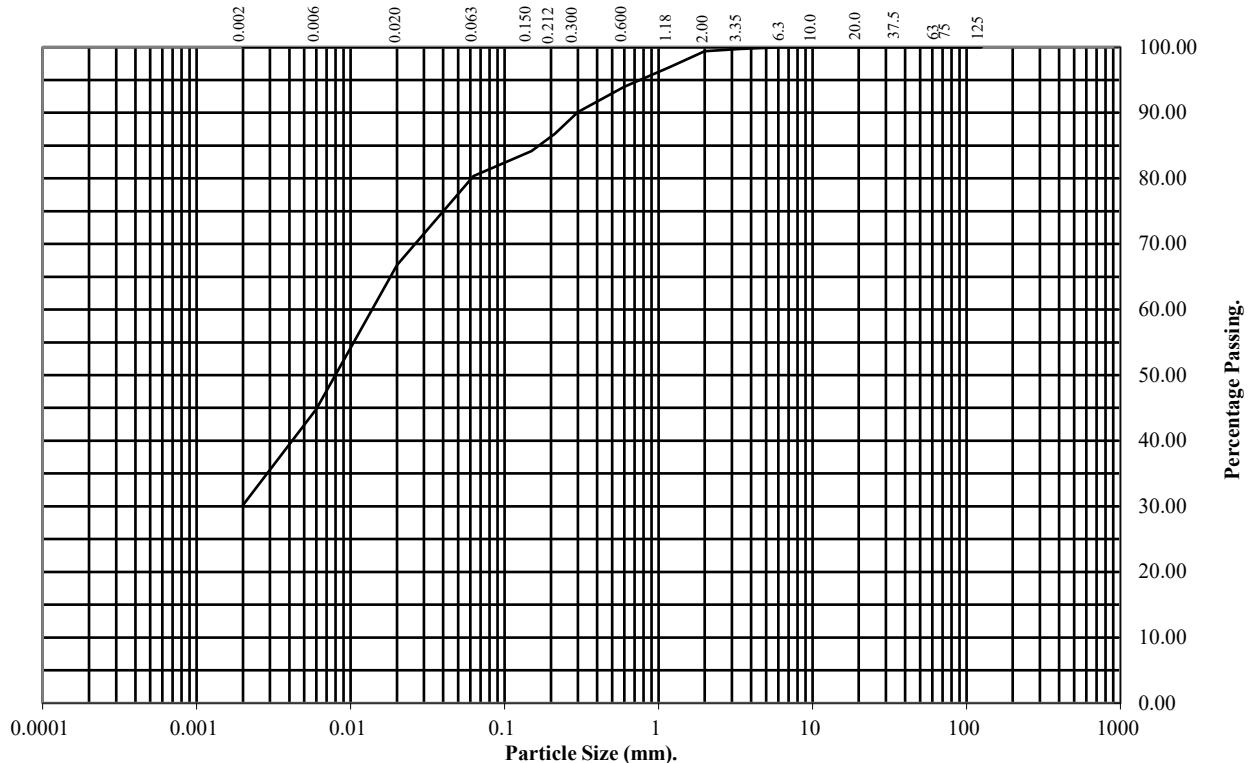
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: HBW-BH101 Top Depth (m): 11.00

Sample Number: Base Depth(m): 11.45

Sample Type: UT

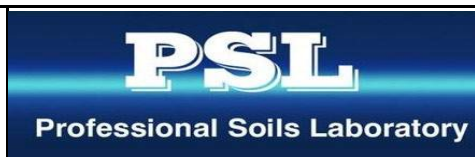


BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	99
1.18	97
0.6	94
0.3	90
0.212	87
0.15	84
0.063	80

Particle Diameter	Percentage Passing
0.02	67
0.006	45
0.002	30

Soil Fraction	Total Percentage
Cobbles	0
Gravel	1
Sand	19
Silt	50
Clay	30

Remarks:
See Summary of Soil Descriptions



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BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

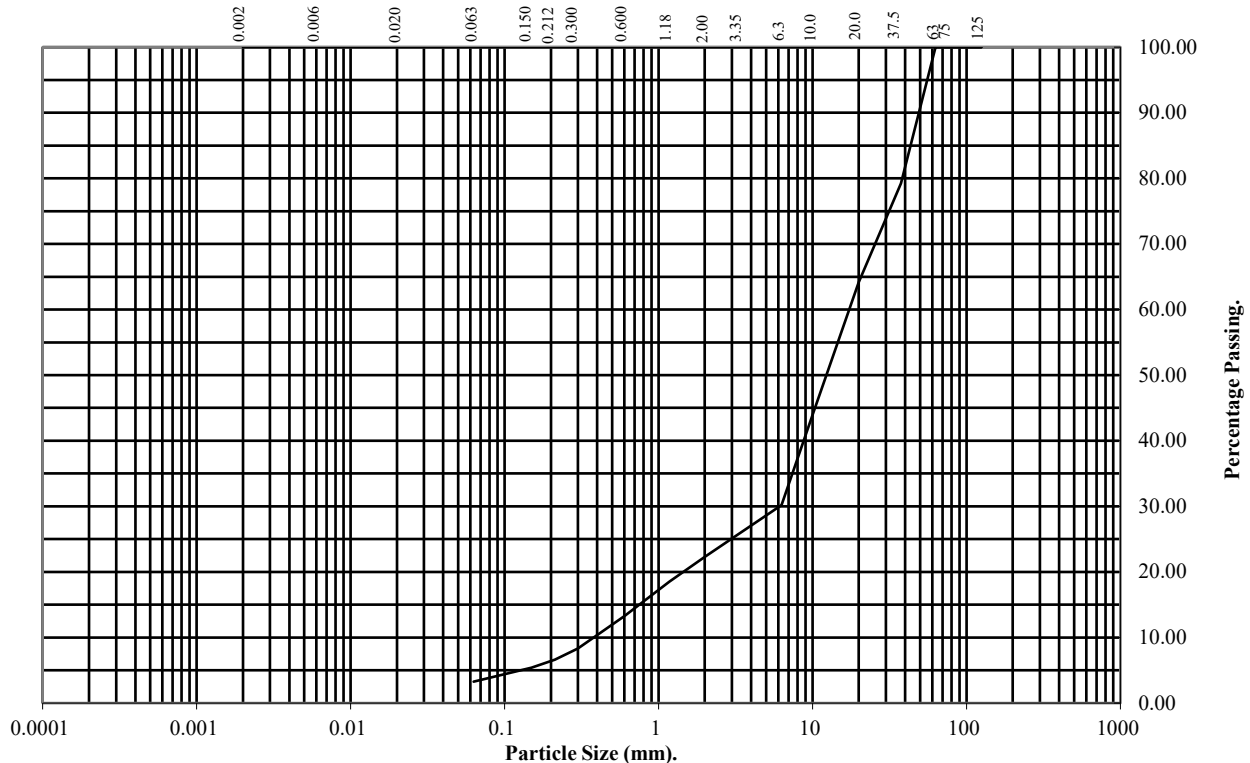
Hole Number: HBW-BH101

Top Depth (m): 19.50

Sample Number:

Base Depth(m): 19.95

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	79
20	64
10	44
6.3	30
3.35	26
2	22
1.18	19
0.6	13
0.3	8
0.212	7
0.15	5
0.063	3

Soil Fraction	Total Percentage
Cobbles	0
Gravel	78
Sand	19
Silt/Clay	3

Remarks:

See Summary of Soil Descriptions



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PARTICLE SIZE DISTRIBUTION TEST

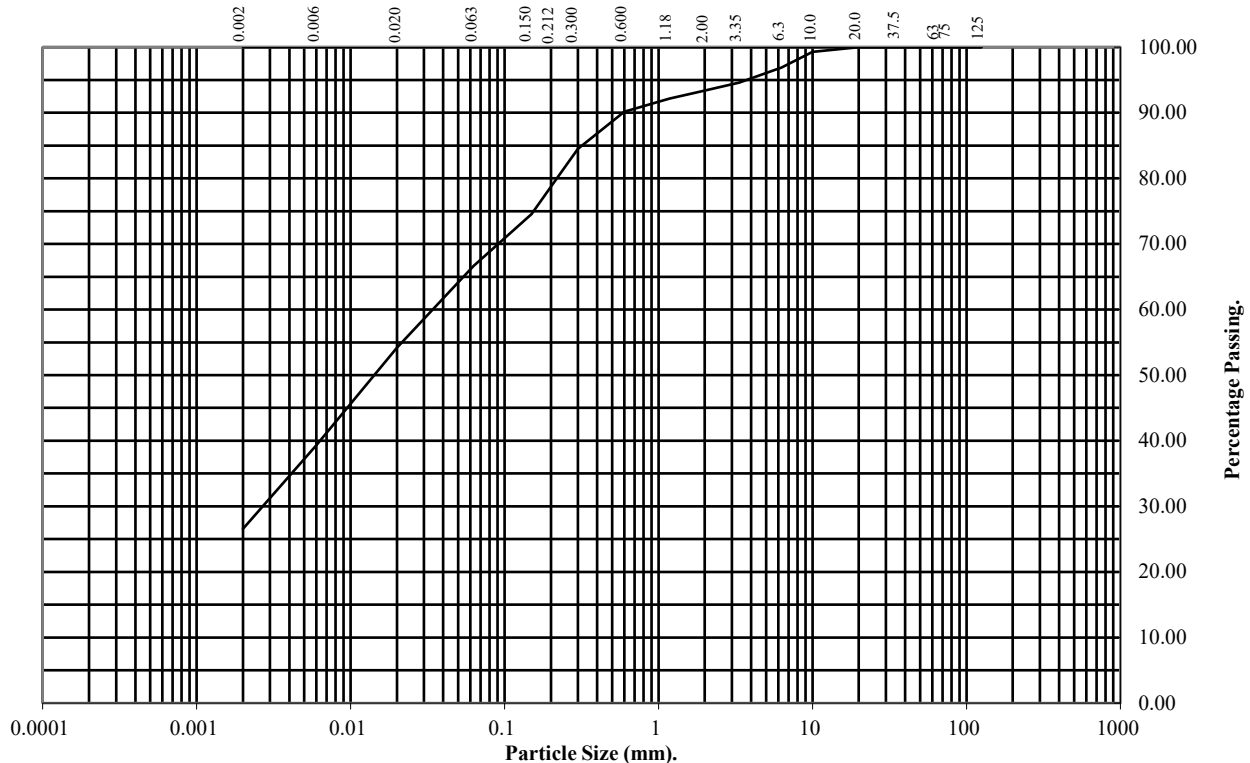
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: HBW-BH101 Top Depth (m): 24.00

Sample Number: Base Depth(m): 24.45

Sample Type: UT

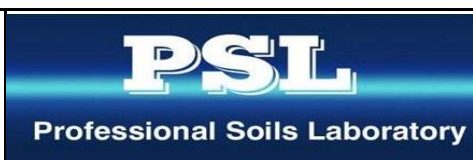


BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	99
6.3	97
3.35	95
2	93
1.18	92
0.6	90
0.3	84
0.212	80
0.15	75
0.063	67

Particle Diameter	Percentage Passing
0.02	54
0.006	39
0.002	27

Soil Fraction	Total Percentage
Cobbles	0
Gravel	7
Sand	26
Silt	40
Clay	27

Remarks:
See Summary of Soil Descriptions



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PARTICLE SIZE DISTRIBUTION TEST

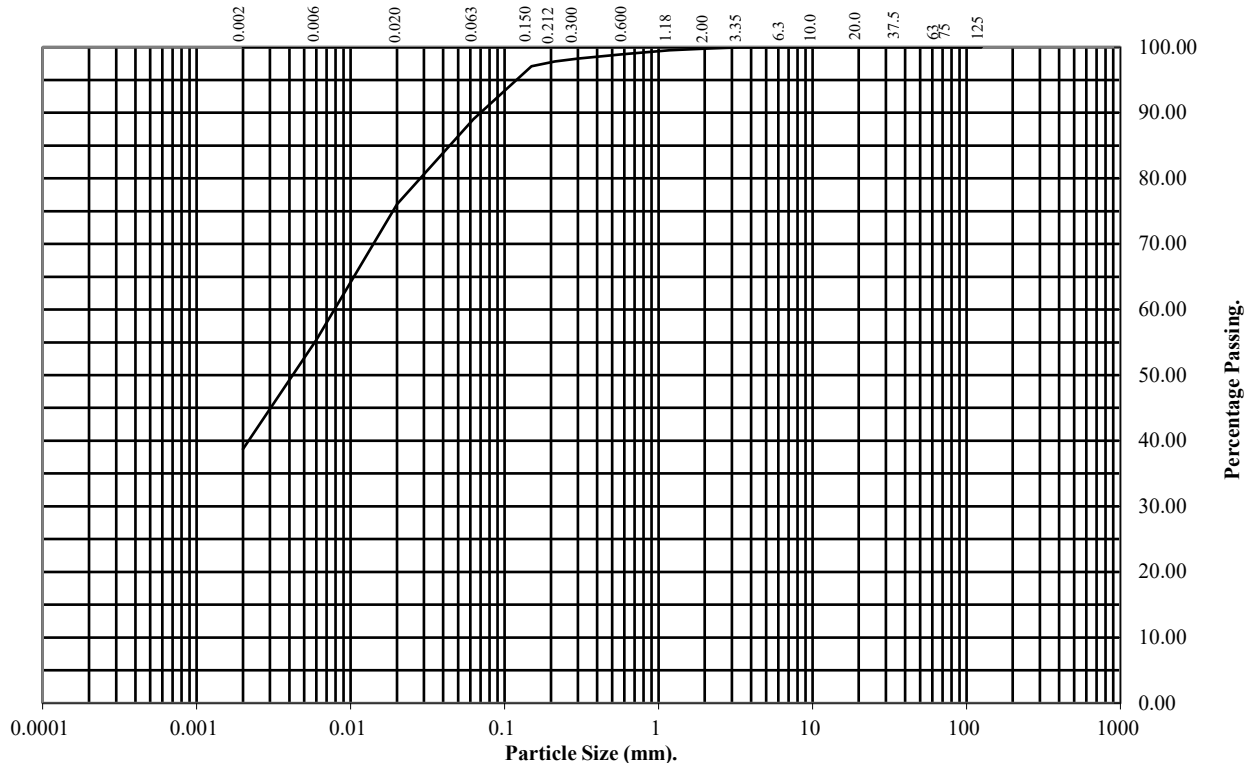
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: HBW-BH101 Top Depth (m): 28.50

Sample Number: Base Depth(m): 28.95

Sample Type: B

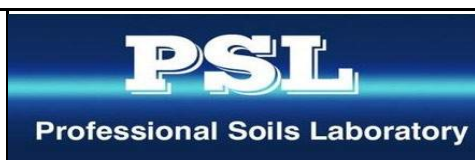


BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	100
1.18	100
0.6	99
0.3	98
0.212	98
0.15	97
0.063	89

Particle Diameter	Percentage Passing
0.02	76
0.006	55
0.002	39

Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	11
Silt	50
Clay	39

Remarks:
See Summary of Soil Descriptions



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PARTICLE SIZE DISTRIBUTION TEST

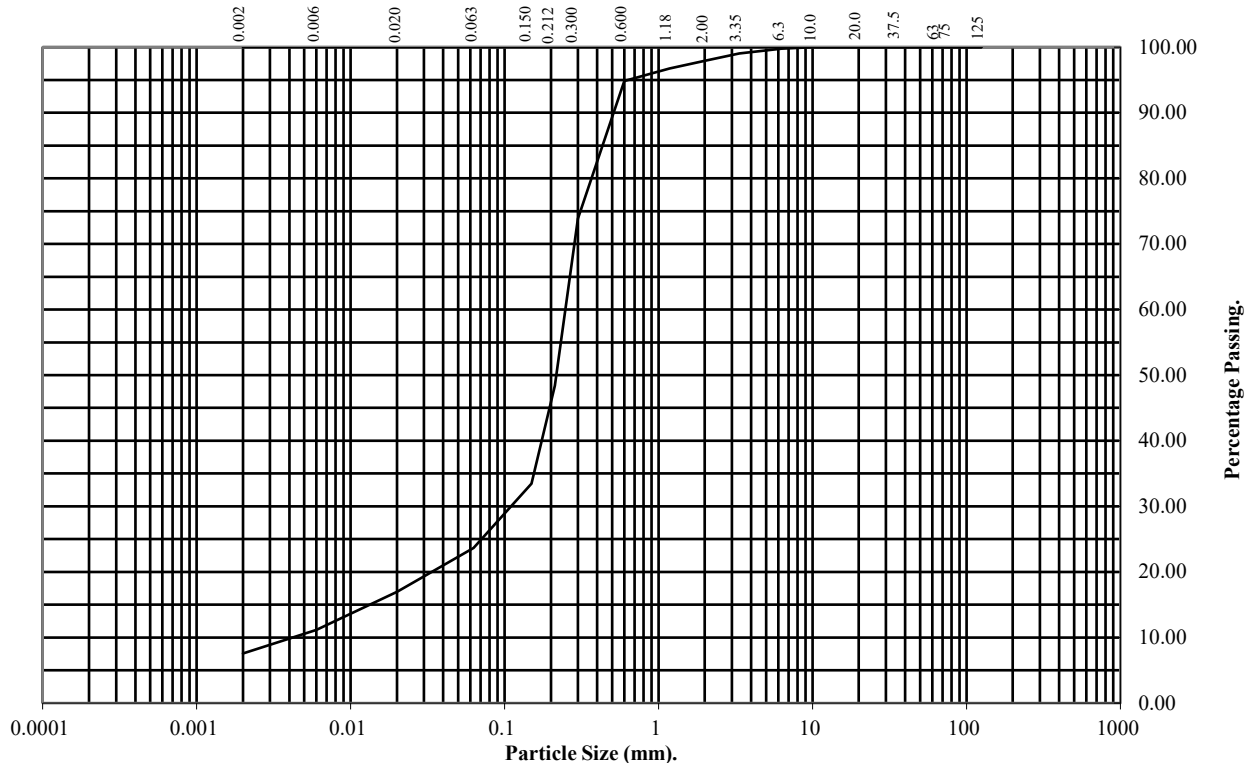
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: HBW-BH101 Top Depth (m): 33.00

Sample Number: Base Depth(m): 33.45

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	99
2	98
1.18	97
0.6	95
0.3	74
0.212	48
0.15	33
0.063	24

Particle Diameter	Percentage Passing
0.02	17
0.006	11
0.002	8

Soil Fraction	Total Percentage
Cobbles	0
Gravel	2
Sand	74
Silt	16
Clay	8

Remarks:

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BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

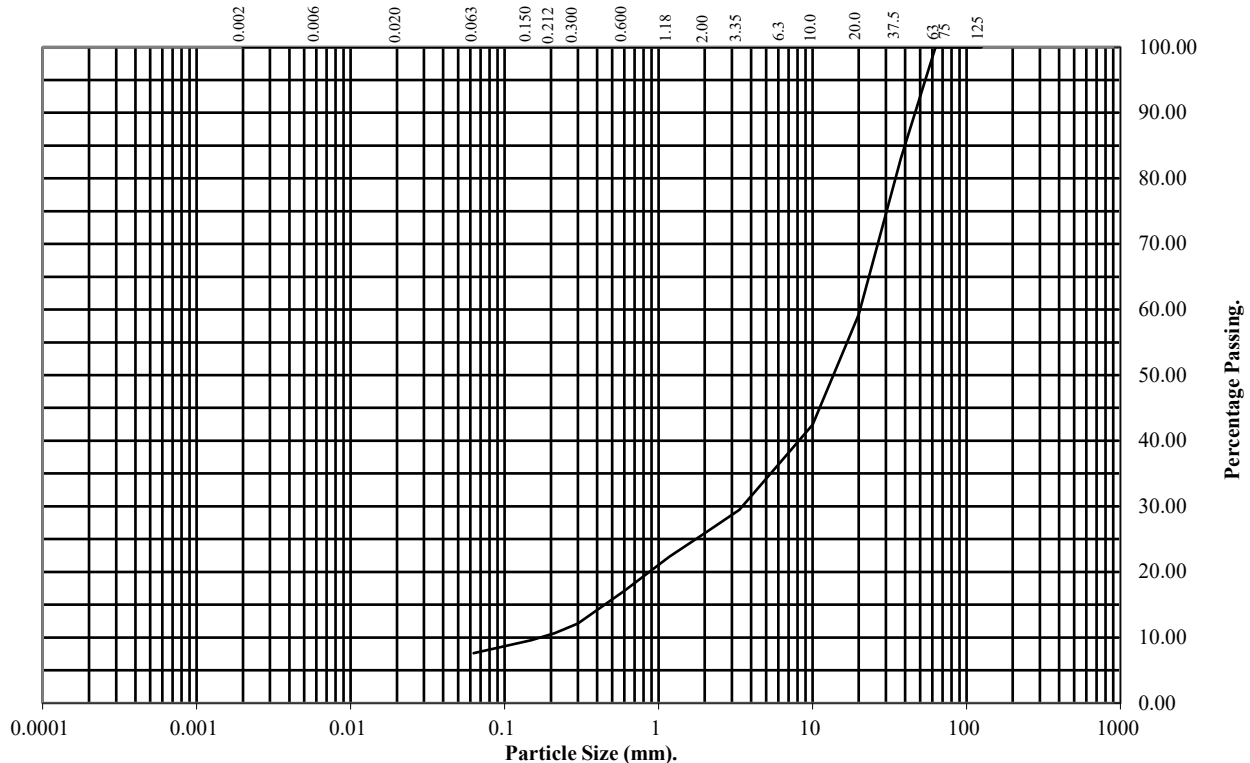
Hole Number: HBW-BH102

Top Depth (m): 0.60

Sample Number:

Base Depth(m): 1.20

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	83
20	59
10	42
6.3	37
3.35	29
2	26
1.18	22
0.6	17
0.3	12
0.212	11
0.15	10
0.063	8

Soil Fraction	Total Percentage
Cobbles	0
Gravel	74
Sand	18
Silt/Clay	8

Remarks:

See Summary of Soil Descriptions



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PARTICLE SIZE DISTRIBUTION TEST

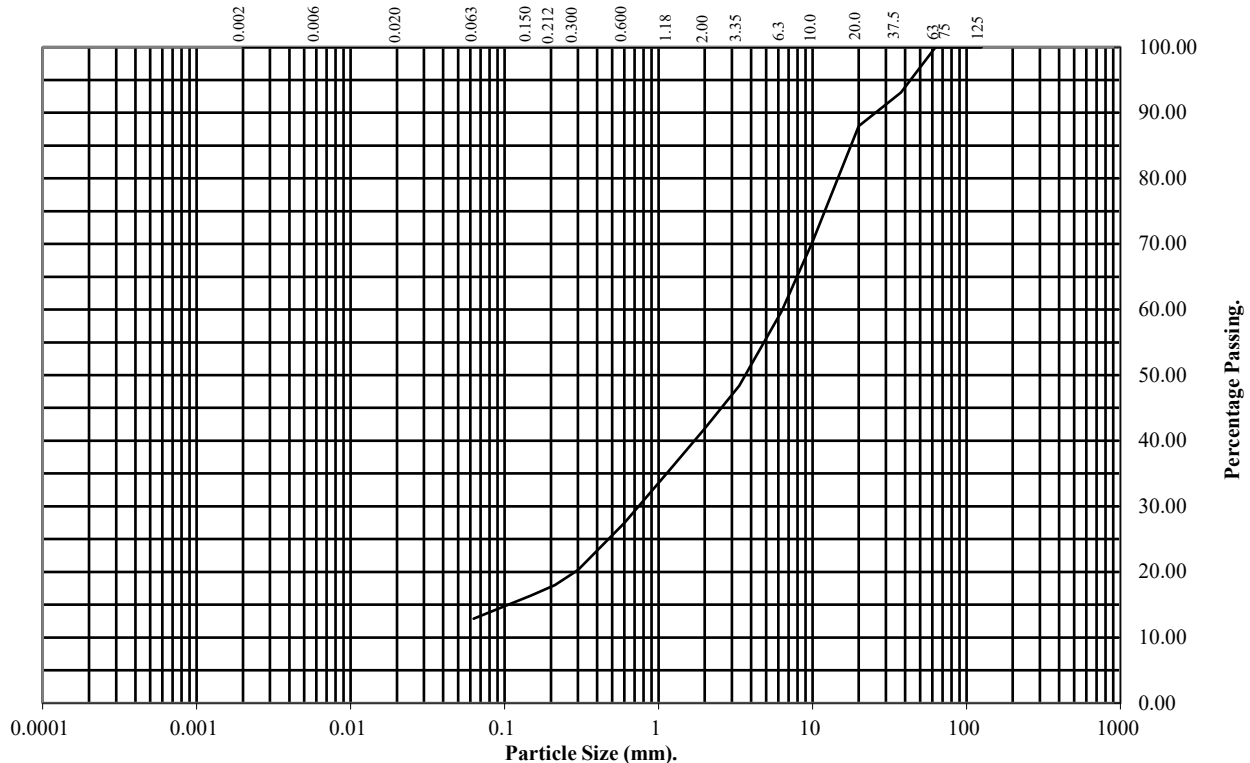
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: HBW-BH102 Top Depth (m): 2.00

Sample Number: Base Depth(m): 2.45

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	93
20	88
10	70
6.3	60
3.35	48
2	42
1.18	35
0.6	27
0.3	20
0.212	18
0.15	16
0.063	13

Soil Fraction	Total Percentage
Cobbles	0
Gravel	58
Sand	29
Silt/Clay	13

Remarks:

See Summary of Soil Descriptions



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PARTICLE SIZE DISTRIBUTION TEST

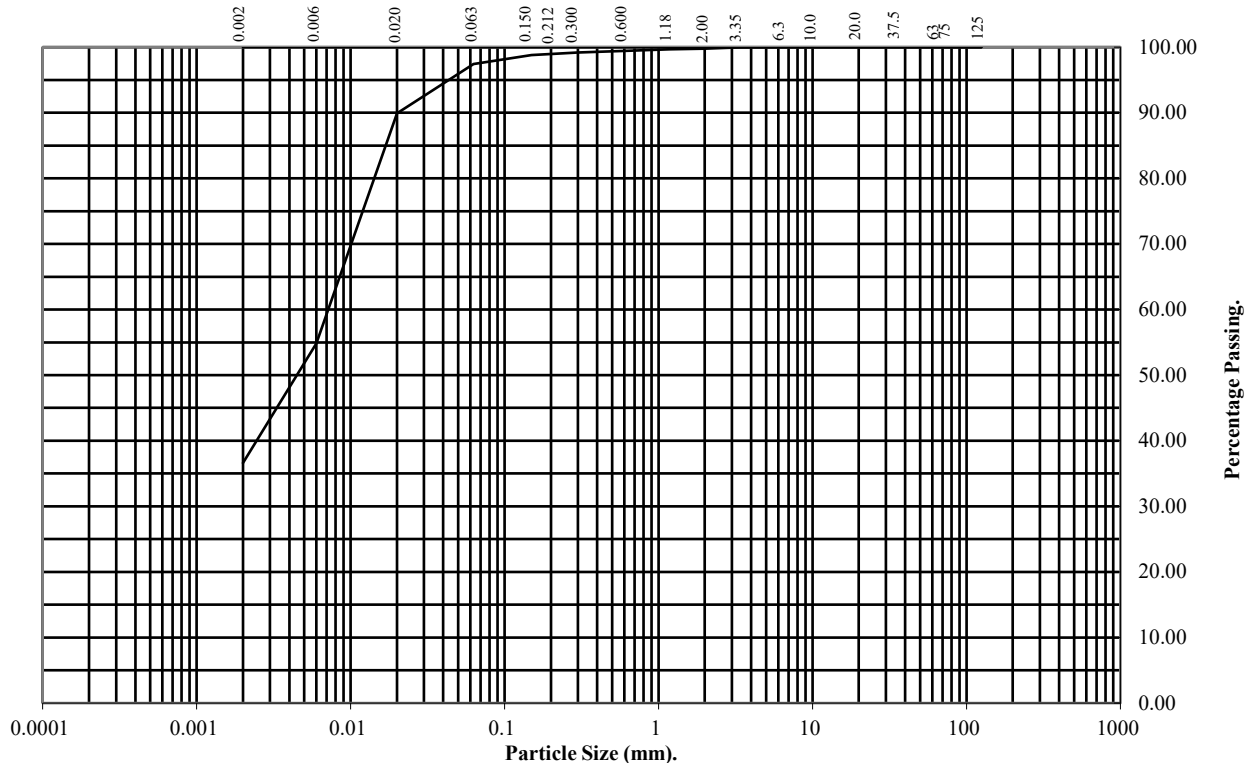
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: HBW-BH102 Top Depth (m): 8.00

Sample Number: Base Depth(m): 8.45

Sample Type: UT



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	100
1.18	100
0.6	99
0.3	99
0.212	99
0.15	99
0.063	97

Particle Diameter	Percentage Passing
0.02	90
0.006	55
0.002	37

Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	3
Silt	60
Clay	37

Remarks:

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PARTICLE SIZE DISTRIBUTION TEST

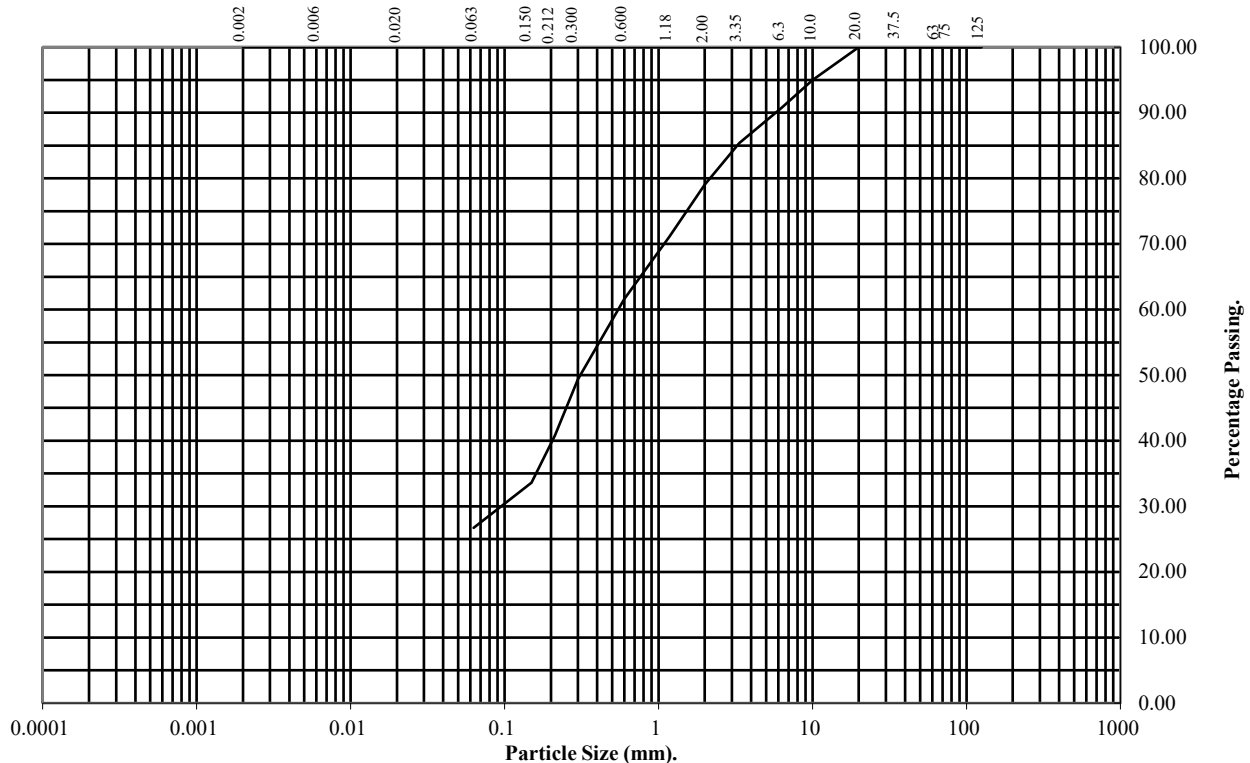
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: HBW-BH102 Top Depth (m): 13.50

Sample Number: Base Depth(m): 13.95

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	95
6.3	91
3.35	85
2	79
1.18	71
0.6	62
0.3	49
0.212	41
0.15	34
0.063	27

Soil Fraction	Total Percentage
Cobbles	0
Gravel	21
Sand	52
Silt/Clay	27

Remarks:

See Summary of Soil Descriptions



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PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

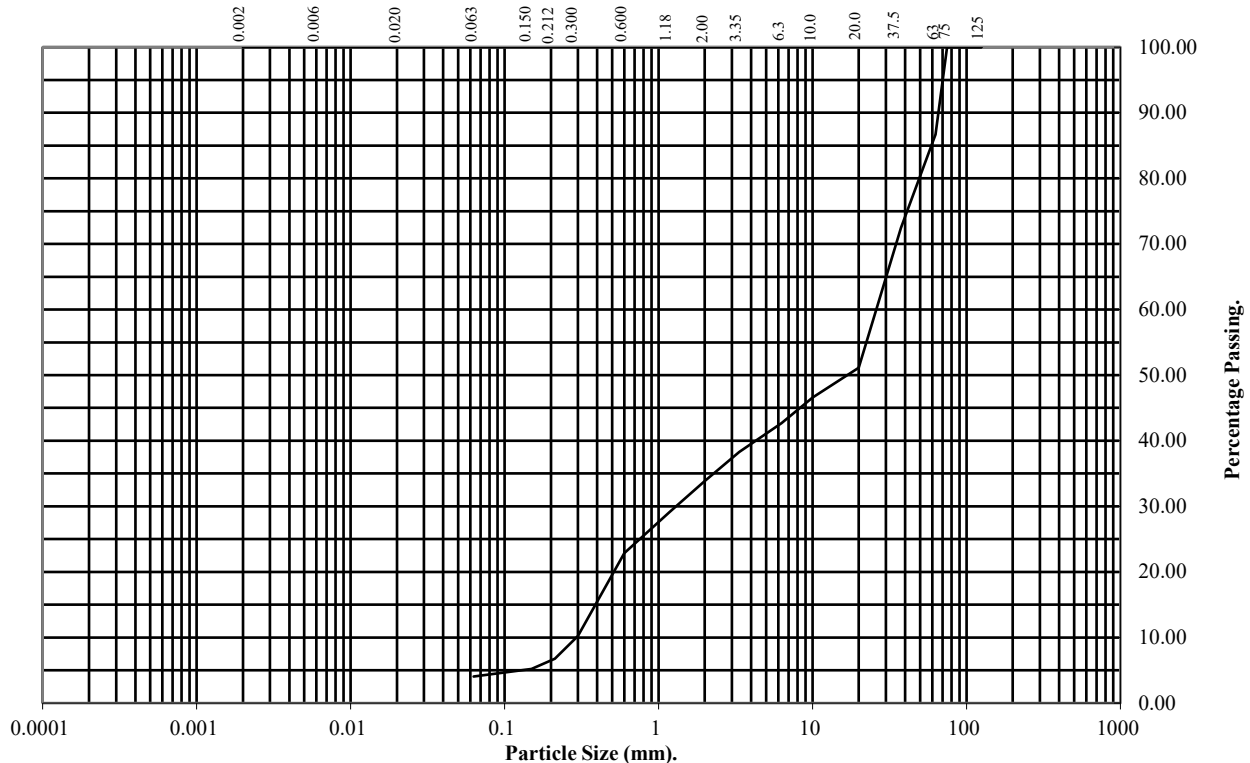
Hole Number: HBW-BH102

Top Depth (m): 16.50

Sample Number:

Base Depth(m): 16.95

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	87
37.5	72
20	51
10	47
6.3	43
3.35	38
2	34
1.18	29
0.6	23
0.3	10
0.212	7
0.15	5
0.063	4

Soil Fraction	Total Percentage
Cobbles	13
Gravel	53
Sand	30
Silt/Clay	4

Remarks:

See Summary of Soil Descriptions



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PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

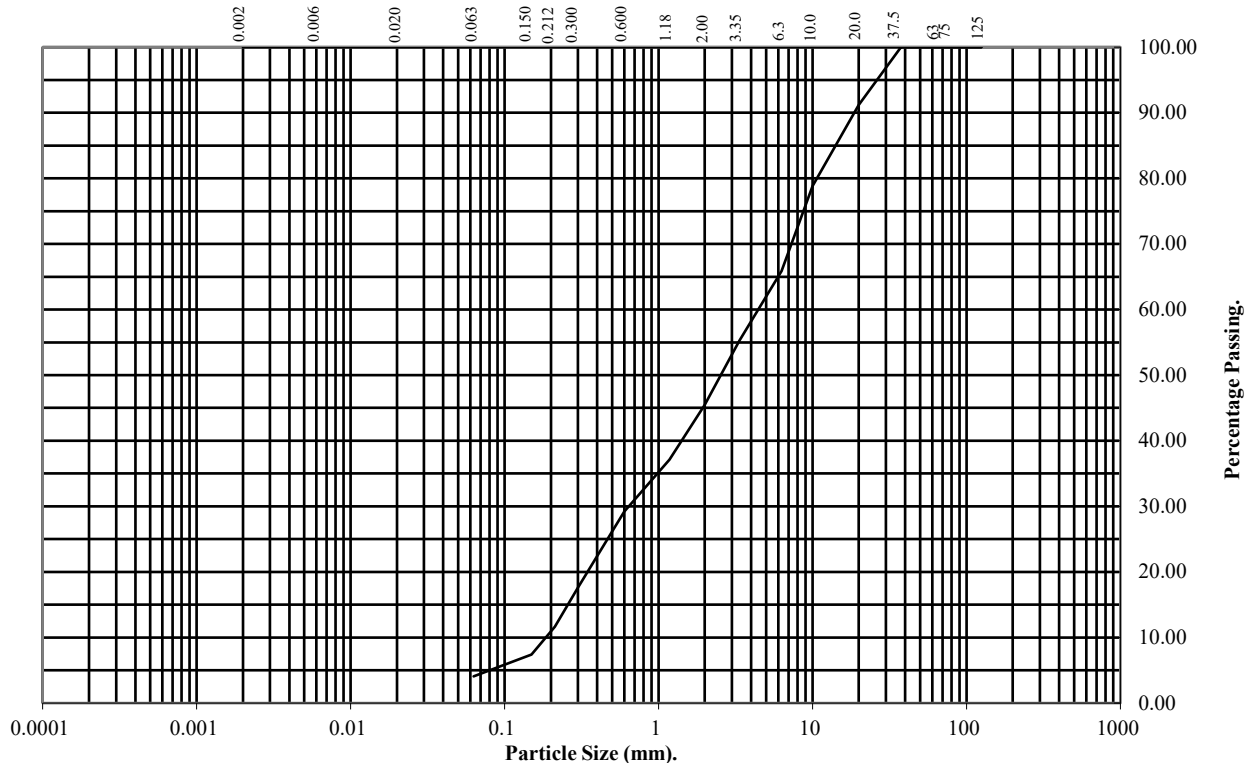
Hole Number: HBW-BH102

Top Depth (m): 19.50

Sample Number:

Base Depth(m): 19.95

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	91
10	79
6.3	66
3.35	55
2	45
1.18	37
0.6	29
0.3	18
0.212	12
0.15	7
0.063	4

Soil Fraction	Total Percentage
Cobbles	0
Gravel	55
Sand	41
Silt/Clay	4

Remarks:

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BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

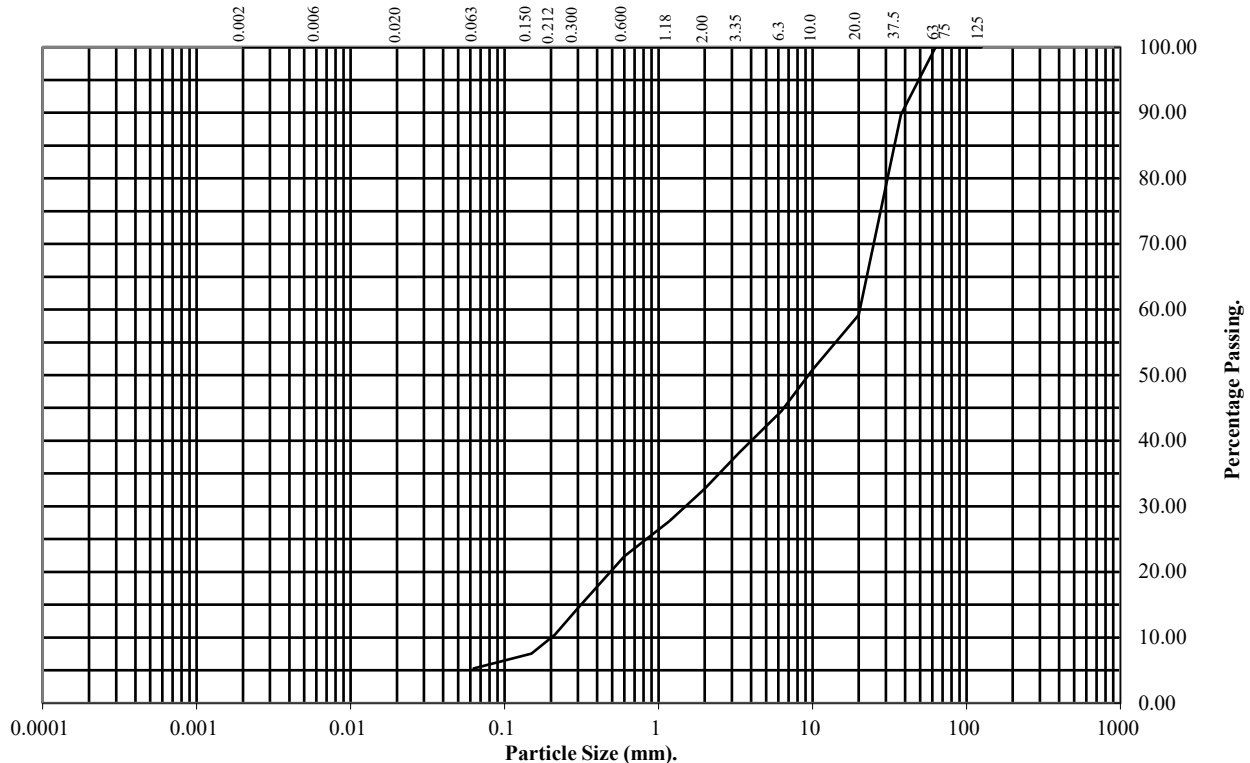
Hole Number: HBW-BH103

Top Depth (m): 0.50

Sample Number:

Base Depth(m):

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	90
20	59
10	51
6.3	45
3.35	38
2	33
1.18	28
0.6	22
0.3	14
0.212	10
0.15	8
0.063	5

Soil Fraction	Total Percentage
Cobbles	0
Gravel	67
Sand	28
Silt/Clay	5

Remarks:

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PARTICLE SIZE DISTRIBUTION TEST

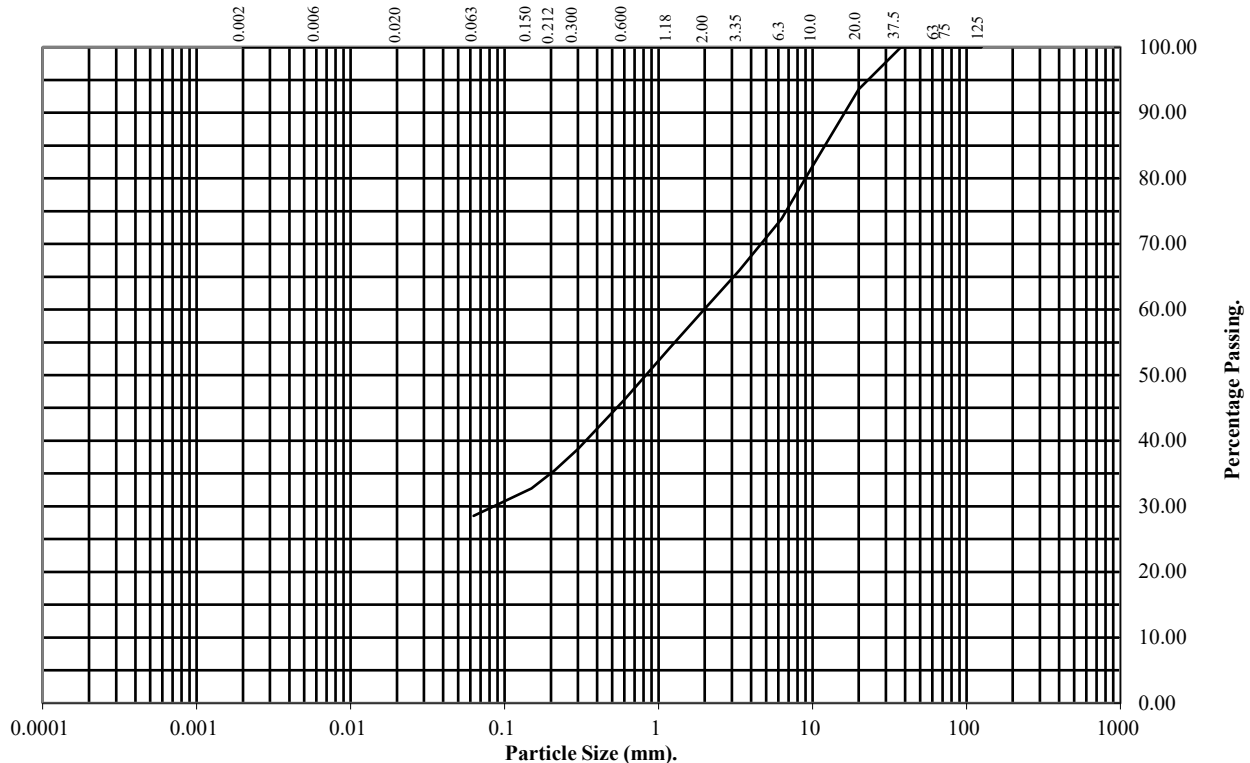
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: HBW-BH103 Top Depth (m): 2.00

Sample Number: Base Depth(m): 2.45

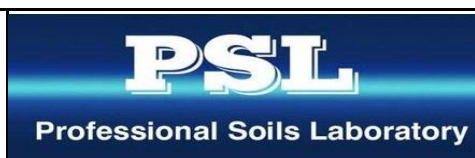
Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	94
10	82
6.3	74
3.35	66
2	60
1.18	54
0.6	46
0.3	39
0.212	35
0.15	33
0.063	29

Soil Fraction	Total Percentage
Cobbles	0
Gravel	40
Sand	31
Silt/Clay	29

Remarks:
See Summary of Soil Descriptions



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PARTICLE SIZE DISTRIBUTION TEST

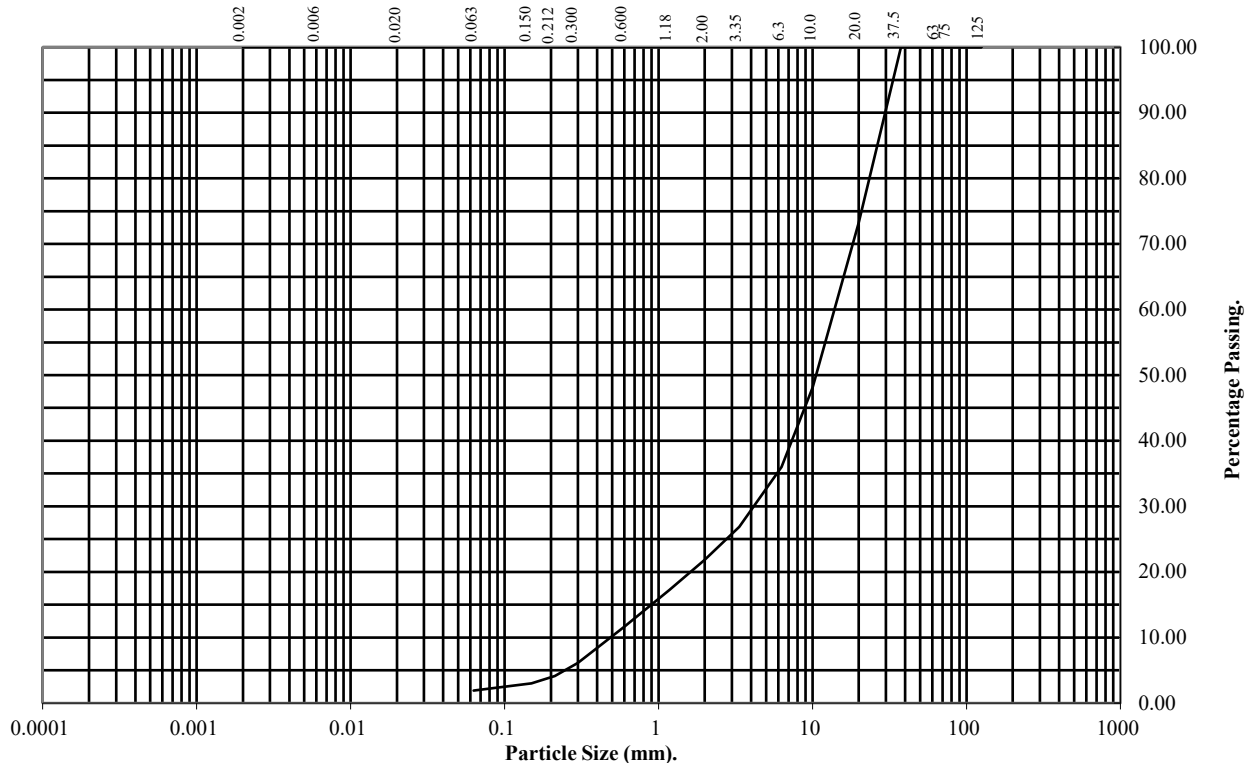
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: HBW-BH103 Top Depth (m): 3.00

Sample Number: Base Depth(m): 3.45

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	73
10	48
6.3	36
3.35	27
2	22
1.18	17
0.6	12
0.3	6
0.212	4
0.15	3
0.063	2

Soil Fraction	Total Percentage
Cobbles	0
Gravel	78
Sand	20
Silt/Clay	2

Remarks:

See Summary of Soil Descriptions



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PARTICLE SIZE DISTRIBUTION TEST

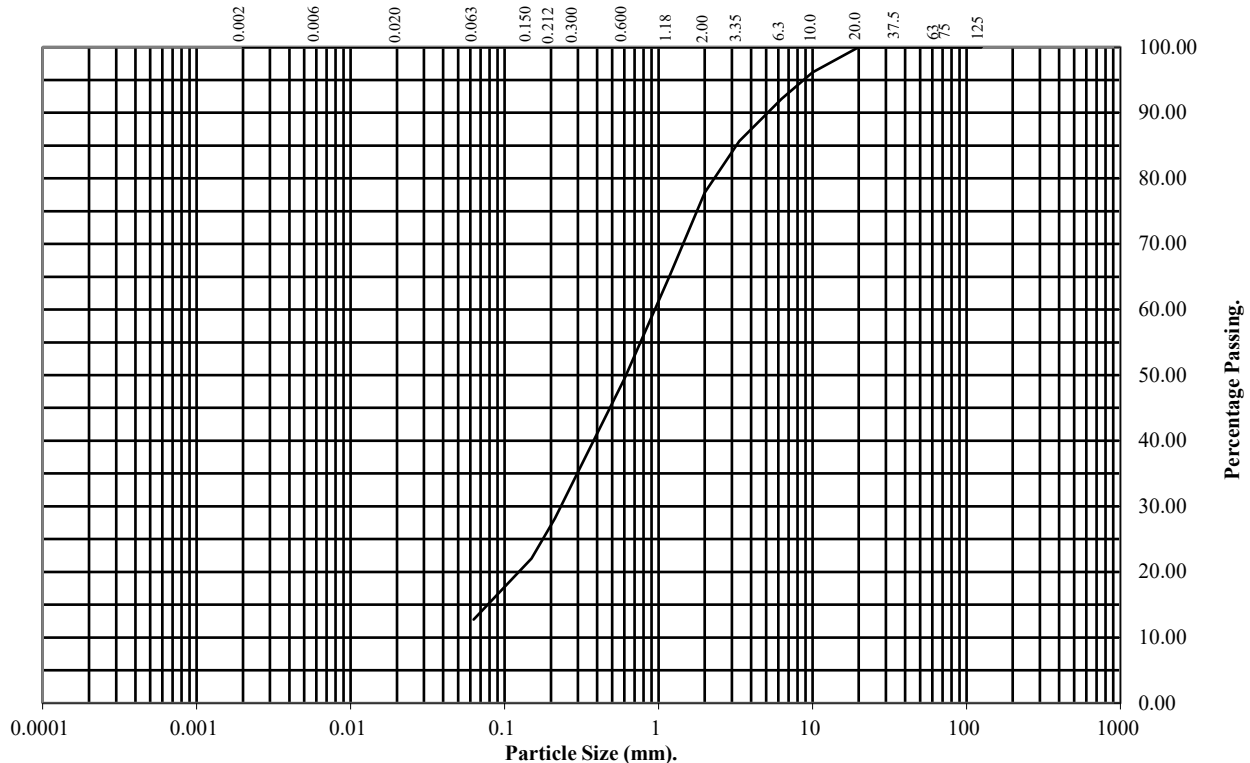
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: HBW-BH103 Top Depth (m): 5.00

Sample Number: Base Depth(m): 5.45

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	96
6.3	92
3.35	86
2	78
1.18	65
0.6	49
0.3	35
0.212	28
0.15	22
0.063	13

Soil Fraction	Total Percentage
Cobbles	0
Gravel	22
Sand	65
Silt/Clay	13

Remarks:

See Summary of Soil Descriptions



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PARTICLE SIZE DISTRIBUTION TEST

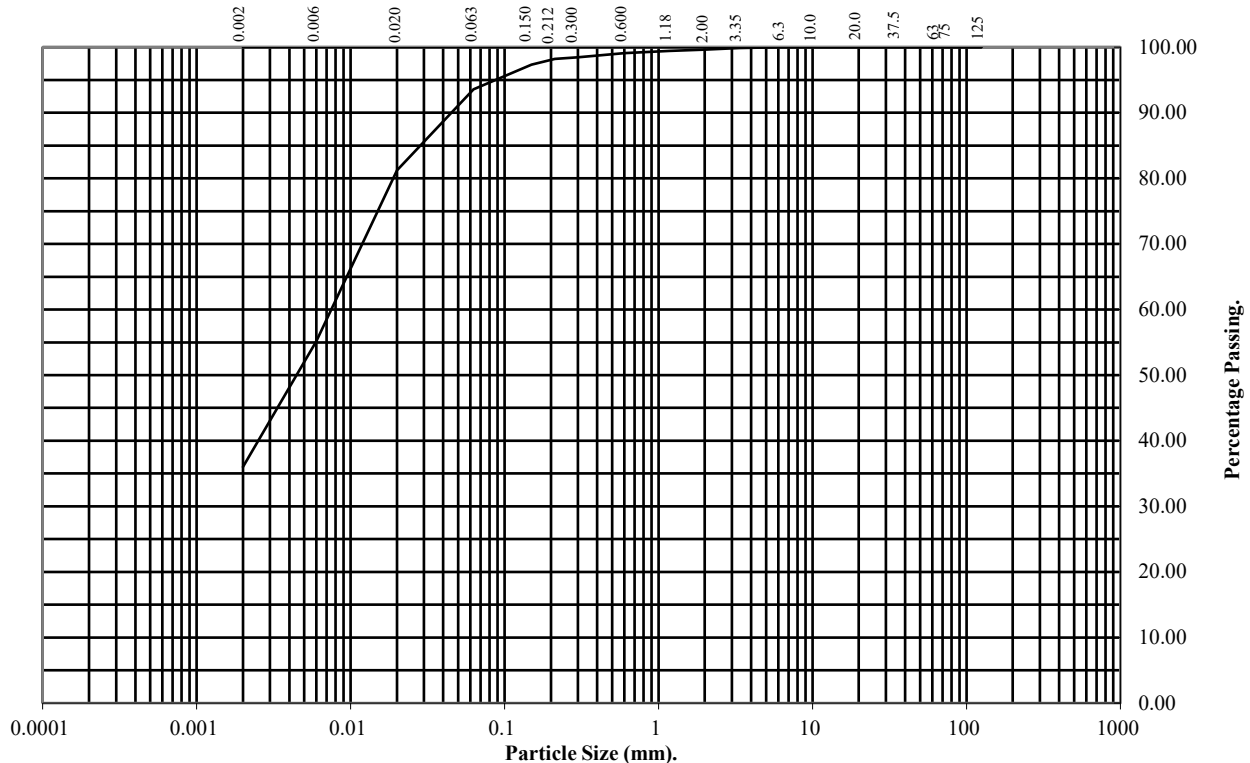
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: HBW-BH103 Top Depth (m): 9.50

Sample Number: Base Depth(m): 9.95

Sample Type: UT

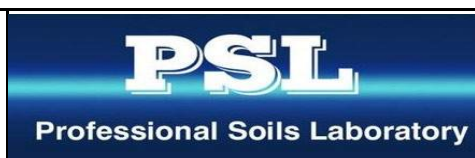


BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	100
1.18	99
0.6	99
0.3	98
0.212	98
0.15	97
0.063	94

Particle Diameter	Percentage Passing
0.02	81
0.006	55
0.002	36

Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	6
Silt	58
Clay	36

Remarks:
See Summary of Soil Descriptions



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PARTICLE SIZE DISTRIBUTION TEST

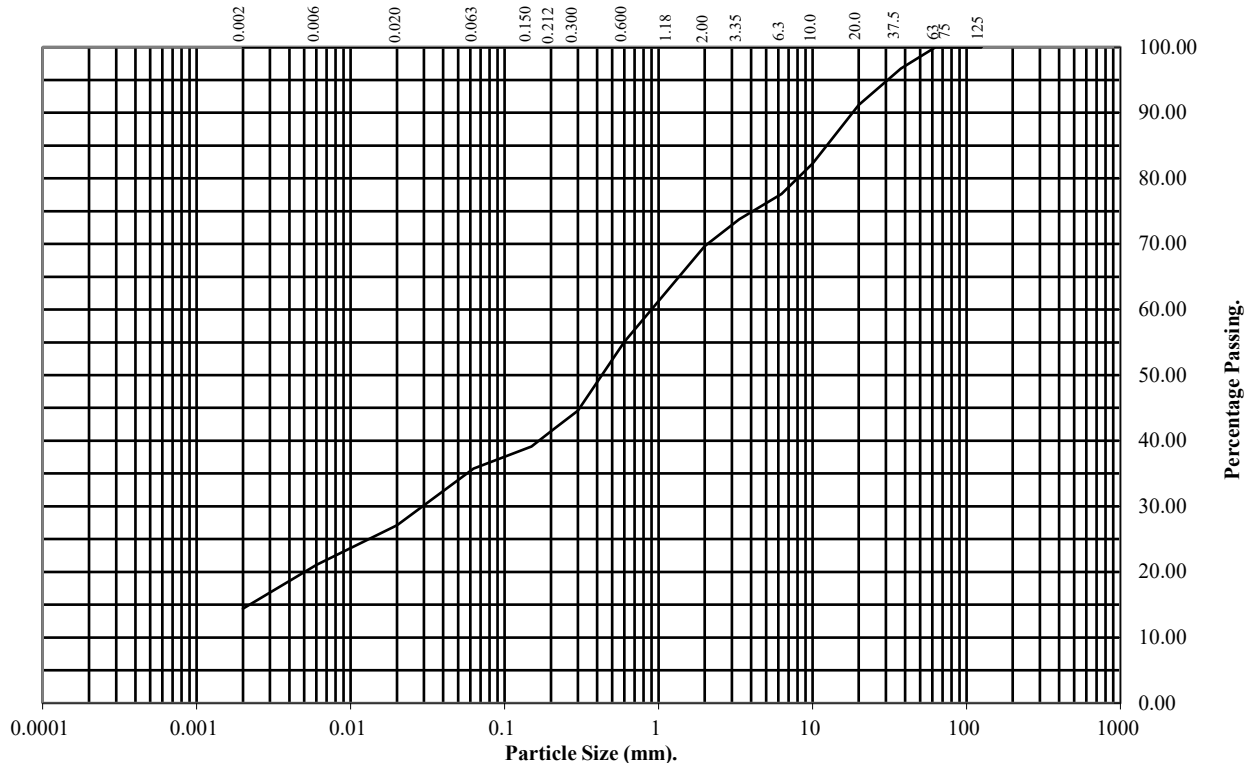
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: HBW-BH103 Top Depth (m): 20.00

Sample Number: Base Depth(m): 20.45

Sample Type: B

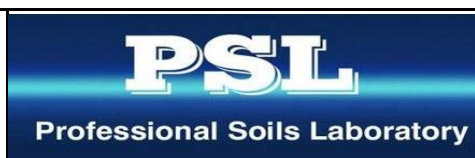


BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	97
20	91
10	82
6.3	78
3.35	74
2	70
1.18	63
0.6	55
0.3	45
0.212	42
0.15	39
0.063	36

Particle Diameter	Percentage Passing
0.02	27
0.006	21
0.002	14

Soil Fraction	Total Percentage
Cobbles	0
Gravel	30
Sand	34
Silt	22
Clay	14

Remarks:
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PARTICLE SIZE DISTRIBUTION TEST

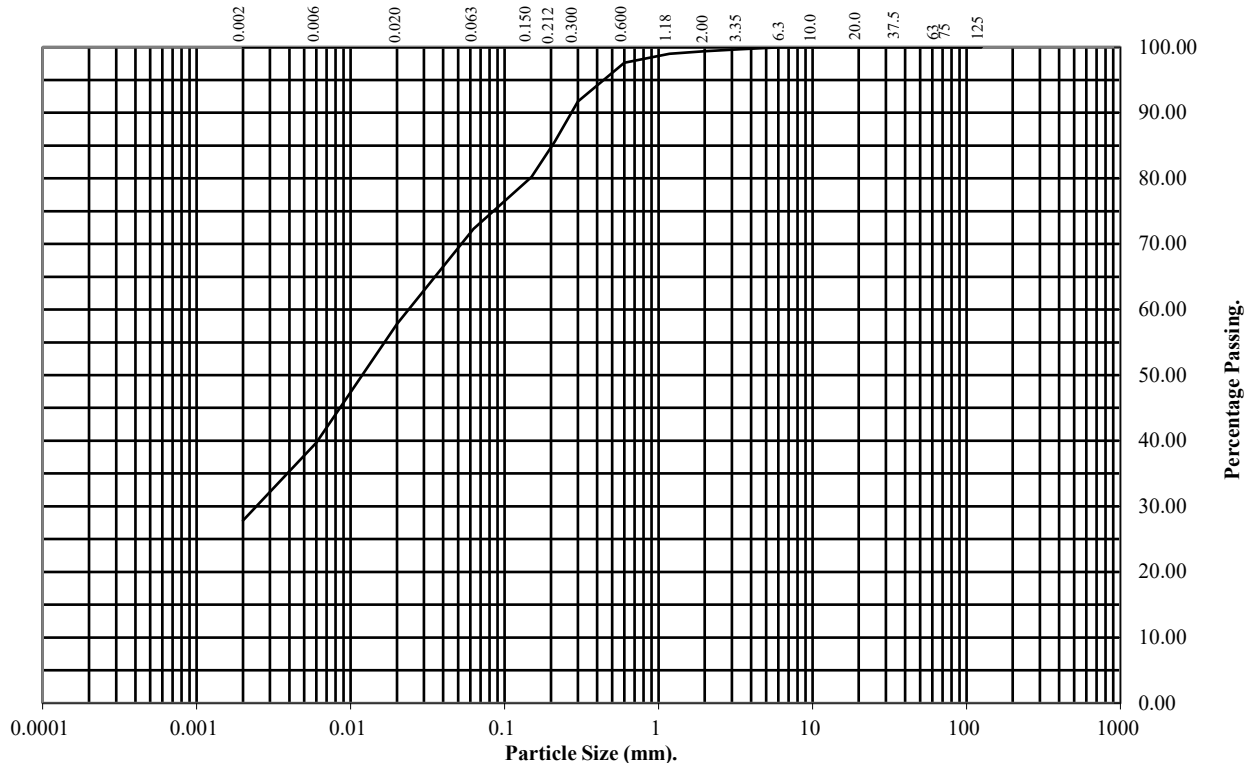
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: HBW-BH103 Top Depth (m): 21.50

Sample Number: Base Depth(m): 21.95

Sample Type: UT

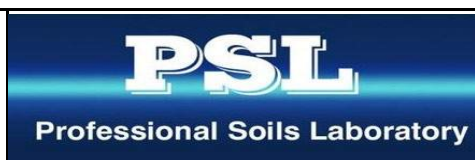


BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	99
1.18	99
0.6	98
0.3	92
0.212	86
0.15	80
0.063	72

Particle Diameter	Percentage Passing
0.02	58
0.006	40
0.002	28

Soil Fraction	Total Percentage
Cobbles	0
Gravel	1
Sand	27
Silt	44
Clay	28

Remarks:
See Summary of Soil Descriptions



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PARTICLE SIZE DISTRIBUTION TEST

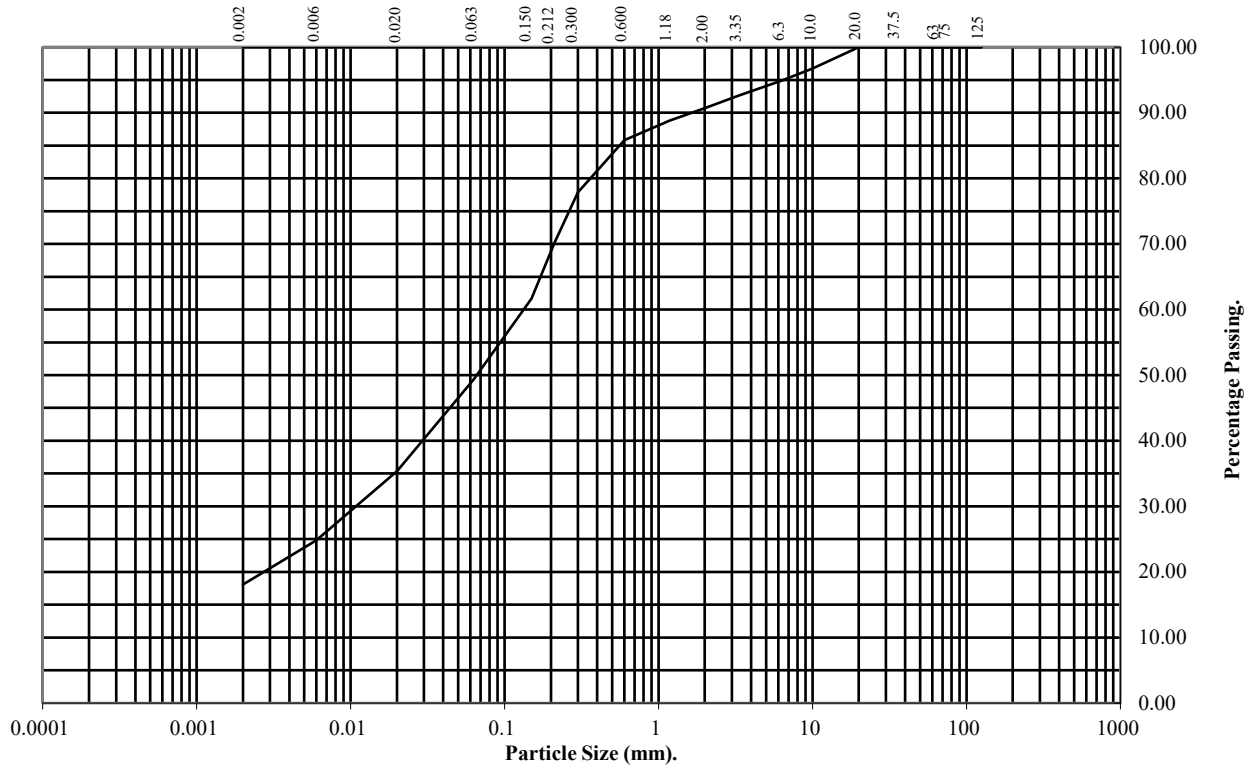
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: HBW-BH103 Top Depth (m): 24.50

Sample Number: Base Depth(m): 24.95

Sample Type: UT



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	97
6.3	95
3.35	93
2	91
1.18	89
0.6	86
0.3	78
0.212	70
0.15	62
0.063	49

Particle Diameter	Percentage Passing
0.02	35
0.006	25
0.002	18

Soil Fraction	Total Percentage
Cobbles	0
Gravel	9
Sand	42
Silt	31
Clay	18

Remarks:

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PARTICLE SIZE DISTRIBUTION TEST

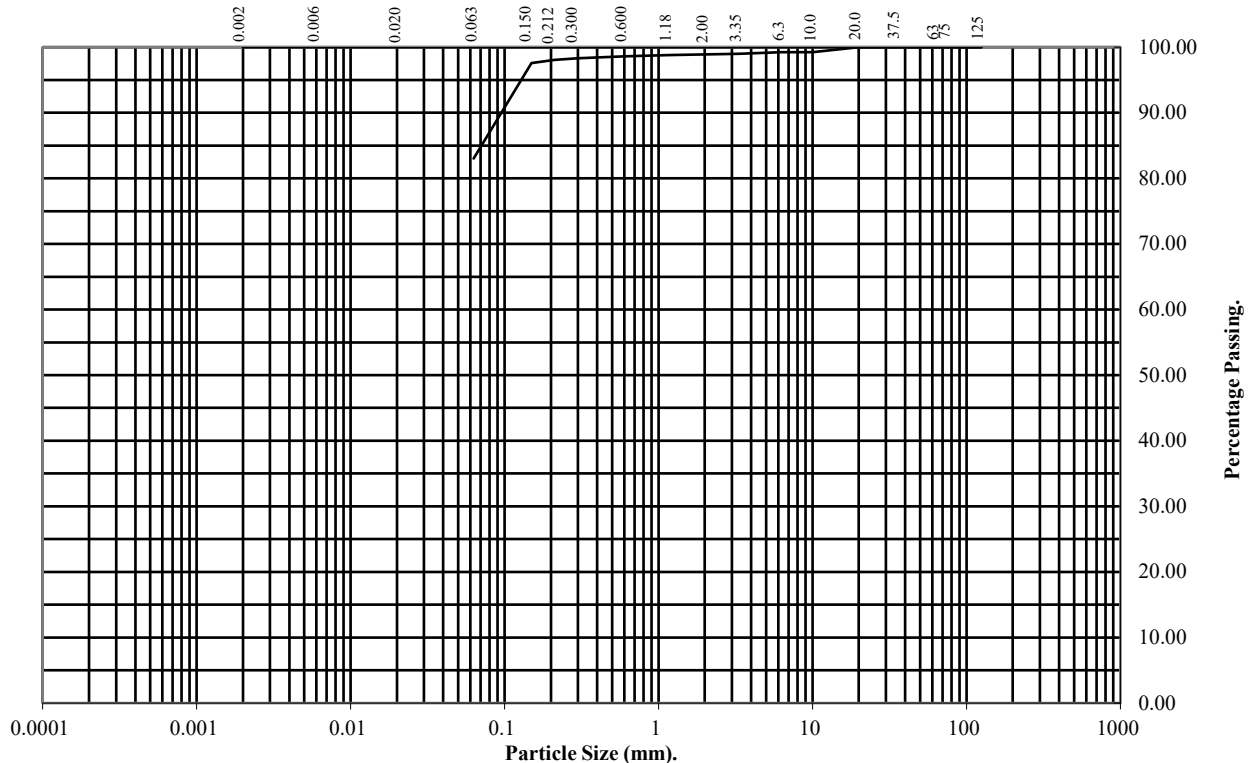
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: HBW-BH103 Top Depth (m): 29.00

Sample Number: Base Depth(m): 29.45

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	99
6.3	99
3.35	99
2	99
1.18	99
0.6	99
0.3	98
0.212	98
0.15	98
0.063	83

Soil Fraction	Total Percentage
Cobbles	0
Gravel	1
Sand	16
Silt/Clay	83

Remarks:

See Summary of Soil Descriptions



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PARTICLE SIZE DISTRIBUTION TEST

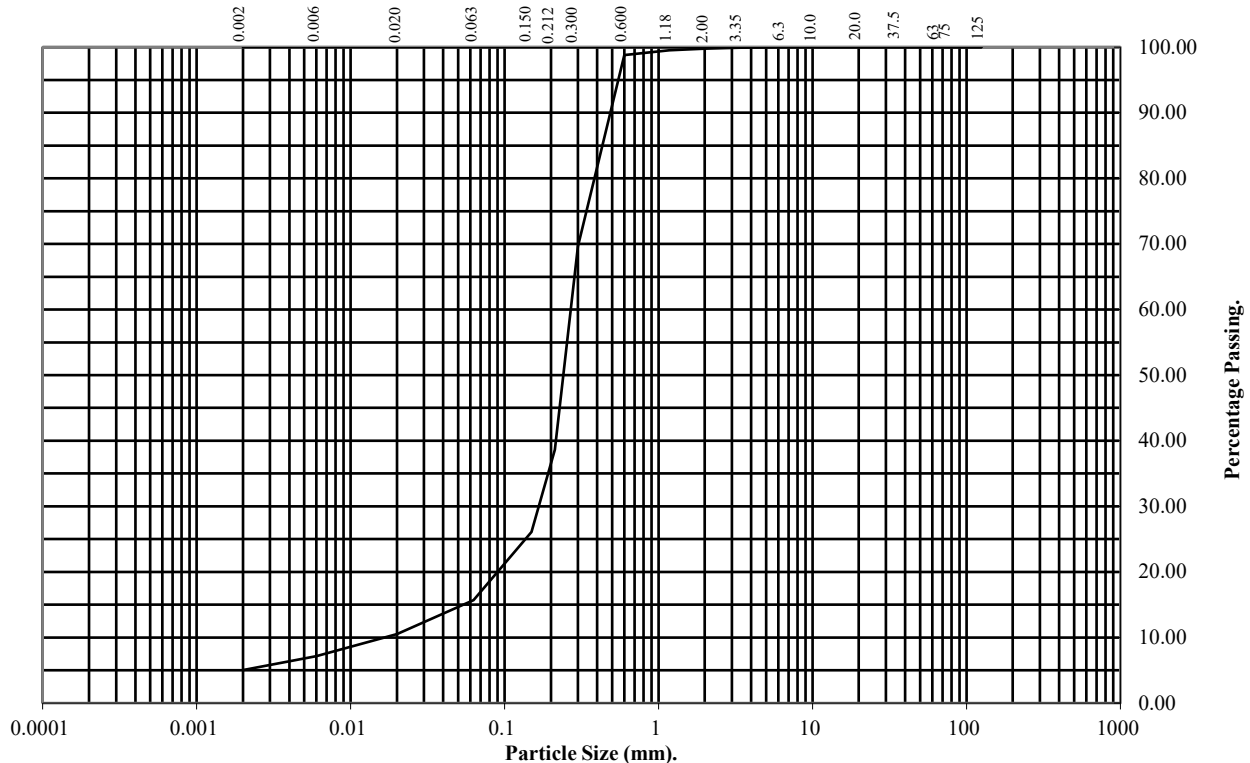
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: HBW-BH103 Top Depth (m): 33.50

Sample Number: Base Depth(m): 33.95

Sample Type: B

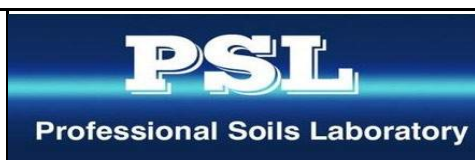


BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	100
1.18	100
0.6	99
0.3	70
0.212	39
0.15	26
0.063	16

Particle Diameter	Percentage Passing
0.02	11
0.006	7
0.002	5

Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	84
Silt	11
Clay	5

Remarks:
See Summary of Soil Descriptions



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PARTICLE SIZE DISTRIBUTION TEST

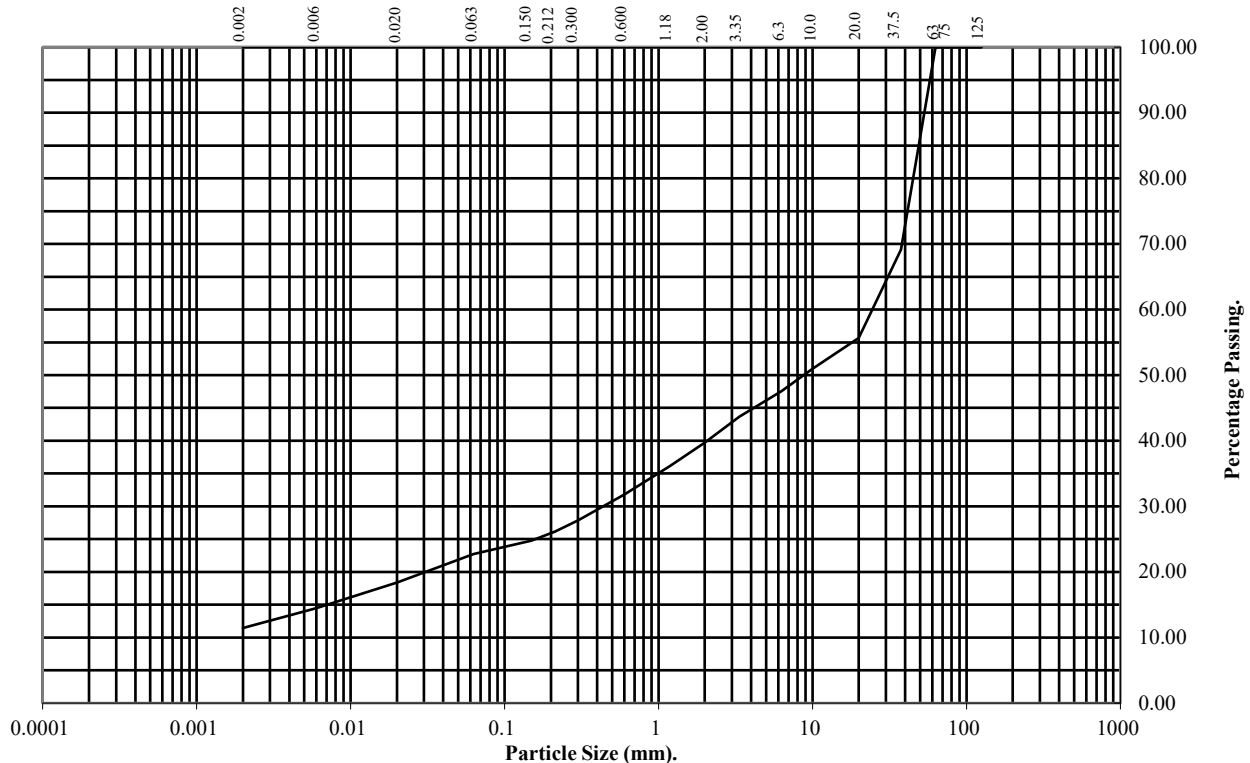
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: HBW-WS101 Top Depth (m): 0.55

Sample Number: Base Depth(m): 1.20

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	69
20	56
10	51
6.3	48
3.35	44
2	40
1.18	36
0.6	32
0.3	28
0.212	26
0.15	25
0.063	23

Particle Diameter	Percentage Passing
0.02	18
0.006	14
0.002	11

Soil Fraction	Total Percentage
Cobbles	0
Gravel	60
Sand	17
Silt	12
Clay	11

Remarks:
See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

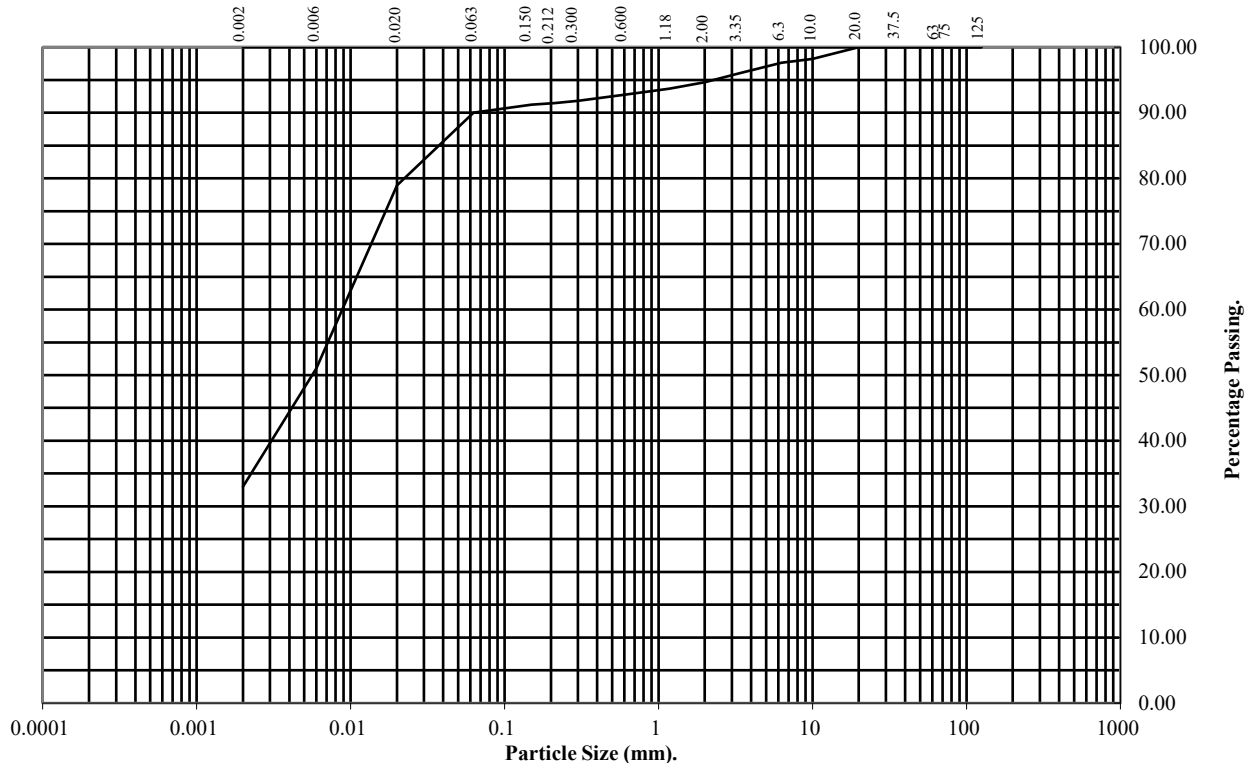
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: HBW-WS101 Top Depth (m): 5.40

Sample Number: Base Depth(m): 6.00

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	98
6.3	98
3.35	96
2	95
1.18	94
0.6	93
0.3	92
0.212	92
0.15	91
0.063	90

Particle Diameter	Percentage Passing
0.02	79
0.006	51
0.002	33

Soil Fraction	Total Percentage
Cobbles	0
Gravel	5
Sand	5
Silt	57
Clay	33

Remarks:

See Summary of Soil Descriptions



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PARTICLE SIZE DISTRIBUTION TEST

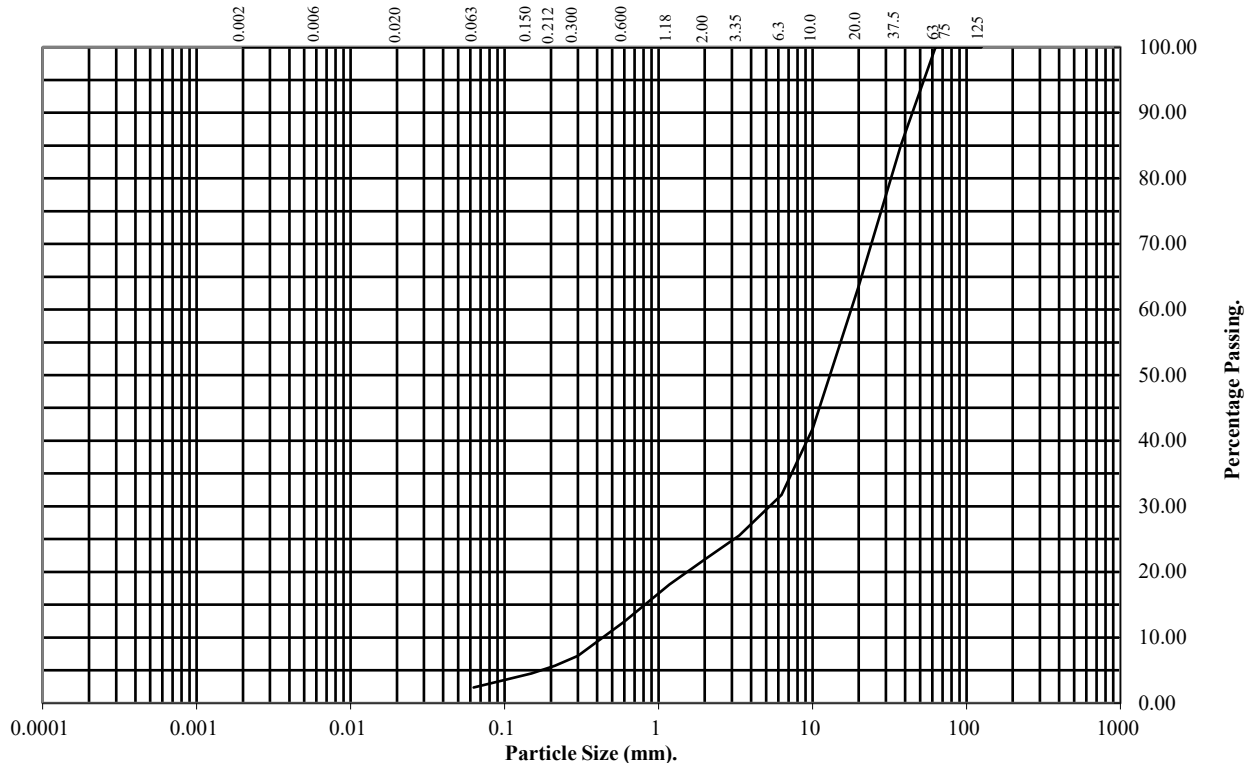
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: HBW-WS102 Top Depth (m): 0.80

Sample Number: Base Depth(m): 1.20

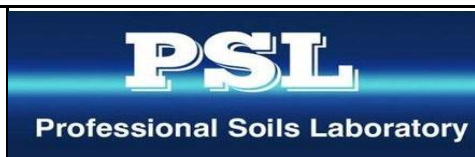
Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	85
20	64
10	42
6.3	32
3.35	26
2	22
1.18	18
0.6	12
0.3	7
0.212	6
0.15	5
0.063	2

Soil Fraction	Total Percentage
Cobbles	0
Gravel	78
Sand	20
Silt/Clay	2

Remarks:
See Summary of Soil Descriptions



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PARTICLE SIZE DISTRIBUTION TEST

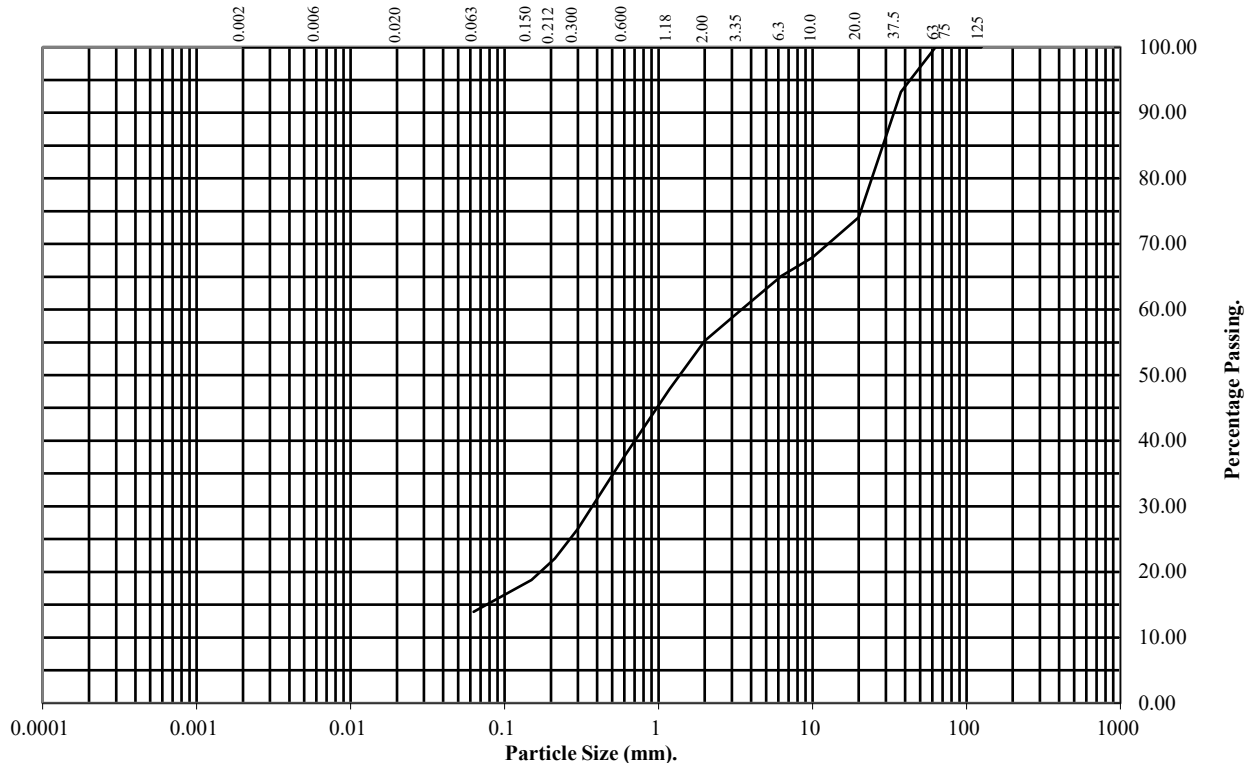
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: HBW-WS102 Top Depth (m): 2.00

Sample Number: Base Depth(m): 3.00

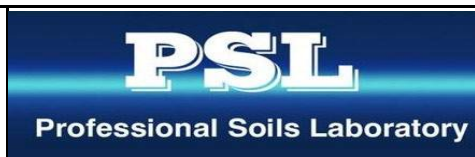
Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	93
20	74
10	68
6.3	65
3.35	60
2	55
1.18	48
0.6	38
0.3	27
0.212	22
0.15	19
0.063	14

Soil Fraction	Total Percentage
Cobbles	0
Gravel	45
Sand	41
Silt/Clay	14

Remarks:
See Summary of Soil Descriptions



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PARTICLE SIZE DISTRIBUTION TEST

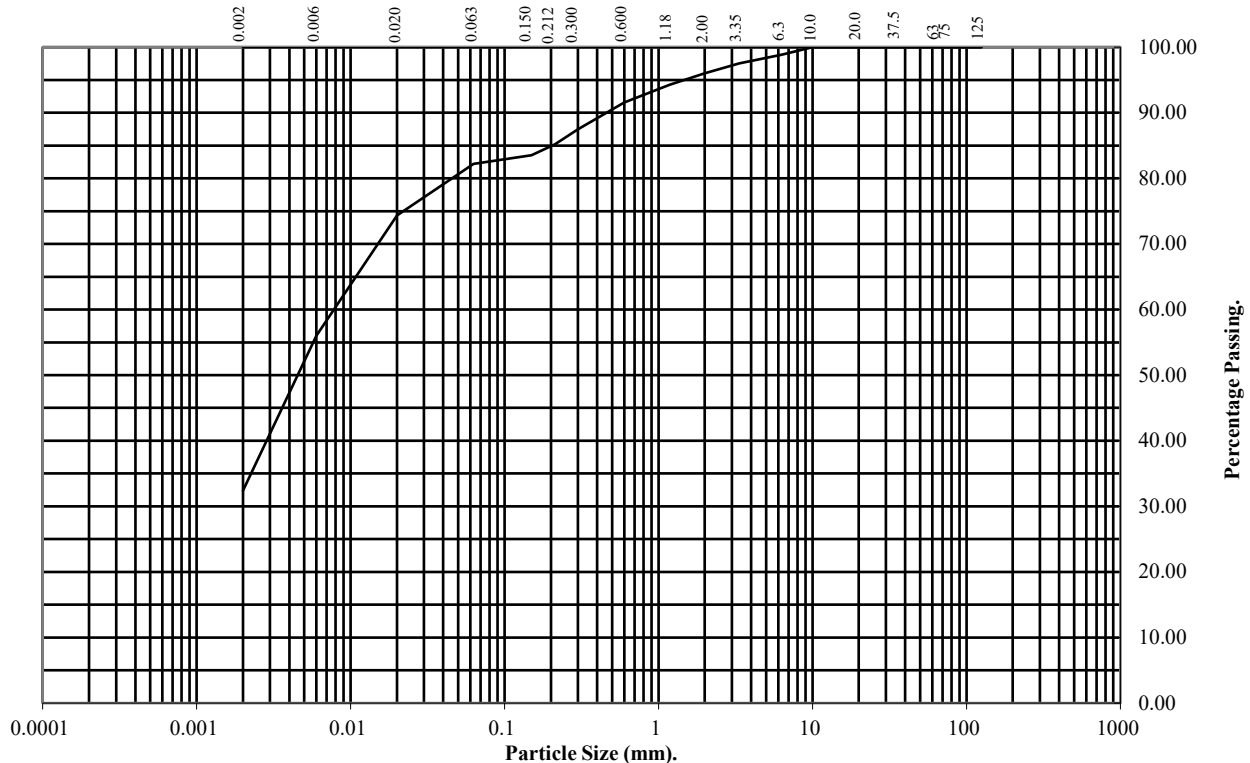
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: HBW-WS102 Top Depth (m): 4.00

Sample Number: Base Depth(m): 5.00

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	99
3.35	98
2	96
1.18	94
0.6	92
0.3	87
0.212	85
0.15	84
0.063	82

Particle Diameter	Percentage Passing
0.02	74
0.006	56
0.002	32

Soil Fraction	Total Percentage
Cobbles	0
Gravel	4
Sand	14
Silt	50
Clay	32

Remarks:

See Summary of Soil Descriptions



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PARTICLE SIZE DISTRIBUTION TEST

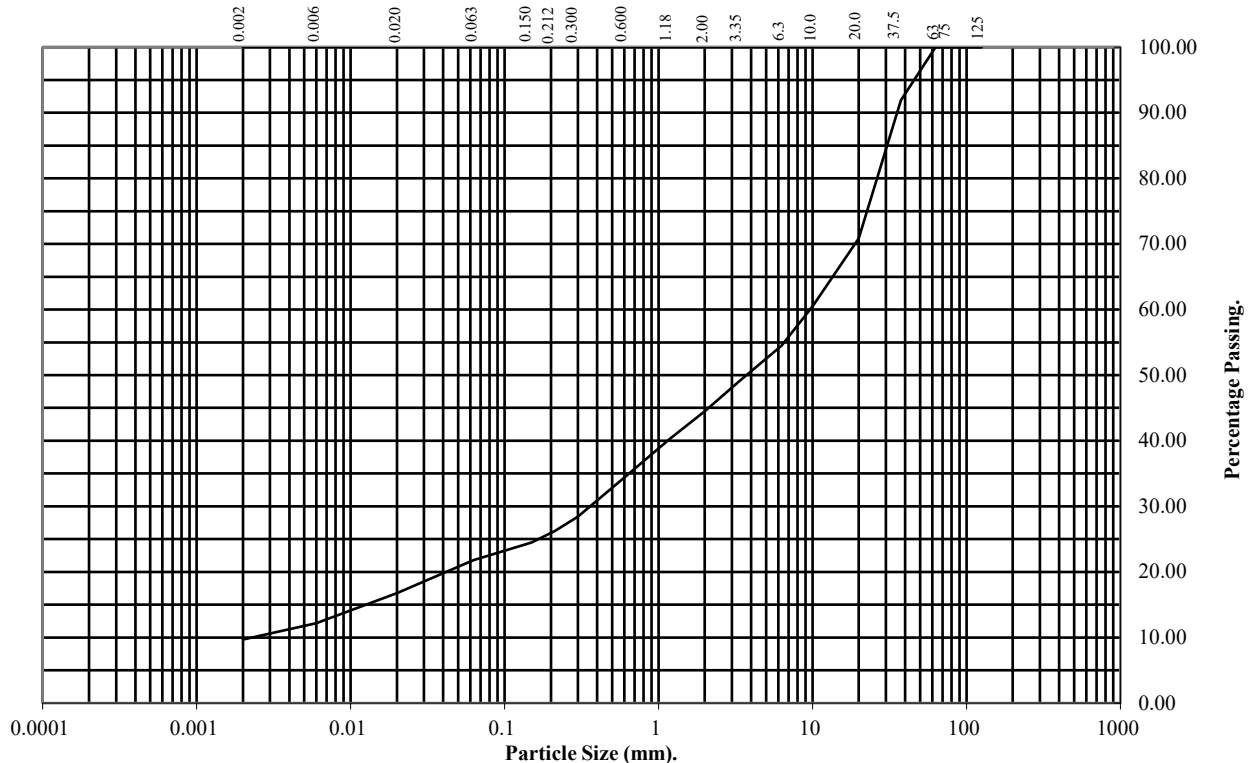
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: HBW-WS103 Top Depth (m): 0.55

Sample Number: Base Depth(m): 1.20

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	92
20	71
10	60
6.3	54
3.35	49
2	44
1.18	40
0.6	34
0.3	28
0.212	26
0.15	25
0.063	22

Particle Diameter	Percentage Passing
0.02	17
0.006	12
0.002	10

Soil Fraction	Total Percentage
Cobbles	0
Gravel	56
Sand	22
Silt	12
Clay	10

Remarks:

See Summary of Soil Descriptions



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PARTICLE SIZE DISTRIBUTION TEST

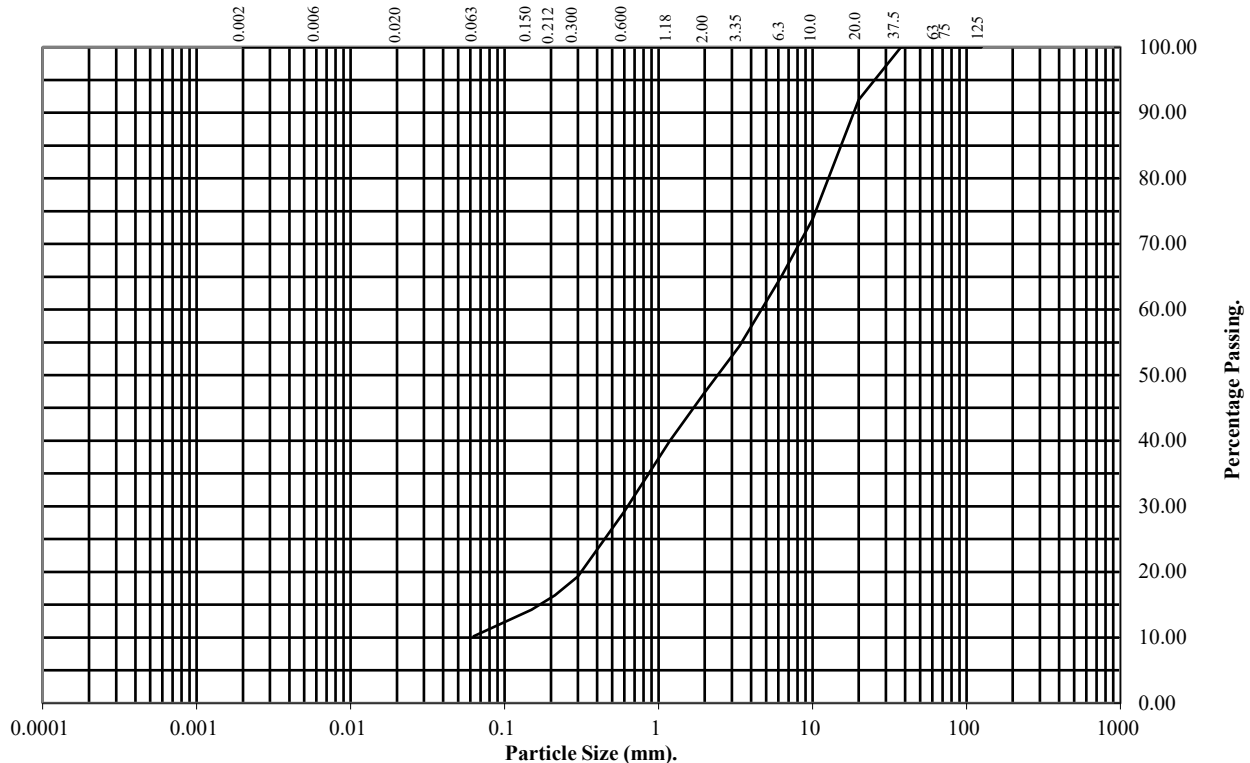
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: HBW-WS103 Top Depth (m): 3.00

Sample Number: Base Depth(m): 4.00

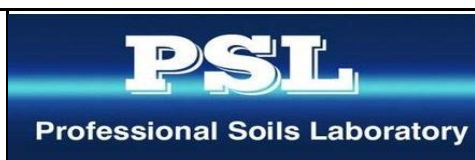
Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	92
10	74
6.3	65
3.35	54
2	47
1.18	40
0.6	29
0.3	19
0.212	16
0.15	14
0.063	10

Soil Fraction	Total Percentage
Cobbles	0
Gravel	53
Sand	37
Silt/Clay	10

Remarks:
See Summary of Soil Descriptions



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PARTICLE SIZE DISTRIBUTION TEST

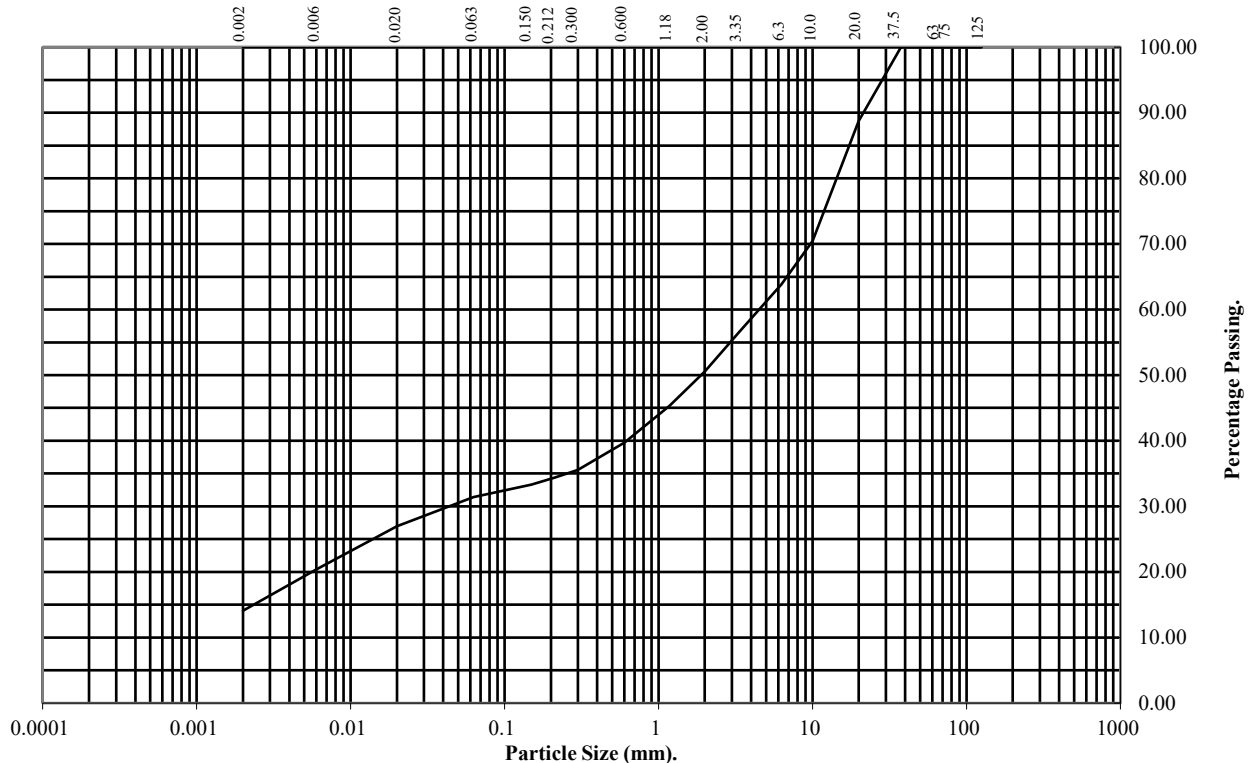
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: HBW-WS104 Top Depth (m): 1.00

Sample Number: Base Depth(m): 1.80

Sample Type: B

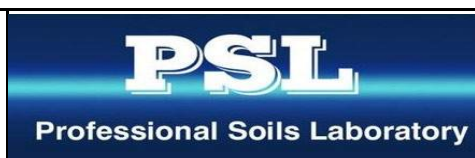


BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	89
10	70
6.3	64
3.35	57
2	51
1.18	45
0.6	40
0.3	36
0.212	34
0.15	33
0.063	31

Particle Diameter	Percentage Passing
0.02	27
0.006	20
0.002	14

Soil Fraction	Total Percentage
Cobbles	0
Gravel	49
Sand	20
Silt	17
Clay	14

Remarks:
See Summary of Soil Descriptions



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PARTICLE SIZE DISTRIBUTION TEST

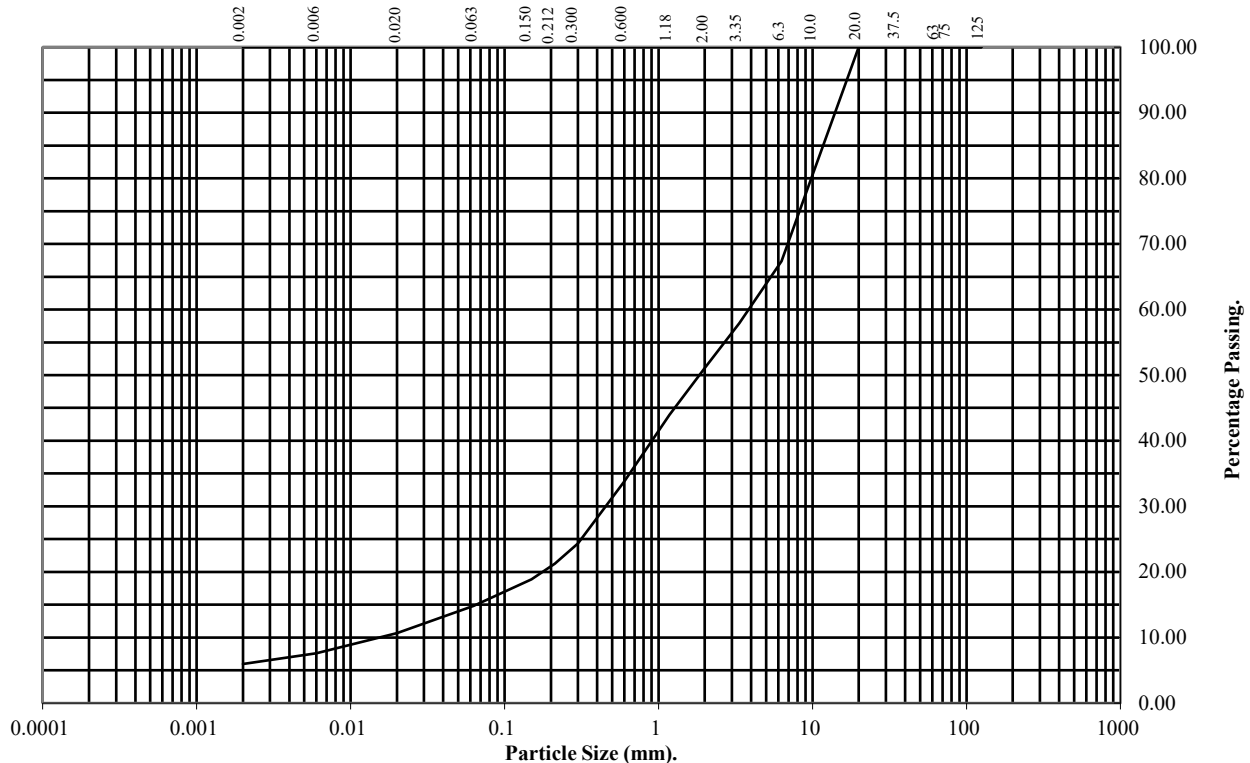
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: HBW-WS104 Top Depth (m): 2.80

Sample Number: Base Depth(m): 3.00

Sample Type: D

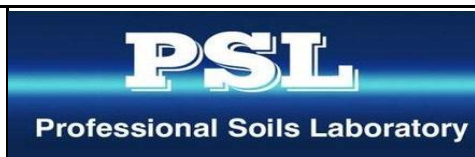


BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	81
6.3	67
3.35	58
2	51
1.18	44
0.6	34
0.3	24
0.212	21
0.15	19
0.063	15

Particle Diameter	Percentage Passing
0.02	11
0.006	8
0.002	6

Soil Fraction	Total Percentage
Cobbles	0
Gravel	49
Sand	36
Silt	9
Clay	6

Remarks:
See Summary of Soil Descriptions



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PARTICLE SIZE DISTRIBUTION TEST

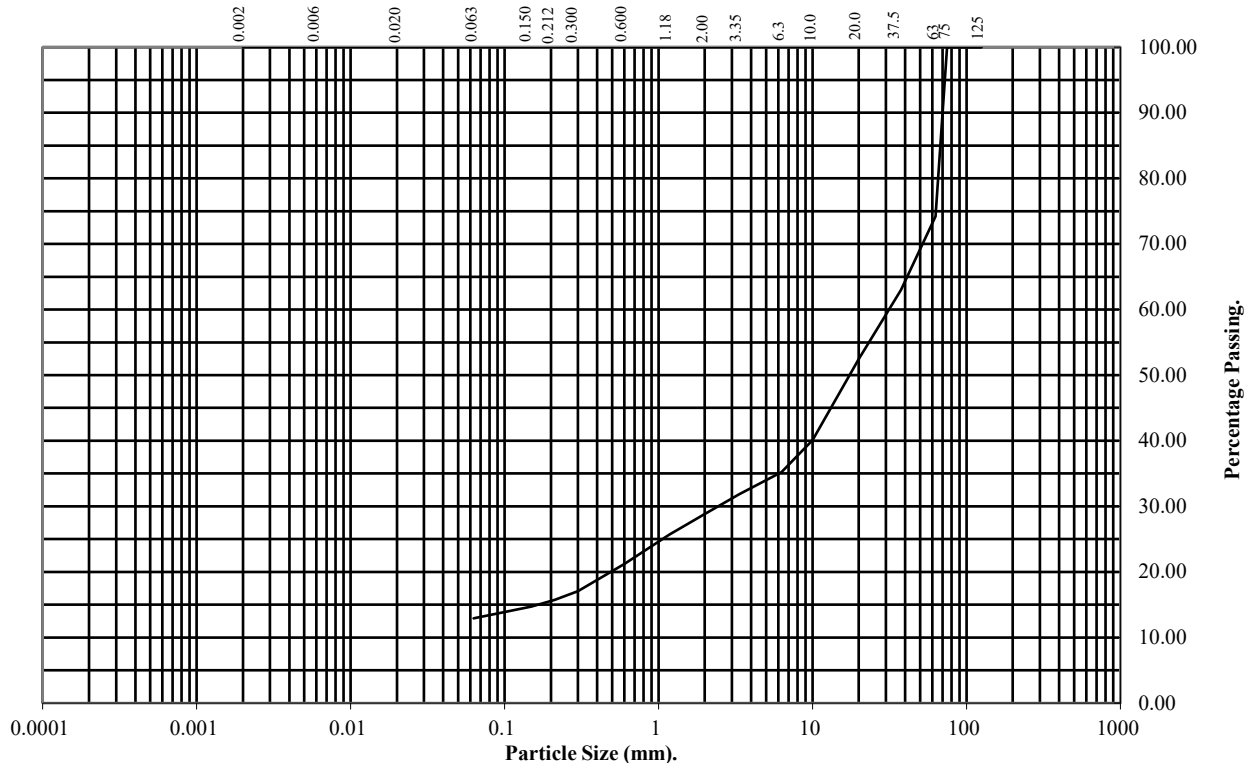
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: HBW-WS105 Top Depth (m): 0.50

Sample Number: Base Depth(m): 1.20

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	74
37.5	63
20	52
10	40
6.3	35
3.35	32
2	29
1.18	26
0.6	21
0.3	17
0.212	16
0.15	15
0.063	13

Soil Fraction	Total Percentage
Cobbles	26
Gravel	45
Sand	16
Silt/Clay	13

Remarks:

See Summary of Soil Descriptions



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PARTICLE SIZE DISTRIBUTION TEST

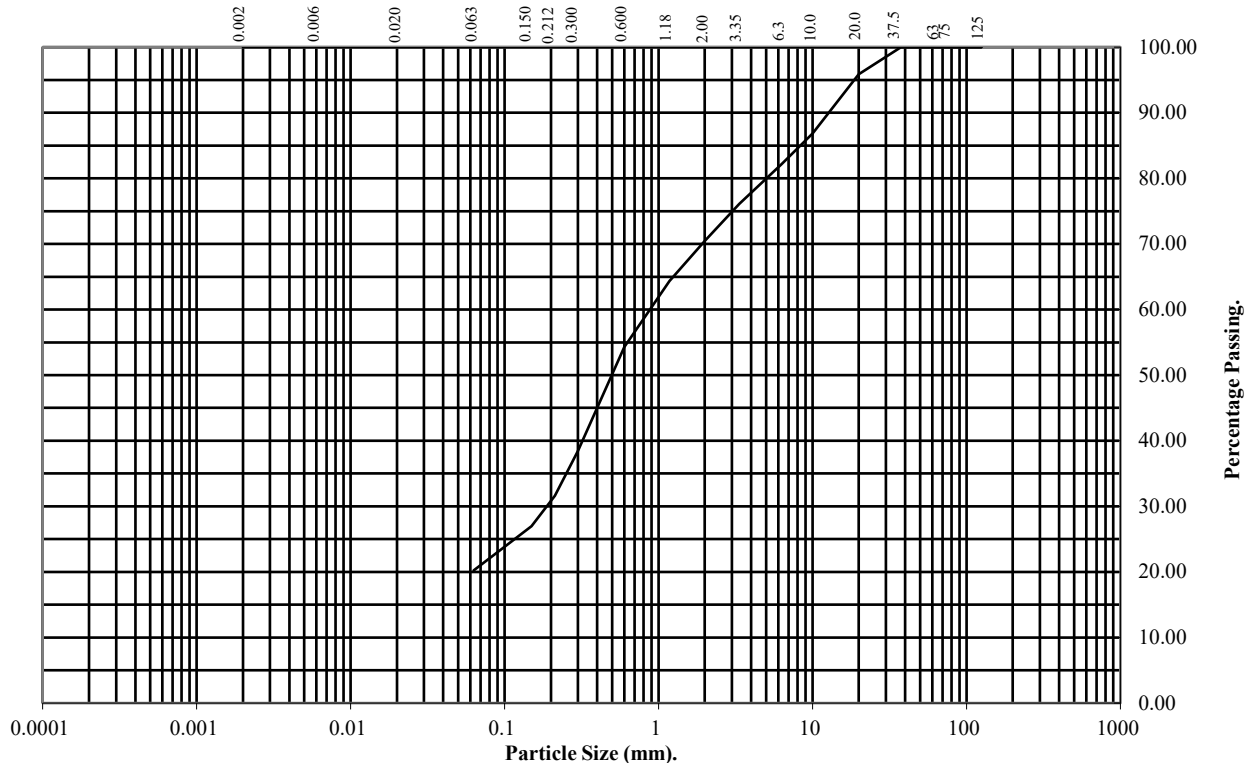
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: HBW-WS105 Top Depth (m): 3.00

Sample Number: Base Depth(m): 4.00

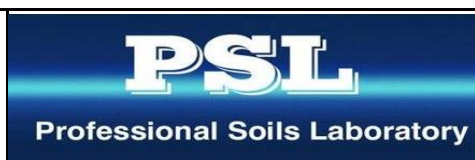
Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	96
10	87
6.3	82
3.35	76
2	70
1.18	64
0.6	54
0.3	38
0.212	32
0.15	27
0.063	20

Soil Fraction	Total Percentage
Cobbles	0
Gravel	30
Sand	50
Silt/Clay	20

Remarks:
See Summary of Soil Descriptions



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UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

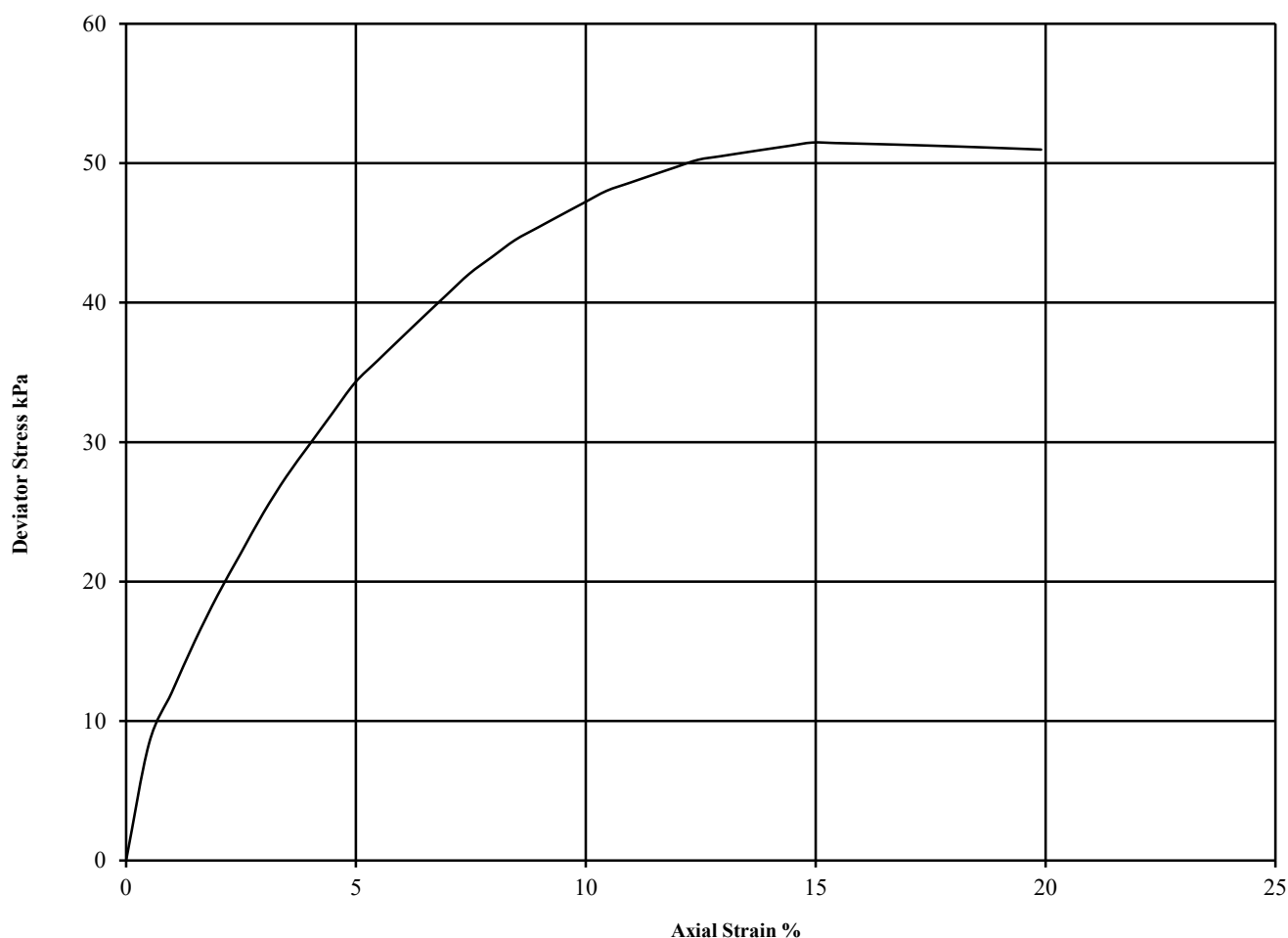
Hole Number: HBW-BH101

Top Depth (m): 3.00

Sample Number:

Base Depth (m): 3.45

Sample Type UT



Diameter (mm):		103	Height (mm):		207	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample
				θ_3	$(\theta_1 - \theta_3)_f$	$\frac{1}{2}(\theta_1 - \theta_3)_f$			Sample taken from top of tube
									Rate of strain = 2 %/min
									Latex Membrane used 0.2 mm thick,
1	29	1.96	1.51	60	51	26	14.9	Plastic	Correction applied 0.34
									See summary of soil descriptions



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UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

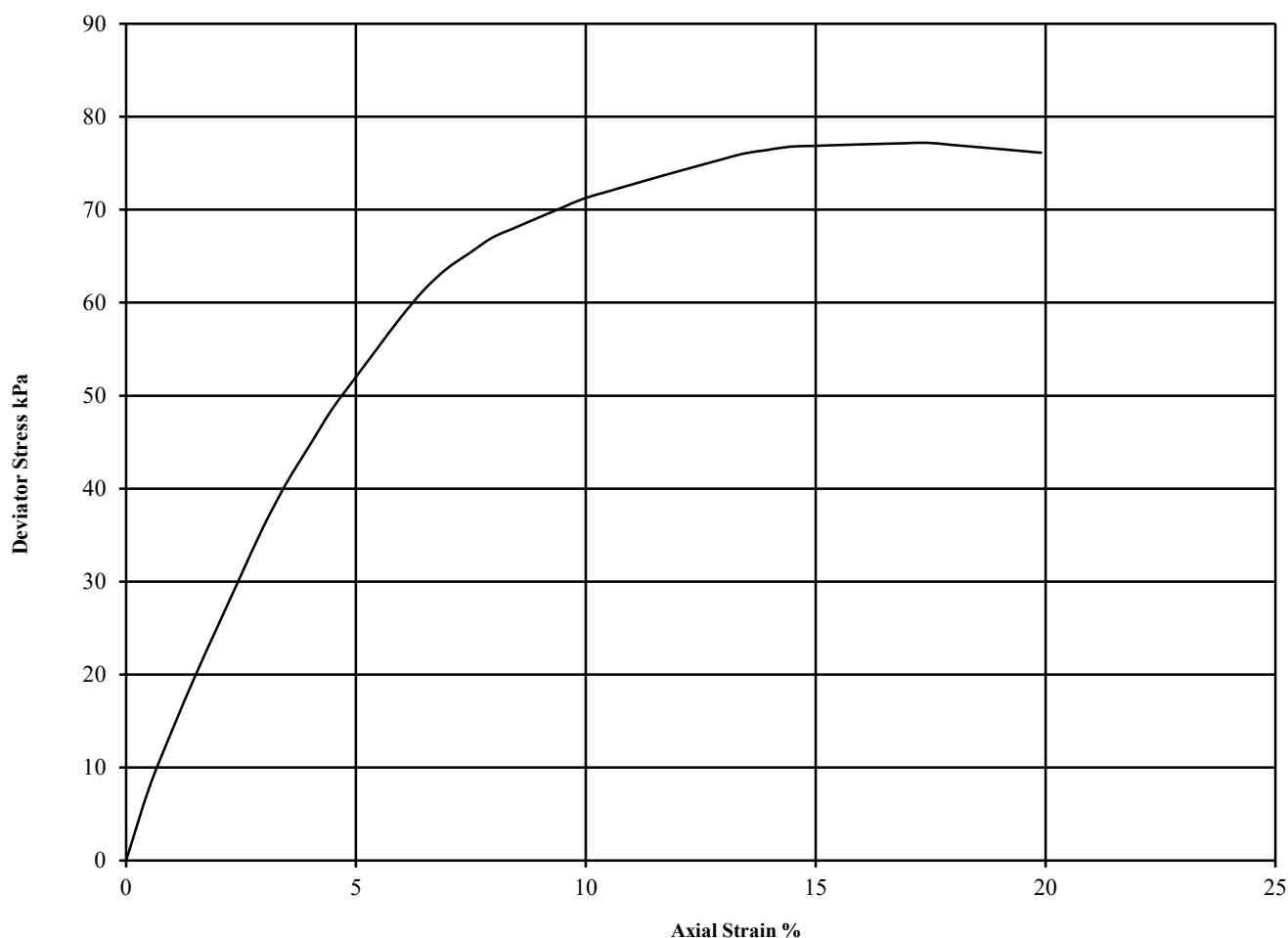
Hole Number: HBW-BH101

Top Depth (m): 11.00

Sample Number:

Base Depth (m): 11.45

Sample Type UT



Diameter (mm):		103	Height (mm):		207	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m ³)	Dry Density (Mg/m ³)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.34 See summary of soil descriptions
				θ_3	$(\theta_1 - \theta_3)_f$	$\frac{1}{2}(\theta_1 - \theta_3)_f$			
1	20	1.94	1.62	220	77	39	17.4	Plastic	



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UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

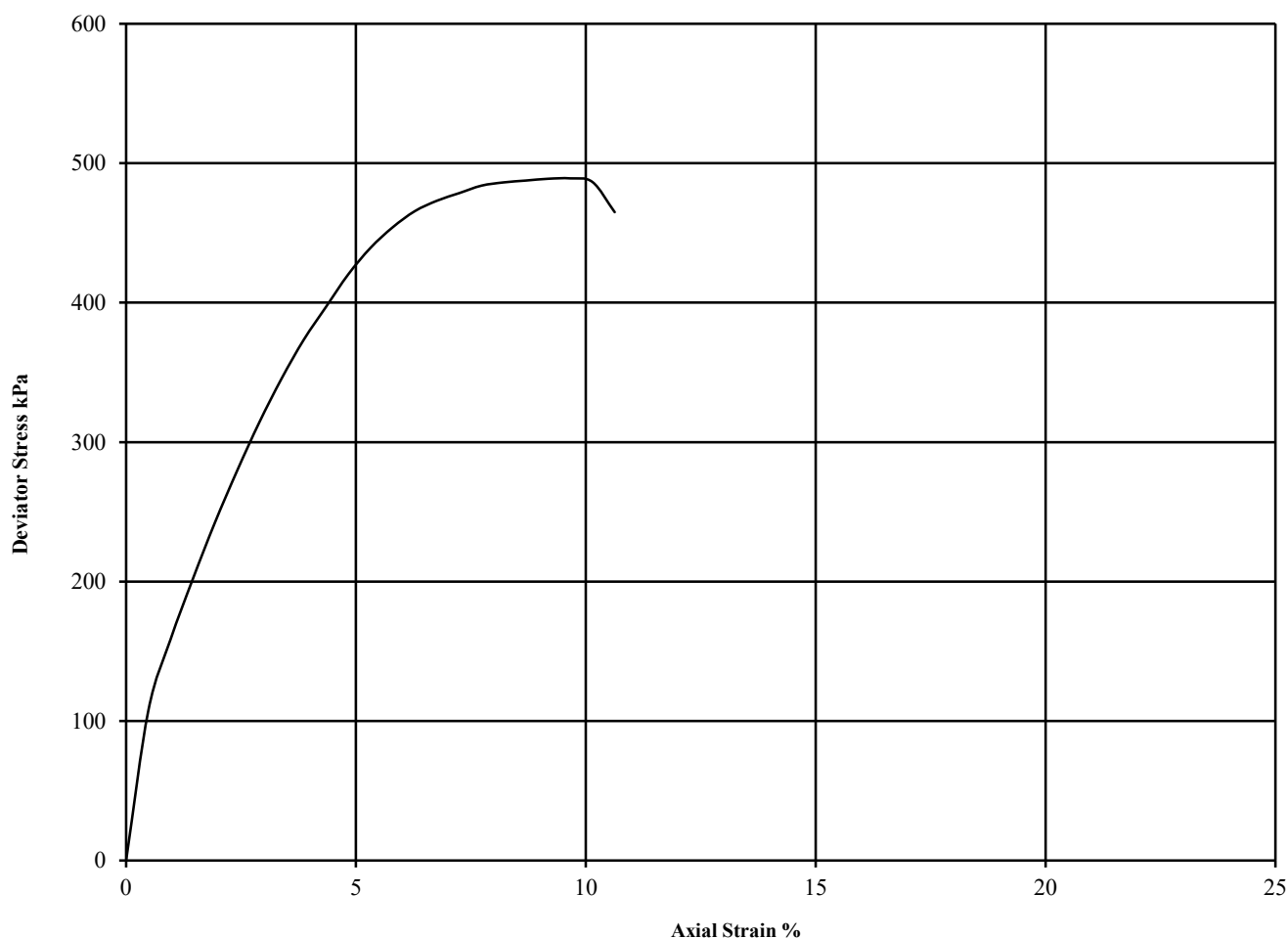
Hole Number: HBW-BH101

Top Depth (m): 24.00

Sample Number:

Base Depth (m): 24.45

Sample Type UT



Diameter (mm):		100	Height (mm):		207	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m ³)	Dry Density (Mg/m ³)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.36 See summary of soil descriptions
				θ_3	$(\theta_1 - \theta_3)_f$	$\frac{1}{2}(\theta_1 - \theta_3)_f$			
1	10	2.14	1.94	480	489	245	9.7	Brittle	



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UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

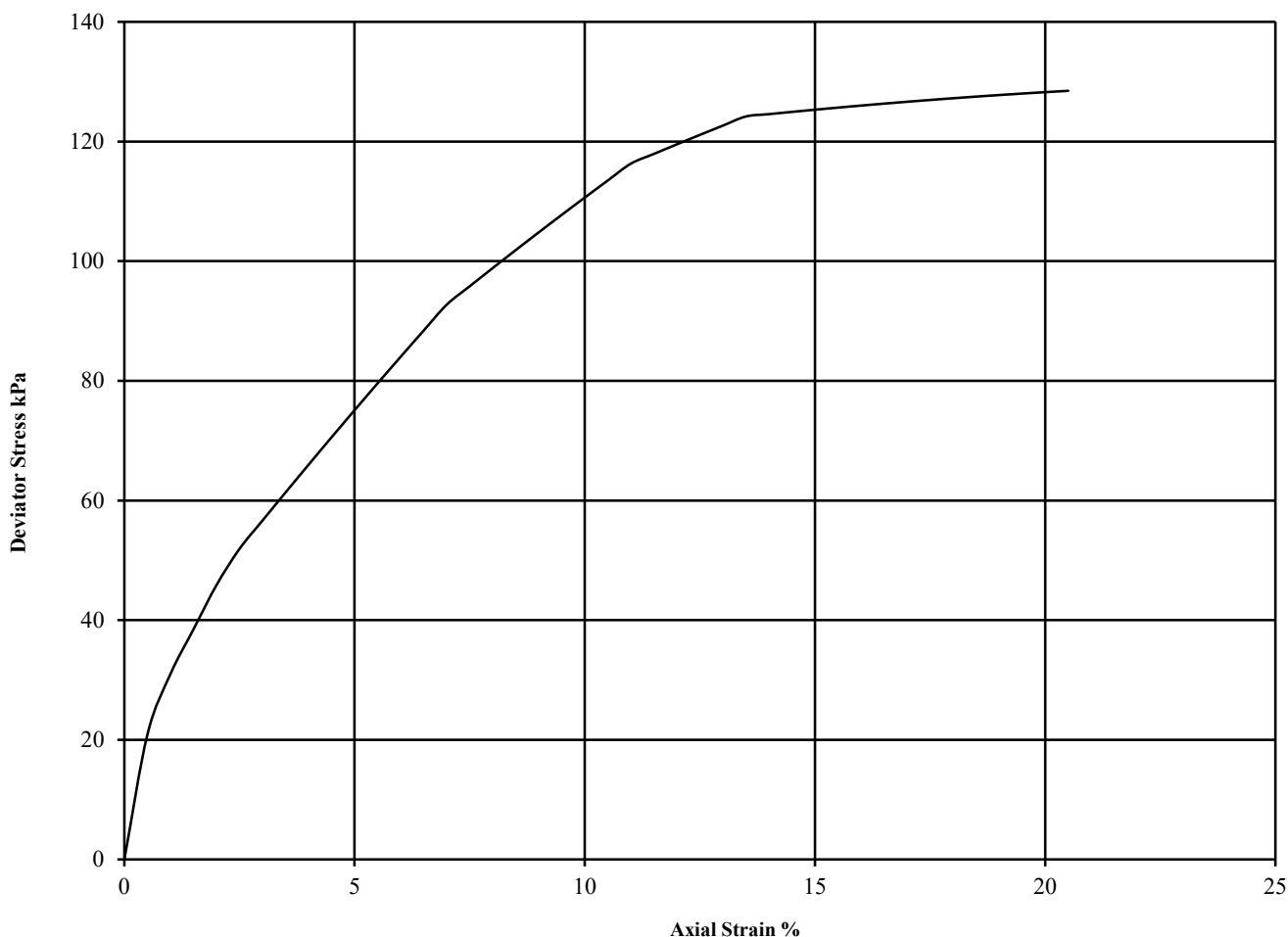
Hole Number: HBW-BH102

Top Depth (m): 8.00

Sample Number:

Base Depth (m): 8.45

Sample Type UT



Diameter (mm):		38	Height (mm):		76	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.68 38mm due to insufficient material
				θ_3	$(\theta_1 - \theta_3)_f$	$\frac{1}{2}(\theta_1 - \theta_3)_f$			
1	24	2.07	1.66	160	128	64	20.5	Plastic	



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UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

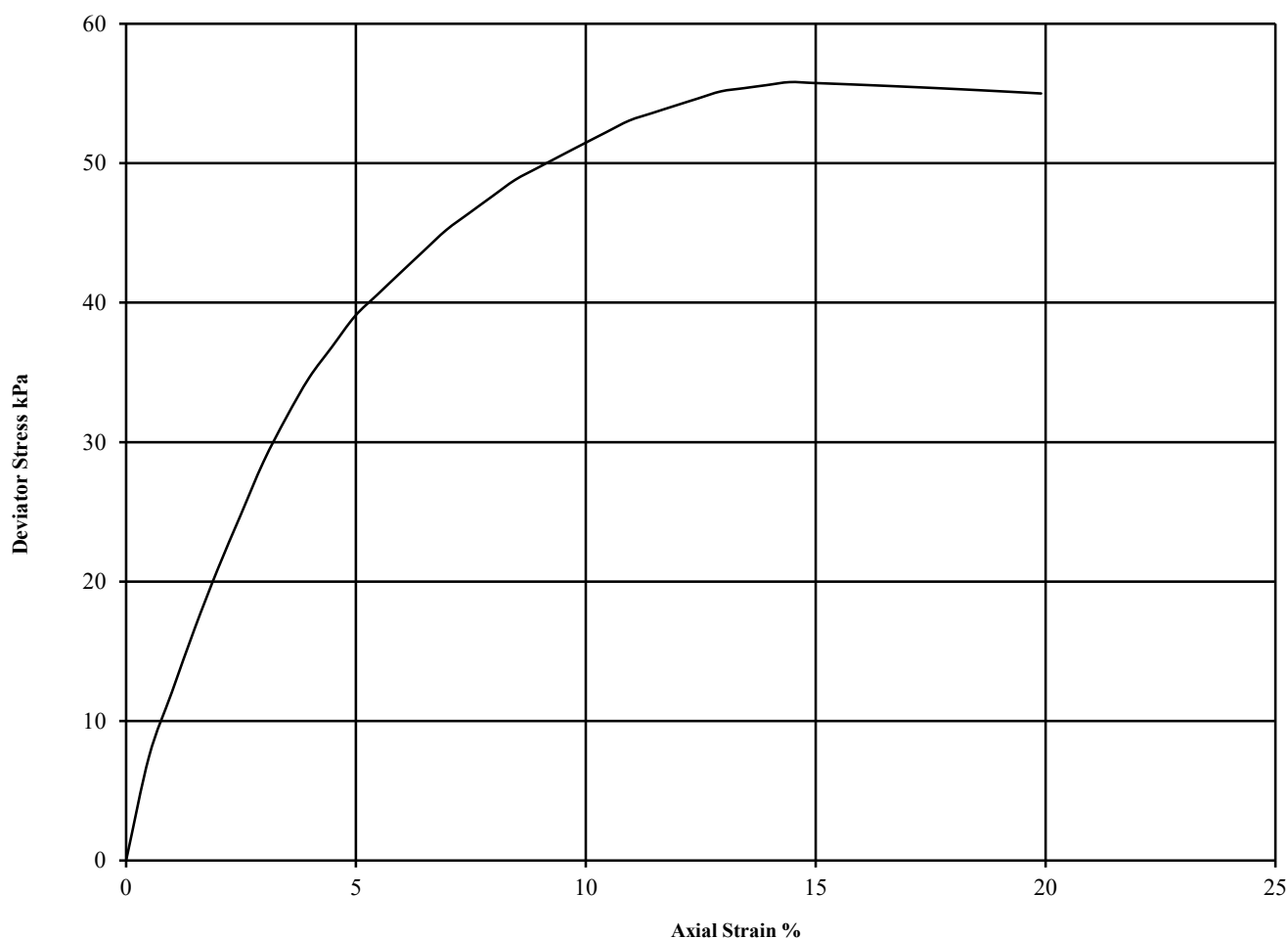
Hole Number: HBW-BH103

Top Depth (m): 9.50

Sample Number:

Base Depth (m): 9.95

Sample Type UT



Diameter (mm):		103		Height (mm):		207	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m ³)	Dry Density (Mg/m ³)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.34 See summary of soil descriptions	
				θ_3	$(\theta_1 - \theta_3)_f$	$\frac{1}{2}(\theta_1 - \theta_3)_f$				
1	32	1.92	1.46	200	56	28	14.4	Plastic		



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UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

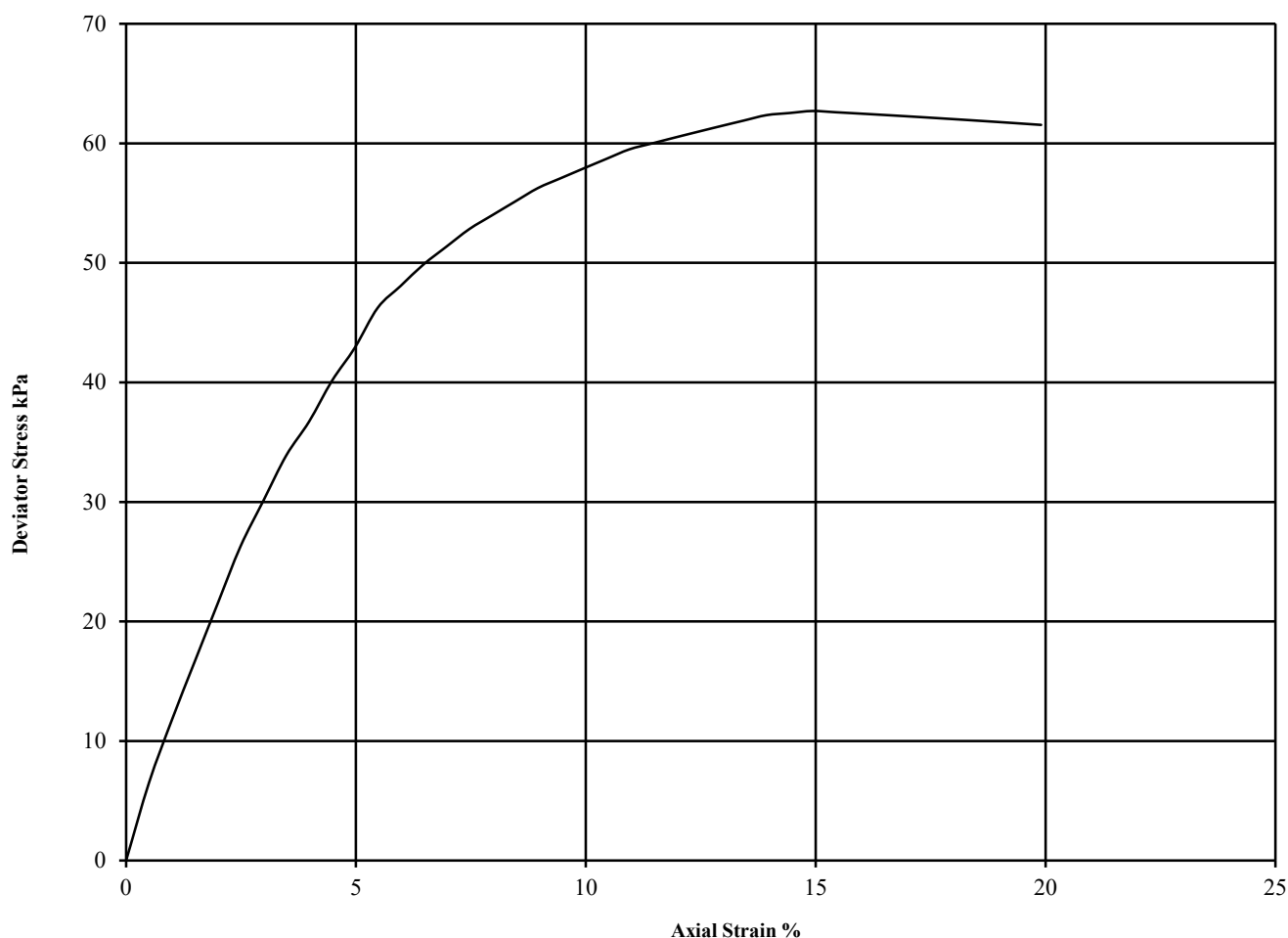
Hole Number: HBW-BH103

Top Depth (m): 15.50

Sample Number:

Base Depth (m): 15.95

Sample Type UT



Diameter (mm):		103	Height (mm):		207	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m ³)	Dry Density (Mg/m ³)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.34 See summary of soil descriptions
				θ_3	$(\theta_1 - \theta_3)_f$	$\frac{1}{2}(\theta_1 - \theta_3)_f$			
1	28	1.98	1.55	300	63	31	14.9	Plastic	



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UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

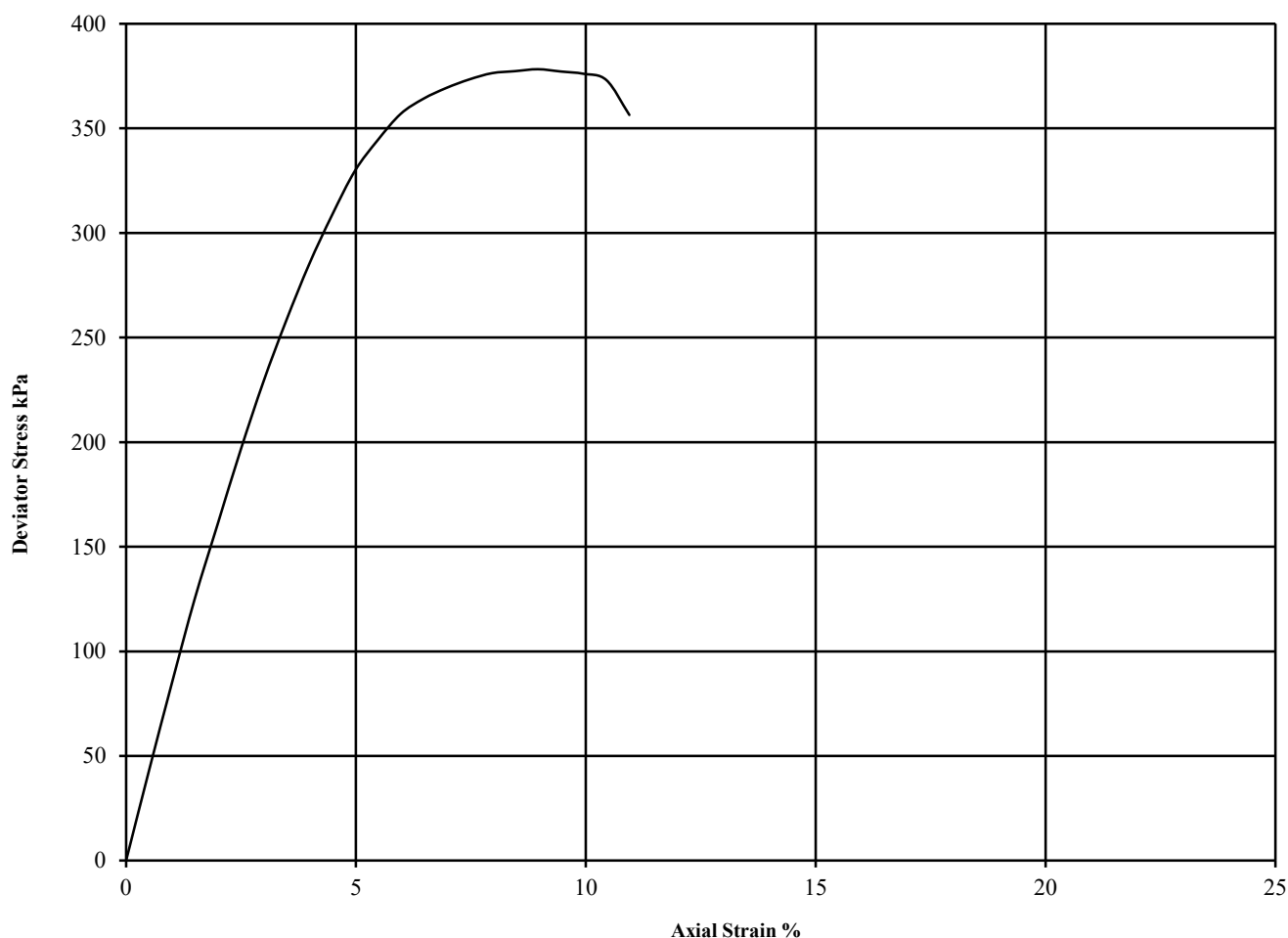
Hole Number: HBW-BH103

Top Depth (m): 21.50

Sample Number:

Base Depth (m): 21.95

Sample Type UT



Diameter (mm):		103	Height (mm):		207	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.35 See summary of soil descriptions
				θ_3	$(\theta_1 - \theta_3)_f$	$\frac{1}{2}(\theta_1 - \theta_3)_f$			
1	19	2.09	1.76	430	378	189	9.0	Brittle	



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DETS

Certificate of Analysis

Certificate Number 21-09439

Issued: 13-May-21

Client Professional Soils Laboratory Ltd
5/7 Hexthorpe Road
Hexthorpe
DN4 0AR

Our Reference 21-09439

Client Reference PSL21/3246

Order No (not supplied)

Contract Title High Bay Warehouse

Description 19 Soil samples.

Date Received 06-May-21

Date Started 06-May-21

Date Completed 13-May-21

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By



Adam Fenwick
Contracts Manager



Summary of Chemical Analysis Soil Samples

Our Ref 21-09439

Client Ref PSL21/3246

Contract Title High Bay Warehouse

Lab No	1842775	1842776	1842777	1842778	1842779	1842780	1842781	1842782	1842783	1842784
Sample ID	BH101	BH101	BH101	BH101	BH101	BH101	BH102	BH102	BH102	BH103
Depth	0.50	3.00-3.45	4.00-4.45	11.00-11.45	24.00-24.45	33.00-33.45	2.00-2.45	3.00-3.45	13.50-13.95	0.50
Other ID										
Sample Type	ES	UT	B	UT	UT	B	B	UT	B	B
Sampling Date	31/03/2021	31/03/2021	31/03/2021	31/03/2021	31/03/2021	31/03/2021	12/04/2021	12/04/2021	12/04/2021	24/03/2021
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units										
Metals													
Magnesium Aqueous Extract	DETSC 2076*	10	mg/l	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Inorganics													
pH	DETSC 2008#		pH	8.6	7.8	8.6	8.2	8.6	8.0	7.7	8.0	8.4	8.0
Chloride Aqueous Extract	DETSC 2055	1	mg/l	14	26	2.9	2.8	9.1	8.1	2.3	3.6	3.3	4.5
Nitrate Aqueous Extract as NO3	DETSC 2055	1	mg/l	19	< 1.0	1.1	< 1.0	3.9	< 1.0	< 1.0	< 1.0	< 1.0	2.1
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	31	57	19	100	43	21	20	12	29	13
Sulphur as S, Total	DETSC 2320	0.01	%	0.02	0.09	< 0.01	0.24	0.05	0.18	0.01	< 0.01	0.17	0.01
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.05	0.04	0.02	0.08	0.04	0.05	0.03	0.02	0.04	0.03

Summary of Chemical Analysis Soil Samples

Our Ref 21-09439

Client Ref PSL21/3246

Contract Title High Bay Warehouse

Lab No	1842785	1842786	1842787	1842788	1842789	1842790	1842791	1842792	1842793
Sample ID	BH103	BH103	BH103	BH103	BH103	WS101	WS102	WS102	WS105
Depth	3.00-3.45	5.00-5.45	9.50-9.95	20.00-20.45	29.00-29.45	0.55-1.20	0.80-1.20	4.00-5.00	0.50-1.20
Other ID									
Sample Type	B	B	UT	B	B	B	B	B	B
Sampling Date	24/03/2021	24/03/2021	24/03/2021	24/03/2021	24/03/2021	26/03/2021	26/03/2021	26/03/2021	25/03/2021
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units									
Metals												
Magnesium Aqueous Extract	DETSC 2076*	10	mg/l	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Inorganics												
pH	DETSC 2008#		pH	7.8	7.8	8.2	8.3	8.3	7.4	8.0	7.9	7.5
Chloride Aqueous Extract	DETSC 2055	1	mg/l	2.1	4.6	6.6	4.8	3.6	7.0	7.5	9.2	35
Nitrate Aqueous Extract as NO3	DETSC 2055	1	mg/l	3.5	< 1.0	< 1.0	< 1.0	< 1.0	4.2	< 1.0	< 1.0	1.4
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	< 10	17	94	35	26	32	29	94	42
Sulphur as S, Total	DETSC 2320	0.01	%	< 0.01	0.02	0.21	0.09	0.07	0.01	0.01	0.18	0.02
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.02	0.02	0.06	0.04	0.03	0.02	0.02	0.06	0.04

Information in Support of the Analytical Results

Our Ref 21-09439
 Client Ref PSL21/3246
 Contract High Bay Warehouse

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1842775	BH101 0.50 SOIL	31/03/21	PT 1L	Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), pH + Conductivity (7 days)	
1842776	BH101 3.00-3.45 SOIL	31/03/21	PT 500ml	Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), pH + Conductivity (7 days)	
1842777	BH101 4.00-4.45 SOIL	31/03/21	PT 500ml	Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), pH + Conductivity (7 days)	
1842778	BH101 11.00-11.45 SOIL	31/03/21	PT 500ml	Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), pH + Conductivity (7 days)	
1842779	BH101 24.00-24.45 SOIL	31/03/21	PT 500ml	Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), pH + Conductivity (7 days)	
1842780	BH101 33.00-33.45 SOIL	31/03/21	PT 500ml	Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), pH + Conductivity (7 days)	
1842781	BH102 2.00-2.45 SOIL	12/04/21	PT 500ml	Total Sulphur ICP (7 days), pH + Conductivity (7 days)	
1842782	BH102 3.00-3.45 SOIL	12/04/21	PT 500ml	Total Sulphur ICP (7 days), pH + Conductivity (7 days)	
1842783	BH102 13.50-13.95 SOIL	12/04/21	PT 500ml	Total Sulphur ICP (7 days), pH + Conductivity (7 days)	
1842784	BH103 0.50 SOIL	24/03/21	PT 500ml	Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), pH + Conductivity (7 days)	
1842785	BH103 3.00-3.45 SOIL	24/03/21	PT 500ml	Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), pH + Conductivity (7 days)	
1842786	BH103 5.00-5.45 SOIL	24/03/21	PT 500ml	Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), pH + Conductivity (7 days)	
1842787	BH103 9.50-9.95 SOIL	24/03/21	PT 500ml	Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), pH + Conductivity (7 days)	
1842788	BH103 20.00-20.45 SOIL	24/03/21	PT 500ml	Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), pH + Conductivity (7 days)	
1842789	BH103 29.00-29.45 SOIL	24/03/21	PT 500ml	Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), pH + Conductivity (7 days)	
1842790	WS101 0.55-1.20 SOIL	26/03/21	PT 500ml	Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), pH + Conductivity (7 days)	
1842791	WS102 0.80-1.20 SOIL	26/03/21	PT 500ml	Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), pH + Conductivity (7 days)	
1842792	WS102 4.00-5.00 SOIL	26/03/21	PT 500ml	Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), pH + Conductivity (7 days)	

Information in Support of the Analytical Results

Our Ref 21-09439
Client Ref PSL21/3246
Contract High Bay Warehouse

1842793	WS105 0.50-1.20 SOIL	25/03/21	PT 500ml	Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), pH + Conductivity (7 days)	
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Key: P-Plastic T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report



Professional Soils Laboratory

TEST AMENDMENT NOTICE

(Please tick boxes as appropriate)

From: Day Stringer

Date: S / S / 2021

To: Kronspan Limited

Laboratory Ref: PSLZ113246

Location: High Bay Warehouse

Contract Number:

☒ BH102 ☐ TP Sample Number

Depth (m): 3.00

Sample Type: ☐ U

☐ B

☐ D

☐ W

☐ P

☐ C

Test/s:

Q.U.T

The above sample cannot be tested for the following reasons:

☐ The Sample has not been received

☐ There is insufficient material for BS1377: 1990 testing

Maximum Grain Size (Minimum 10%):

Sample Mass (kg):

Required Mass (kg):

☐ Fine

☐ Medium

☐ Coarse

☐ The Sample has been previously tested.

☐ The Sample has been misplaced in the Laboratory.

☒ The Sample is unsuitable for testing because: Collapsed on extrusion due to brittle nature of specimen

Please advise action required:

☐ Perform original test on the following alternative Sample:

☐ BH

☐ TP

Sample Number:

Sample Type: ☐ U

☐ B

☐ D

☐ W

☐ P

☐ C

☐ Combine original Sample with the following sample:

☐ BH

☐ TP

Sample Number:

Sample Type: ☐ U

☐ B

☐ D

☐ W

☐ P

☐ C

☐ Perform the following alternative test/s on the original Sample

☐ Perform non-standard test on material available

☐ Take no further action.

Signed

.....

(Project Engineer)

Date

.....



Professional Soils Laboratory

TEST AMENDMENT NOTICE

(Please tick boxes as appropriate)

From: Jay Stanger

Date: 5 / 5 / 2021

Contract Number:

☒ BH 103 ☐ TP Sample Number

Sample Type: ☒ U ☐ B ☐ D ☐ W ☐ P ☐ C
Test/s:

To: Kronospan Limited

Laboratory Ref: PSL2113246

Location: High Bay Warehouse

Depth (m): 24.56

Q.U.T

The above sample cannot be tested for the following reasons:

- ☐ The Sample has not been received
- ☒ There is insufficient material for BS1377: 1990 testing
 - Maximum Grain Size (Minimum 10%):
 - Sample Mass (kg):
 - Required Mass (kg):

☐ Fine ☐ Medium ☐ Coarse
.....
.....

- ☐ The Sample has been previously tested.
- ☐ The Sample has been misplaced in the Laboratory.
- ☐ The Sample is unsuitable for testing because:

Please advise action required:

- ☐ Perform original test on the following alternative Sample:
 - ☐ BH ☐ TP Sample Number:
 - Sample Type: ☐ U ☐ B ☐ D ☐ W ☐ P ☐ C Depth (m):
- ☐ Combine original Sample with the following sample:
 - ☐ BH ☐ TP Sample Number:
 - Sample Type: ☐ U ☐ B ☐ D ☐ W ☐ P ☐ C Depth (m):
- ☐ Perform the following alternative test/s on the original Sample
- ☐ Perform non-standard test on material available
- ☐ Take no further action.

Signed Date
(Project Engineer)

APPENDIX 6

Laboratory Test Results - Contamination (Soil)



DETS

Certificate of Analysis

Certificate Number 21-06511

Issued: 29-Apr-21

Client Geotechnics LTD
203 Torrington Avenue
Tile Hill
Coventry
CV4 9AP

Our Reference 21-06511

Client Reference PN214198

Order No AUTH-ON29050

Contract Title Highbay Warehouse Kronospan

Description 3 Soil samples.

Date Received 26-Mar-21

Date Started 26-Mar-21

Date Completed 29-Apr-21

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By



Adam Fenwick
Contracts Manager



Summary of Chemical Analysis

Soil Samples

Our Ref 21-06511

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1823548	1823549	1823550
Sample ID	HBW-BH103	HBW-WS104	HBW-WS104
Depth	0.50	0.30	1.80-2.00
Other ID			
Sample Type	ES	ES	ES
Sampling Date	23/03/2021	23/03/2021	23/03/2021
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
Metals						
Antimony	DETSC 2301*	1	mg/kg	1.6	< 1.0	1.5
Arsenic	DETSC 2301#	0.2	mg/kg	14	17	14
Barium	DETSC 2301#	1.5	mg/kg	33	8.0	33
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	< 0.2	< 0.2	0.2
Cadmium	DETSC 2301#	0.1	mg/kg	0.2	0.2	0.1
Chromium III	DETSC 2301*	0.15	mg/kg	33	3.6	29
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	33	79	30
Lead	DETSC 2301#	0.3	mg/kg	20	6.8	23
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05	< 0.05
Nickel	DETSC 2301#	1	mg/kg	40	9.9	35
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg	28	7.4	33
Zinc	DETSC 2301#	1	mg/kg	94	39	100
Inorganics						
pH	DETSC 2008#		pH	7.8	9.5	7.7
Total Organic Carbon	DETSC 2084#	0.5	%	1.1	2.0	0.7
Formaldehyde	DETSC 2047*	0.2	mg/kg			< 0.2
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	25	35	11
Petroleum Hydrocarbons						
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10

Summary of Chemical Analysis

Soil Samples

Our Ref 21-06511

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1823548	1823549	1823550
Sample ID	HBW-BH103	HBW-WS104	HBW-WS104
Depth	0.50	0.30	1.80-2.00
Other ID			
Sample Type	ES	ES	ES
Sampling Date	23/03/2021	23/03/2021	23/03/2021
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
PAHs						
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
PAH Total	DETSC 3301	1.6	mg/kg	< 1.6	< 1.6	< 1.6

Summary of Chemical Analysis

Soil VOC/SVOC Samples

Our Ref 21-06511

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1823550
Sample ID	HBW-WS104
Depth	1.80-2.00
Other ID	
Sample Type	ES
Sampling Date	23/03/2021
Sampling Time	n/s

Test	Method	LOD	Units	
VOCs				
Vinyl Chloride	DETSC 3431	0.01	mg/kg	< 0.01
1,1 Dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01
Trans-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01
1,1-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01
Cis-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01
2,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01
Bromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01
Chloroform	DETSC 3431	0.01	mg/kg	< 0.01
1,1,1-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01
1,1-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01
Carbon tetrachloride	DETSC 3431	0.01	mg/kg	< 0.01
Benzene	DETSC 3431	0.01	mg/kg	< 0.01
1,2-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01
Trichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01
1,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01
Dibromomethane	DETSC 3431	0.01	mg/kg	< 0.01
Bromodichloromethane	DETSC 3431	0.01	mg/kg	< 0.01
cis-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01
Toluene	DETSC 3431	0.01	mg/kg	< 0.01
trans-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01
1,1,2-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01
Tetrachloroethylene	DETSC 3431	0.01	mg/kg	< 0.01
1,3-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01
Dibromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01
1,2-dibromoethane	DETSC 3431	0.01	mg/kg	< 0.01
Chlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01
1,1,1,2-tetrachloroethane	DETSC 3431	0.01	mg/kg	< 0.01
Ethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01
m+p-Xylene	DETSC 3431	0.01	mg/kg	< 0.01
o-Xylene	DETSC 3431	0.01	mg/kg	< 0.01
Styrene	DETSC 3431*	0.01	mg/kg	< 0.01
Bromoform	DETSC 3431	0.01	mg/kg	< 0.01
Isopropylbenzene	DETSC 3431	0.01	mg/kg	< 0.01
Bromobenzene	DETSC 3431	0.01	mg/kg	< 0.01
1,2,3-trichloropropane	DETSC 3431	0.01	mg/kg	< 0.01
n-propylbenzene	DETSC 3431	0.01	mg/kg	< 0.01
2-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01
1,3,5-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01
4-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01
Tert-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01

Summary of Chemical Analysis

Soil VOC/SVOC Samples

Our Ref 21-06511

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1823550
Sample ID	HBW-WS104
Depth	1.80-2.00
Other ID	
Sample Type	ES
Sampling Date	23/03/2021
Sampling Time	n/s

Test	Method	LOD	Units	
1,2,4-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01
sec-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01
p-isopropyltoluene	DETSC 3431	0.01	mg/kg	< 0.01
1,3-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01
1,4-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01
n-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01
1,2-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01
1,2-dibromo-3-chloropropane	DETSC 3431	0.01	mg/kg	< 0.01
1,2,4-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01
Hexachlorobutadiene	DETSC 3431	0.01	mg/kg	< 0.01
1,2,3-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01
MTBE	DETSC 3431*	0.01	mg/kg	< 0.01
SVOCs				
Phenol	DETSC 3433	0.1	mg/kg	< 0.1
Aniline	DETSC 3433*	0.1	mg/kg	< 0.1
2-Chlorophenol	DETSC 3433	0.1	mg/kg	< 0.1
Benzyl Alcohol	DETSC 3433	0.1	mg/kg	< 0.1
2-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1
Bis(2-chloroisopropyl)ether	DETSC 3433	0.1	mg/kg	< 0.1
3&4-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1
2,4-Dimethylphenol	DETSC 3433	0.1	mg/kg	< 0.1
Bis-(dichloroethoxy)methane	DETSC 3433	0.1	mg/kg	< 0.1
2,4-Dichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1
1,2,4-Trichlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1
4-Chloro-3-methylphenol	DETSC 3433	0.1	mg/kg	< 0.1
2-Methylnaphthalene	DETSC 3433	0.1	mg/kg	< 0.1
Hexachlorocyclopentadiene	DETSC 3433*	0.1	mg/kg	< 0.1
2,4,6-Trichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1
2,4,5-Trichlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1
2-Chloronaphthalene	DETSC 3433	0.1	mg/kg	< 0.1
2-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1
2,4-Dinitrotoluene	DETSC 3433*	0.1	mg/kg	< 0.1
3-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1
4-Nitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1
Dibenzofuran	DETSC 3433	0.1	mg/kg	< 0.1
2,6-Dinitrotoluene	DETSC 3433	0.1	mg/kg	< 0.1
2,3,4,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1
Diethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1
4-Chlorophenylphenylether	DETSC 3433*	0.1	mg/kg	< 0.1
4-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1

Summary of Chemical Analysis

Soil VOC/SVOC Samples

Our Ref 21-06511

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1823550
Sample ID	HBW-WS104
Depth	1.80-2.00
Other ID	
Sample Type	ES
Sampling Date	23/03/2021
Sampling Time	n/s

Test	Method	LOD	Units	
2-Methyl-4,6-Dinitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1
Diphenylamine	DETSC 3433	0.1	mg/kg	< 0.1
4-Bromophenylphenylether	DETSC 3433	0.1	mg/kg	< 0.1
Hexachlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1
Pentachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1
Di-n-butylphthalate	DETSC 3433	0.1	mg/kg	< 0.1
Butylbenzylphthalate	DETSC 3433*	0.1	mg/kg	< 0.1
Bis(2-ethylhexyl)phthalate	DETSC 3433	0.1	mg/kg	< 0.1
Di-n-octylphthalate	DETSC 3433*	0.1	mg/kg	< 0.1
1,4-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1
Dimethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1
1,3-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1
1,2-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1
2,3,5,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1
Azobenzene	DETSC 3433	0.1	mg/kg	< 0.1
Carbazole	DETSC 3433*	0.1	mg/kg	< 0.1
VOC TICs				
Blank (TIC)	DETSC 3431*		mg/kg	None

Summary of Asbestos Analysis

Soil Samples

Our Ref 21-06511

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1823548	HBW-BH103 0.50	SOIL	NAD	none	Darryl Fletcher
1823549	HBW-WS104 0.30	SOIL	NAD	none	Darryl Fletcher
1823550	HBW-WS104 1.80-2.00	SOIL	NAD	none	Darryl Fletcher

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 21-06511
 Client Ref PN214198
 Contract Highbay Warehouse Kronospan

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1823548	HBW-BH103 0.50 SOIL	23/03/21	GJ 60ml x2, PT 1L		
1823549	HBW-WS104 0.30 SOIL	23/03/21	GJ 250ml, GJ 60ml x2, PT 1L		
1823550	HBW-WS104 1.80-2.00 SOIL	23/03/21	GJ 250ml, GJ 60ml x2, PT 1L		

Key: G-Glass P-Plastic J-Jar T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report



DETS

Certificate of Analysis

Certificate Number 21-06584

Issued: 29-Apr-21

Client Geotechnics LTD
The Geotechnical Centre
Unit 1B Borders Ind. Park
River Lane
Saltney
Chester
CH4 8RJ

Our Reference 21-06584

Client Reference PN214198

Order No (not supplied)

Contract Title Highbay Warehouse Kronospan

Description One Soil sample.

Date Received 29-Mar-21

Date Started 29-Mar-21

Date Completed 29-Apr-21

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By



Adam Fenwick
Contracts Manager



Summary of Chemical Analysis

Soil Samples

Our Ref 21-06584

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1824190
Sample ID	HBW-BH103
Depth	2.00
Other ID	
Sample Type	ES
Sampling Date	23/03/2021
Sampling Time	n/s

Test	Method	LOD	Units	
Metals				
Antimony	DETSC 2301*	1	mg/kg	< 1.0
Arsenic	DETSC 2301#	0.2	mg/kg	12
Barium	DETSC 2301#	1.5	mg/kg	26
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	29
Cadmium	DETSC 2301#	0.1	mg/kg	< 0.1
Chromium III	DETSC 2301*	0.15	mg/kg	23
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	25
Lead	DETSC 2301#	0.3	mg/kg	26
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05
Nickel	DETSC 2301#	1	mg/kg	25
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg	21
Zinc	DETSC 2301#	1	mg/kg	71
Inorganics				
pH	DETSC 2008#		pH	8.2
Total Organic Carbon	DETSC 2002	0.1	%	< 0.1
Formaldehyde	DETSC 2047*	0.2	mg/kg	< 0.2
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	280
Petroleum Hydrocarbons				
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	mg/kg	< 10

Summary of Chemical Analysis

Soil Samples

Our Ref 21-06584

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1824190
Sample ID	HBW-BH103
Depth	2.00
Other ID	
Sample Type	ES
Sampling Date	23/03/2021
Sampling Time	n/s

Test	Method	LOD	Units	
PAHs				
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1
PAH Total	DETSC 3301	1.6	mg/kg	< 1.6

Summary of Asbestos Analysis Soil Samples

Our Ref 21-06584

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1824190	HBW-BH103 2.00	SOIL	NAD	none	Colin Patrick

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 21-06584
 Client Ref PN214198
 Contract Highbay Warehouse Kronospan

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1824190	HBW-BH103 2.00 SOIL	23/03/21	GJ 250ml, GJ 60ml x2, PT 1L		
Key: G-Glass P-Plastic J-Jar T-Tub DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.					

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377. Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis. The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.
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Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :- Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report



DETS

Certificate of Analysis

Certificate Number 21-06581

Issued: 29-Apr-21

Client Geotechnics LTD
The Geotechnical Centre
Unit 1B Borders Ind. Park
River Lane
Saltney
Chester
CH4 8RJ

Our Reference 21-06581

Client Reference PN214198

Order No ON29050

Contract Title Highbay Warehouse Kronospan

Description 5 Soil samples.

Date Received 29-Mar-21

Date Started 29-Mar-21

Date Completed 29-Apr-21

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By



Adam Fenwick
Contracts Manager



Summary of Chemical Analysis

Soil Samples

Our Ref 21-06581

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1824136	1824137	1824138
Sample ID	HBW-WS103	HBW-WS103	HBW-WS103
Depth	0.27-0.55	1.00	3.00
Other ID			
Sample Type	ES	ES	ES
Sampling Date	25/03/2021	25/03/2021	25/03/2021
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
Metals						
Antimony	DETSC 2301*	1	mg/kg	< 1.0	1.0	1.1
Arsenic	DETSC 2301#	0.2	mg/kg	19	10	16
Barium	DETSC 2301#	1.5	mg/kg	14	43	39
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	5.3	1.6	1.7
Cadmium	DETSC 2301#	0.1	mg/kg	0.2	< 0.1	0.2
Chromium III	DETSC 2301*	0.15	mg/kg	4.2	26	27
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	78	16	40
Lead	DETSC 2301#	0.3	mg/kg	8.9	17	20
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05	< 0.05
Nickel	DETSC 2301#	1	mg/kg	12	25	36
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg	7.1	31	25
Zinc	DETSC 2301#	1	mg/kg	34	83	91
Inorganics						
pH	DETSC 2008#		pH	9.2	7.8	8.0
Total Organic Carbon	DETSC 2002	0.1	%	0.1	0.8	0.1
Formaldehyde	DETSC 2047*	0.2	mg/kg		< 0.2	
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	45	16	10
Petroleum Hydrocarbons						
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10

Summary of Chemical Analysis

Soil Samples

Our Ref 21-06581

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1824136	1824137	1824138
Sample ID	HBW-WS103	HBW-WS103	HBW-WS103
Depth	0.27-0.55	1.00	3.00
Other ID			
Sample Type	ES	ES	ES
Sampling Date	25/03/2021	25/03/2021	25/03/2021
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
PAHs						
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
PAH Total	DETSC 3301	1.6	mg/kg	< 1.6	< 1.6	< 1.6

Summary of Chemical Analysis

Soil Samples

Our Ref 21-06581

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1824139	1824140
Sample ID	HBW-WS105	HBW-WS105
Depth	1.00	3.00
Other ID		
Sample Type	ES	ES
Sampling Date	25/03/2021	25/03/2021
Sampling Time	n/s	n/s

Test	Method	LOD	Units		
Metals					
Antimony	DETSC 2301*	1	mg/kg	< 1.0	< 1.0
Arsenic	DETSC 2301#	0.2	mg/kg	12	4.4
Barium	DETSC 2301#	1.5	mg/kg	34	22
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	0.6	0.2
Cadmium	DETSC 2301#	0.1	mg/kg	0.1	0.2
Chromium III	DETSC 2301*	0.15	mg/kg	31	30
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	28	41
Lead	DETSC 2301#	0.3	mg/kg	20	19
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05
Nickel	DETSC 2301#	1	mg/kg	36	46
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg	28	24
Zinc	DETSC 2301#	1	mg/kg	90	120
Inorganics					
pH	DETSC 2008#		pH	7.5	8.1
Total Organic Carbon	DETSC 2002	0.1	%	0.3	0.2
Formaldehyde	DETSC 2047*	0.2	mg/kg	< 0.2	1.3
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	13	21
Petroleum Hydrocarbons					
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10

Summary of Chemical Analysis

Soil Samples

Our Ref 21-06581

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1824139	1824140
Sample ID	HBW-WS105	HBW-WS105
Depth	1.00	3.00
Other ID		
Sample Type	ES	ES
Sampling Date	25/03/2021	25/03/2021
Sampling Time	n/s	n/s

Test	Method	LOD	Units		
PAHs					
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
PAH Total	DETSC 3301	1.6	mg/kg	< 1.6	< 1.6

Summary of Chemical Analysis

Soil VOC/SVOC Samples

Our Ref 21-06581

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1824137	1824139
Sample ID	HBW-WS103	HBW-WS105
Depth	1.00	1.00
Other ID		
Sample Type	ES	ES
Sampling Date	25/03/2021	25/03/2021
Sampling Time	n/s	n/s

Test	Method	LOD	Units		
VOCs					
Vinyl Chloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,1 Dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Trans-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,1-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Cis-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
2,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Bromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Chloroform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,1,1-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,1-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Carbon tetrachloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Benzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,2-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Trichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Dibromomethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Bromodichloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
cis-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Toluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
trans-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,1,2-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Tetrachloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,3-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Dibromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,2-dibromoethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Chlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,1,1,2-tetrachloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Ethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
m+p-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
o-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Styrene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01
Bromoform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Isopropylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Bromobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,2,3-trichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
n-propylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
2-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,3,5-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
4-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Tert-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01

Summary of Chemical Analysis

Soil VOC/SVOC Samples

Our Ref 21-06581

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1824137	1824139
Sample ID	HBW-WS103	HBW-WS105
Depth	1.00	1.00
Other ID		
Sample Type	ES	ES
Sampling Date	25/03/2021	25/03/2021
Sampling Time	n/s	n/s

Test	Method	LOD	Units		
1,2,4-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
sec-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
p-isopropyltoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,3-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,4-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
n-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,2-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,2-dibromo-3-chloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,2,4-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Hexachlorobutadiene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,2,3-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
MTBE	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01
SVOCs					
Phenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
Aniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
2-Chlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
Benzyl Alcohol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
2-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
Bis(2-chloroisopropyl)ether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
3&4-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
2,4-Dimethylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
Bis-(dichloroethoxy)methane	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
2,4-Dichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
1,2,4-Trichlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
4-Chloro-3-methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
2-Methylnaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
Hexachlorocyclopentadiene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
2,4,6-Trichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
2,4,5-Trichlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
2-Chloronaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
2-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
2,4-Dinitrotoluene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
3-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
4-Nitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
Dibenzofuran	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
2,6-Dinitrotoluene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
2,3,4,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
Diethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
4-Chlorophenylphenylether	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
4-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1

Summary of Chemical Analysis

Soil VOC/SVOC Samples

Our Ref 21-06581

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1824137	1824139
Sample ID	HBW-WS103	HBW-WS105
Depth	1.00	1.00
Other ID		
Sample Type	ES	ES
Sampling Date	25/03/2021	25/03/2021
Sampling Time	n/s	n/s

Test	Method	LOD	Units		
2-Methyl-4,6-Dinitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
Diphenylamine	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
4-Bromophenylphenylether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
Hexachlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
Pentachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
Di-n-butylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
Butylbenzylphthalate	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
Bis(2-ethylhexyl)phthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
Di-n-octylphthalate	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
1,4-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
Dimethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
1,3-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
1,2-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
2,3,5,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
Azobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
Carbazole	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
VOC TICs					
Blank (TIC)	DETSC 3431*		mg/kg	None	None

Summary of Asbestos Analysis

Soil Samples

Our Ref 21-06581

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1824136	HBW-WS103 0.27-0.55	SOIL	NAD	none	Emma Stacey
1824137	HBW-WS103 1.00	SOIL	NAD	none	Emma Stacey
1824139	HBW-WS105 1.00	SOIL	NAD	none	Emma Stacey

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 21-06581
 Client Ref PN214198
 Contract Highbay Warehouse Kronospan

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1824136	HBW-WS103 0.27-0.55 SOIL	25/03/21	GJ 250ml, GJ 60ml x2, PT 1L		
1824137	HBW-WS103 1.00 SOIL	25/03/21	GJ 250ml, GJ 60ml x2, PT 1L		
1824138	HBW-WS103 3.00 SOIL	25/03/21	GJ 250ml, GJ 60ml x2, PT 1L		
1824139	HBW-WS105 1.00 SOIL	25/03/21	GJ 250ml, GJ 60ml x2, PT 1L		
1824140	HBW-WS105 3.00 SOIL	25/03/21	GJ 250ml, GJ 60ml x2, PT 1L		

Key: G-Glass P-Plastic J-Jar T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report



DETS

Certificate of Analysis

Certificate Number 21-07767

Issued: 29-Apr-21

Client Geotechnics LTD
The Geotechnical Centre
Unit 1B Borders Ind. Park
River Lane
Saltney
Chester
CH4 8RJ

Our Reference 21-07767

Client Reference PN214198

Order No ON29050

Contract Title Highbay Warehouse Kronospan

Description 1 Soil sample, 2 Leachate samples.

Date Received 29-Mar-21

Date Started 14-Apr-21

Date Completed 29-Apr-21

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By



Adam Fenwick
Contracts Manager



WASTE ACCEPTANCE CRITERIA TESTING ANALYTICAL REPORT

Our Ref 21-07767

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Sample Id HBW-WS105 1.00

Sample Numbers 1831909 1831910 1831911

Date Analysed 20/04/2021

Test Results On Waste		
Determinand and Method Reference	Units	Result
DETS 2084* Total Organic Carbon	%	1.4
DETS 2003# Loss On Ignition	%	1.8
DETS 3321# BTEX	mg/kg	< 0.04
DETS 3401# PCBs (7 congeners)	mg/kg	< 0.01
DETS 3311# TPH (C10 - C40)	mg/kg	< 10
DETS 3301 PAHs	mg/kg	< 1.6
DETS 2008# pH	pH Units	7.6
DETS 2073* Acid Neutralisation Capacity (pH4)	mol/kg	< 1.0
DETS 2073* Acid Neutralisation Capacity (pH7)	mol/kg	< 1.0

WAC Limit Values		
Inert Waste	SNRHW	Hazardous Waste
3	5	6
n/a	n/a	10
6	n/a	n/a
1	n/a	n/a
500	n/a	n/a
100	n/a	n/a
n/a	>6	n/a
n/a	TBE	TBE
n/a	TBE	TBE

Test Results On Leachate				
Determinand and Method Reference	Conc in Eluate ug/l		Amount Leached* mg/kg	
	2:1	8:1	LS2	LS10
DETS 2306 Arsenic as As	1.5	0.56	0.003	< 0.01
DETS 2306 Barium as Ba	0.85	0.62	< 0.02	< 0.1
DETS 2306 Cadmium as Cd	< 0.030	< 0.030	< 0.004	< 0.02
DETS 2306 Chromium as Cr	1	0.27	< 0.02	< 0.1
DETS 2306 Copper as Cu	2.2	0.7	0.004	< 0.02
DETS 2306 Mercury as Hg	< 0.010	< 0.010	< 0.0004	< 0.002
DETS 2306 Molybdenum as Mo	< 1.1	< 1.1	< 0.02	< 0.1
DETS 2306 Nickel as Ni	< 0.50	< 0.50	< 0.02	< 0.1
DETS 2306 Lead as Pb	1.3	0.46	< 0.01	< 0.05
DETS 2306 Antimony as Sb	0.19	< 0.17	< 0.01	< 0.05
DETS 2306 Selenium as Se	0.51	< 0.25	< 0.006	< 0.03
DETS 2306 Zinc as Zn	2	< 1.3	0.004	< 0.01
DETS 2055 Chloride as Cl	1700	930	< 20	< 100
DETS 2055* Fluoride as F	230	< 100	0.46	0.19
DETS 2055 Sulphate as SO4	6600	1600	< 20	< 100
DETS 2009* Total Dissolved Solids	38000	16000	76	178.5
DETS 2130 Phenol Index	< 100	< 100	< 0.2	< 1
DETS 2085 Dissolved Organic Carbon	2500	< 2000	< 10	< 50

WAC Limit Values		
Limit values for LS10 Leachate		
Inert Waste	SNRHW	Hazardous Waste
0.5	2	25
20	100	300
0.04	1	5
0.5	10	70
2	50	100
0.01	0.2	2
0.5	10	30
0.4	10	40
0.5	10	50
0.06	0.7	5
0.1	0.5	7
4	50	200
800	15,000	25,000
10	150	500
1000	20,000	50,000
4000	60,000	100,000
1	n/a	n/a
500	800	1000

Additional Information

DETS 2008 pH	6.2	6.2
DETS 2009 Conductivity uS/cm	53.9	22.8
* Temperature*	17.0	17.0

Mass of Sample Kg*	0.130
Mass of dry Sample Kg*	0.119

Stage 1

Volume of Leachant L2*	0.226
Volume of Eluate VE1*	0.1

Stage 2

Volume of Leachant L8*	0.949
Volume of Eluate VE2*	0.91

TBE - To Be Evaluated
SNRHW - Stable Non-Reactive
Hazardous Waste

Disclaimer: The WAC limit values are provided for guidance only. DETS does not accept responsibility for errors or omissions. Values are correct at time of issue.

* DETS are accredited for the testing of leachates and not the leachate preparation stage which is unaccredited.

Information in Support of the Analytical Results

Our Ref 21-07767
 Client Ref PN214198
 Contract Highbay Warehouse Kronospan

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1831909	HBW-WS105 1.00 SOIL	25/03/21	PT 1L (1kg)		BTEX, PAH FID, PCB, EPH/TPH
1831910	HBW-WS105 1.00 LEACHATE	25/03/21	PT 1L (1kg)		
1831911	HBW-WS105 1.00 LEACHATE	25/03/21	PT 1L (1kg)		

Key: P-Plastic T-Tub

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Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report



DETS

Certificate of Analysis

Certificate Number 21-06692

Issued: 29-Apr-21

Client Geotechnics LTD
The Geotechnical Centre
Unit 1B Borders Ind. Park
River Lane
Saltney
Chester
CH4 8RJ

Our Reference 21-06692

Client Reference PN214198

Order No ON29050

Contract Title Highbay Warehouse Kronospan

Description 6 Soil samples.

Date Received 30-Mar-21

Date Started 30-Mar-21

Date Completed 29-Apr-21

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By



Adam Fenwick
Contracts Manager



Summary of Chemical Analysis

Matrix Descriptions

Our Ref 21-06692

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Sample ID	Depth	Lab No	Completed	Matrix Description
HBW-WS101	0.25	1824808	08/04/2021	Brown gravelly SAND
HBW-WS101	1	1824809	08/04/2021	Dark grey gravelly, very sandy CLAY
HBW-WS101	3	1824810	08/04/2021	Dark grey SAND
HBW-WS102	0.28	1824811	08/04/2021	Brown sandy GRAVEL (sample matrix outside MCERTS scope of accreditation)
HBW-WS102	1	1824812	08/04/2021	Grey gravelly SAND
HBW-WS102	2	1824813	08/04/2021	Brown gravelly SAND

Summary of Chemical Analysis

Soil Samples

Our Ref 21-06692

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1824808	1824809	1824810
Sample ID	HBW-WS101	HBW-WS101	HBW-WS101
Depth	0.25	1.00	3.00
Other ID			
Sample Type	ES	ES	ES
Sampling Date	26/03/2021	26/03/2021	26/03/2021
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
Metals						
Antimony	DETSC 2301*	1	mg/kg	< 1.0	1.5	1.5
Arsenic	DETSC 2301#	0.2	mg/kg	14	12	2.3
Barium	DETSC 2301#	1.5	mg/kg	28	41	26
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	0.3	< 0.2	< 0.2
Cadmium	DETSC 2301#	0.1	mg/kg	0.9	0.2	0.1
Chromium III	DETSC 2301*	0.15	mg/kg	4.4	27	29
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	79	26	33
Lead	DETSC 2301#	0.3	mg/kg	9.9	21	20
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05	< 0.05
Nickel	DETSC 2301#	1	mg/kg	7.2	31	37
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg	7.5	26	23
Zinc	DETSC 2301#	1	mg/kg	59	81	110
Inorganics						
pH	DETSC 2008#		pH	10.2	7.5	8.5
Total Organic Carbon	DETSC 2002	0.1	%	0.1	0.1	< 0.1
Formaldehyde	DETSC 2047*	0.2	mg/kg		< 0.2	0.4
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	270	16	17
Petroleum Hydrocarbons						
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10

Summary of Chemical Analysis

Soil Samples

Our Ref 21-06692

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1824808	1824809	1824810
Sample ID	HBW-WS101	HBW-WS101	HBW-WS101
Depth	0.25	1.00	3.00
Other ID			
Sample Type	ES	ES	ES
Sampling Date	26/03/2021	26/03/2021	26/03/2021
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
PAHs						
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
PAH Total	DETSC 3301	1.6	mg/kg	< 1.6	< 1.6	< 1.6

Summary of Chemical Analysis

Soil Samples

Our Ref 21-06692

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1824811	1824812	1824813
Sample ID	HBW-WS102	HBW-WS102	HBW-WS102
Depth	0.28	1.00	2.00
Other ID			
Sample Type	ES	ES	ES
Sampling Date	26/03/2021	26/03/2021	26/03/2021
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
Metals						
Antimony	DETSC 2301*	1	mg/kg	< 1.0	< 1.0	1.6
Arsenic	DETSC 2301#	0.2	mg/kg	6.0	11	17
Barium	DETSC 2301#	1.5	mg/kg	7.4	98	28
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	< 0.2	< 0.2	< 0.2
Cadmium	DETSC 2301#	0.1	mg/kg	< 0.1	0.2	0.2
Chromium III	DETSC 2301*	0.15	mg/kg	3.1	20	28
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	50	30	35
Lead	DETSC 2301#	0.3	mg/kg	2.9	15	18
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05	< 0.05
Nickel	DETSC 2301#	1	mg/kg	6.7	27	37
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg	6.7	18	25
Zinc	DETSC 2301#	1	mg/kg	54	72	87
Inorganics						
pH	DETSC 2008#		pH	9.1	8.0	7.7
Total Organic Carbon	DETSC 2002	0.1	%	< 0.1	0.3	1.1
Formaldehyde	DETSC 2047*	0.2	mg/kg		< 0.2	< 0.2
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	15	24	24
Petroleum Hydrocarbons						
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	5.1	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	12	6.9
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	44	45
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	1300	1700
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	1300	1800
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	5.8	7.2
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	34	31
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	850	1100
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	890	1100
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	mg/kg	< 10	2200	2900

Summary of Chemical Analysis

Soil Samples

Our Ref 21-06692

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1824811	1824812	1824813
Sample ID	HBW-WS102	HBW-WS102	HBW-WS102
Depth	0.28	1.00	2.00
Other ID			
Sample Type	ES	ES	ES
Sampling Date	26/03/2021	26/03/2021	26/03/2021
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
PAHs						
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1
PAH Total	DETSC 3301	1.6	mg/kg	< 1.6	< 1.6	< 1.6

Summary of Chemical Analysis

Soil VOC/SVOC Samples

Our Ref 21-06692

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1824809	1824812	1824813
Sample ID	HBW-WS101	HBW-WS102	HBW-WS102
Depth	1.00	1.00	2.00
Other ID			
Sample Type	ES	ES	ES
Sampling Date	26/03/2021	26/03/2021	26/03/2021
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
VOCs						
Vinyl Chloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1 Dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Trans-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Cis-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
2,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Bromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Chloroform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1,1-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Carbon tetrachloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Benzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Trichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Dibromomethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Bromodichloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
cis-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Toluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
trans-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1,2-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Tetrachloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,3-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Dibromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dibromoethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Chlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1,1,2-tetrachloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Ethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
m+p-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
o-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Styrene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Bromoform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Isopropylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Bromobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2,3-trichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
n-propylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
2-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,3,5-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
4-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Tert-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01

Summary of Chemical Analysis

Soil VOC/SVOC Samples

Our Ref 21-06692

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1824809	1824812	1824813
Sample ID	HBW-WS101	HBW-WS102	HBW-WS102
Depth	1.00	1.00	2.00
Other ID			
Sample Type	ES	ES	ES
Sampling Date	26/03/2021	26/03/2021	26/03/2021
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
1,2,4-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
sec-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
p-isopropyltoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,3-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,4-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
n-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dibromo-3-chloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2,4-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Hexachlorobutadiene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2,3-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
MTBE	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
SVOCs						
Phenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Aniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2-Chlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzyl Alcohol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Bis(2-chloroisopropyl)ether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
3&4-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,4-Dimethylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Bis-(dichloroethoxy)methane	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,4-Dichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
1,2,4-Trichlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
4-Chloro-3-methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2-Methylnaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Hexachlorocyclopentadiene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,4,6-Trichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,4,5-Trichlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2-Chloronaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,4-Dinitrotoluene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
3-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
4-Nitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Dibenzofuran	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,6-Dinitrotoluene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,3,4,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Diethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
4-Chlorophenylphenylether	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
4-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1

Summary of Chemical Analysis

Soil VOC/SVOC Samples

Our Ref 21-06692

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1824809	1824812	1824813
Sample ID	HBW-WS101	HBW-WS102	HBW-WS102
Depth	1.00	1.00	2.00
Other ID			
Sample Type	ES	ES	ES
Sampling Date	26/03/2021	26/03/2021	26/03/2021
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
2-Methyl-4,6-Dinitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Diphenylamine	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
4-Bromophenylphenylether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Hexachlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Pentachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Di-n-butylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Butylbenzylphthalate	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Bis(2-ethylhexyl)phthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Di-n-octylphthalate	DETSC 3433*	0.1	mg/kg	< 0.1	0.1	< 0.1
1,4-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Dimethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
1,3-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
1,2-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,3,5,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Azobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Carbazole	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
SVOC TICs						
Blank (TIC)	DETSC 3433*		mg/kg	None	None	None

Summary of Asbestos Analysis

Soil Samples

Our Ref 21-06692

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1824808	HBW-WS101 0.25	SOIL	NAD	none	Colin Patrick
1824809	HBW-WS101 1.00	SOIL	NAD	none	Colin Patrick
1824811	HBW-WS102 0.28	SOIL	NAD	none	Colin Patrick
1824812	HBW-WS102 1.00	SOIL	NAD	none	Colin Patrick

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 21-06692
 Client Ref PN214198
 Contract Highbay Warehouse Kronospan

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1824808	HBW-WS101 0.25 SOIL	26/03/21	GJ 250ml, GJ 60ml x2, PT 1L		
1824809	HBW-WS101 1.00 SOIL	26/03/21	GJ 250ml, GJ 60ml x2, PT 1L		
1824810	HBW-WS101 3.00 SOIL	26/03/21	GJ 250ml, GJ 60ml x2, PT 1L		
1824811	HBW-WS102 0.28 SOIL	26/03/21	GJ 250ml, GJ 60ml x2, PT 1L		
1824812	HBW-WS102 1.00 SOIL	26/03/21	GJ 250ml, GJ 60ml x2, PT 1L		
1824813	HBW-WS102 2.00 SOIL	26/03/21	GJ 250ml, GJ 60ml x2, PT 1L		

Key: G-Glass P-Plastic J-Jar T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETS 2002	Organic matter	%	0.1	Air Dried	No	Yes	Yes
DETS 2003	Loss on ignition	%	0.01	Air Dried	No	Yes	Yes
DETS 2008	pH	pH Units	1	Air Dried	No	Yes	Yes
DETS 2024	Sulphide	mg/kg	10	Air Dried	No	Yes	Yes
DETS 2076	Sulphate Aqueous Extract as SO ₄	mg/l	10	Air Dried	No	Yes	Yes
DETS 2084	Total Carbon	%	0.5	Air Dried	No	Yes	Yes
DETS 2084	Total Organic Carbon	%	0.5	Air Dried	No	Yes	Yes
DETS 2119	Ammoniacal Nitrogen as N	mg/kg	0.5	Air Dried	No	Yes	Yes
DETS 2130	Cyanide free	mg/kg	0.1	Air Dried	No	Yes	Yes
DETS 2130	Cyanide total	mg/kg	0.1	Air Dried	No	Yes	Yes
DETS 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETS 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes
DETS 2321	Total Sulphate as SO ₄	%	0.01	Air Dried	No	Yes	Yes
DETS 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETS 3049	Sulphur (free)	mg/kg	0.75	Air Dried	No	Yes	Yes
DETS 2123	Boron (water soluble)	mg/kg	0.2	Air Dried	No	Yes	Yes
DETS 2301	Arsenic	mg/kg	0.2	Air Dried	No	Yes	Yes
DETS 2301	Barium	mg/kg	1.5	Air Dried	No	Yes	Yes
DETS 2301	Beryllium	mg/kg	0.2	Air Dried	No	Yes	Yes
DETS 2301	Cadmium Available	mg/kg	0.1	Air Dried	No	Yes	Yes
DETS 2301	Cadmium	mg/kg	0.1	Air Dried	No	Yes	Yes
DETS 2301	Cobalt	mg/kg	0.7	Air Dried	No	Yes	Yes
DETS 2301	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETS 2301	Copper	mg/kg	0.2	Air Dried	No	Yes	Yes
DETS 2301	Manganese	mg/kg	20	Air Dried	No	Yes	Yes
DETS 2301	Molybdenum	mg/kg	0.4	Air Dried	No	Yes	Yes
DETS 2301	Nickel	mg/kg	1	Air Dried	No	Yes	Yes
DETS 2301	Lead	mg/kg	0.3	Air Dried	No	Yes	Yes
DETS 2301	Selenium	mg/kg	0.5	Air Dried	No	Yes	Yes
DETS 2301	Zinc	mg/kg	1	Air Dried	No	Yes	Yes
DETS 3072	Ali/Aro C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETS 3072	Aliphatic C10-C12	mg/kg	1.5	As Received	No	Yes	Yes
DETS 3072	Aliphatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETS 3072	Aliphatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETS 3072	Aliphatic C12-C16	mg/kg	1.2	As Received	No	Yes	Yes
DETS 3072	Aliphatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETS 3072	Aliphatic C16-C21	mg/kg	1.5	As Received	No	Yes	Yes
DETS 3072	Aliphatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETS 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETS 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETS 3072	Aromatic C10-C12	mg/kg	0.9	As Received	No	Yes	Yes
DETS 3072	Aromatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETS 3072	Aromatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETS 3072	Aromatic C12-C16	mg/kg	0.5	As Received	No	Yes	Yes
DETS 3072	Aromatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETS 3072	Aromatic C16-C21	mg/kg	0.6	As Received	No	Yes	Yes
DETS 3072	Aromatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETS 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETS 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETS 062	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Ethylbenzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	m+p Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	o Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 3311	C10-C24 Diesel Range Organics (DRO)	mg/kg	10	As Received	No	Yes	Yes
DETS 3311	C24-C40 Lube Oil Range Organics (LORO)	mg/kg	10	As Received	No	Yes	Yes
DETS 3311	EPH (C10-C40)	mg/kg	10	As Received	No	Yes	Yes

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETS 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETS 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETS 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETS 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETS 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETS 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETS 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETS 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETS 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETS 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETS 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETS 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETS 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETS 3401	PCB 28 + PCB 31	mg/kg	0.01	As Received	No	Yes	Yes
DETS 3401	PCB 52	mg/kg	0.01	As Received	No	Yes	Yes
DETS 3401	PCB 101	mg/kg	0.01	As Received	No	Yes	Yes
DETS 3401	PCB 118	mg/kg	0.01	As Received	No	Yes	Yes
DETS 3401	PCB 153	mg/kg	0.01	As Received	No	Yes	Yes
DETS 3401	PCB 138	mg/kg	0.01	As Received	No	Yes	Yes
DETS 3401	PCB 180	mg/kg	0.01	As Received	No	Yes	Yes
DETS 3401	PCB Total	mg/kg	0.01	As Received	No	Yes	Yes

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS. No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

End of Report



DETS

Certificate of Analysis

Certificate Number 21-07768

Issued: 29-Apr-21

Client Geotechnics LTD
The Geotechnical Centre
Unit 1B Borders Ind. Park
River Lane
Saltney
Chester
CH4 8RJ

Our Reference 21-07768

Client Reference PN214198

Order No ON29050

Contract Title Highbay Warehouse Kronospan

Description 1 Soil sample, 2 Leachate samples.

Date Received 30-Mar-21

Date Started 14-Apr-21

Date Completed 29-Apr-21

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By



Adam Fenwick
Contracts Manager



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WASTE ACCEPTANCE CRITERIA TESTING ANALYTICAL REPORT

Our Ref 21-07768

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Sample Id HBW-WS102 1.00

Sample Numbers 1831912 1831913 1831914

Date Analysed 21/04/2021

Test Results On Waste		
Determinand and Method Reference	Units	Result
DETS 2084# Total Organic Carbon	%	0.7
DETS 2003# Loss On Ignition	%	1.6
DETS 3321# BTEX	mg/kg	< 0.04
DETS 3401# PCBs (7 congeners)	mg/kg	< 0.01
DETS 3311# TPH (C10 - C40)	mg/kg	3800.0
DETS 3301 PAHs	mg/kg	< 1.6
DETS 2008# pH	pH Units	8.0
DETS 2073* Acid Neutralisation Capacity (pH4)	mol/kg	< 1.0
DETS 2073* Acid Neutralisation Capacity (pH7)	mol/kg	< 1.0

WAC Limit Values		
Inert Waste	SNRHW	Hazardous Waste
3	5	6
n/a	n/a	10
6	n/a	n/a
1	n/a	n/a
500	n/a	n/a
100	n/a	n/a
n/a	>6	n/a
n/a	TBE	TBE
n/a	TBE	TBE

Test Results On Leachate				
Determinand and Method Reference	Conc in Eluate ug/l		Amount Leached* mg/kg	
	2:1	8:1	LS2	LS10
DETS 2306 Arsenic as As	2.2	0.75	0.004	< 0.01
DETS 2306 Barium as Ba	2.5	0.75	< 0.02	< 0.1
DETS 2306 Cadmium as Cd	0.2	< 0.030	< 0.004	< 0.02
DETS 2306 Chromium as Cr	2.2	0.27	< 0.02	< 0.1
DETS 2306 Copper as Cu	3.1	0.85	0.006	< 0.02
DETS 2306 Mercury as Hg	< 0.010	< 0.010	< 0.0004	< 0.002
DETS 2306 Molybdenum as Mo	< 1.1	< 1.1	< 0.02	< 0.1
DETS 2306 Nickel as Ni	0.51	< 0.50	< 0.02	< 0.1
DETS 2306 Lead as Pb	4.1	0.6	< 0.01	< 0.05
DETS 2306 Antimony as Sb	1.8	0.33	< 0.01	< 0.05
DETS 2306 Selenium as Se	0.47	< 0.25	< 0.006	< 0.03
DETS 2306 Zinc as Zn	1.9	< 1.3	0.004	< 0.01
DETS 2055 Chloride as Cl	1900	1100	< 20	< 100
DETS 2055* Fluoride as F	< 100	< 100	< 0.02	< 0.1
DETS 2055 Sulphate as SO4	8200	1300	< 20	< 100
DETS 2009* Total Dissolved Solids	55000	16000	110	191.9
DETS 2130 Phenol Index	< 100	< 100	< 0.2	< 1
DETS 2085 Dissolved Organic Carbon	12000	< 2000	24	< 50

WAC Limit Values		
Limit values for LS10 Leachate		
Inert Waste	SNRHW	Hazardous Waste
0.5	2	25
20	100	300
0.04	1	5
0.5	10	70
2	50	100
0.01	0.2	2
0.5	10	30
0.4	10	40
0.5	10	50
0.06	0.7	5
0.1	0.5	7
4	50	200
800	15,000	25,000
10	150	500
1000	20,000	50,000
4000	60,000	100,000
1	n/a	n/a
500	800	1000

Additional Information

DETS 2008 pH	6.3	6.4
DETS 2009 Conductivity uS/cm	79.0	23.0
* Temperature*	18.0	18.0

Mass of Sample Kg*	0.130
Mass of dry Sample Kg*	0.122

Stage 1

Volume of Leachant L2*	0.237
Volume of Eluate VE1*	0.1

Stage 2

Volume of Leachant L8*	0.979
Volume of Eluate VE2*	0.96

TBE - To Be Evaluated
SNRHW - Stable Non-Reactive
Hazardous Waste

Disclaimer: The WAC limit values are provided for guidance only. DETS does not accept responsibility for errors or omissions. Values are correct at time of issue.

Information in Support of the Analytical Results

Our Ref 21-07768
 Client Ref PN214198
 Contract Highbay Warehouse Kronospan

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1831912	HBW-WS102 1.00 SOIL	26/03/21	PT 1L (1kg)		BTEX, PAH FID, PCB, EPH/TPH
1831913	HBW-WS102 1.00 LEACHATE	26/03/21	PT 1L (1kg)		
1831914	HBW-WS102 1.00 LEACHATE	26/03/21	PT 1L (1kg)		

Key: P-Plastic T-Tub

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Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report



DETS

Certificate of Analysis

Certificate Number 21-07055

Issued: 29-Apr-21

Client Geotechnics LTD
The Geotechnical Centre
Unit 1B Borders Ind. Park
River Lane
Saltney
Chester
CH4 8RJ

Our Reference 21-07055

Client Reference PN214198

Order No ON29050

Contract Title Highbay Warehouse Kronospan

Description 2 Soil samples.

Date Received 06-Apr-21

Date Started 06-Apr-21

Date Completed 29-Apr-21

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By



Adam Fenwick
Contracts Manager





Summary of Chemical Analysis

Matrix Descriptions

Our Ref 21-07055

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Sample ID	Depth	Lab No	Completed	Matrix Description
HBW-BH101	1	1827075	13/04/2021	Brown sandy, gravelly CLAY
HBW-BH101	3	1827076	13/04/2021	Brown gravelly CLAY

Summary of Chemical Analysis

Soil Samples

Our Ref 21-07055

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1827075	1827076
Sample ID	HBW-BH101	HBW-BH101
Depth	1.00	3.00
Other ID		
Sample Type	ES	ES
Sampling Date	31/03/2021	31/03/2021
Sampling Time	n/s	n/s

Test	Method	LOD	Units		
Metals					
Antimony	DETSC 2301*	1	mg/kg	1.2	1.3
Arsenic	DETSC 2301#	0.2	mg/kg	13	7.0
Barium	DETSC 2301#	1.5	mg/kg	40	81
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	< 0.2	< 0.2
Cadmium	DETSC 2301#	0.1	mg/kg	< 0.1	0.2
Chromium III	DETSC 2301*	0.15	mg/kg	25	28
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	20	34
Lead	DETSC 2301#	0.3	mg/kg	24	34
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05
Nickel	DETSC 2301#	1	mg/kg	27	40
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg	26	29
Zinc	DETSC 2301#	1	mg/kg	85	110
Inorganics					
pH	DETSC 2008#		pH	7.5	8.6
Total Organic Carbon	DETSC 2002	0.1	%	0.4	1.0
Formaldehyde	DETSC 2047*	0.2	mg/kg	< 0.2	
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	42	78
Petroleum Hydrocarbons					
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10

Summary of Chemical Analysis

Soil Samples

Our Ref 21-07055

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1827075	1827076
Sample ID	HBW-BH101	HBW-BH101
Depth	1.00	3.00
Other ID		
Sample Type	ES	ES
Sampling Date	31/03/2021	31/03/2021
Sampling Time	n/s	n/s

Test	Method	LOD	Units		
PAHs					
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1
PAH Total	DETSC 3301	1.6	mg/kg	< 1.6	< 1.6

Summary of Asbestos Analysis Soil Samples

Our Ref 21-07055

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1827075	HBW-BH101 1.00	SOIL	NAD	none	Darryl Fletcher

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 21-07055
 Client Ref PN214198
 Contract Highbay Warehouse Kronospan

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1827075	HBW-BH101 1.00 SOIL	31/03/21	GJ 250ml, GJ 60ml x2, PT 1L		
1827076	HBW-BH101 3.00 SOIL	31/03/21	GJ 250ml, GJ 60ml x2, PT 1L		

Key: G-Glass P-Plastic J-Jar T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 2002	Organic matter	%	0.1	Air Dried	No	Yes	Yes
DETSC 2003	Loss on ignition	%	0.01	Air Dried	No	Yes	Yes
DETSC 2008	pH	pH Units	1	Air Dried	No	Yes	Yes
DETSC 2024	Sulphide	mg/kg	10	Air Dried	No	Yes	Yes
DETSC 2076	Sulphate Aqueous Extract as SO ₄	mg/l	10	Air Dried	No	Yes	Yes
DETSC 2084	Total Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2084	Total Organic Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2119	Ammoniacal Nitrogen as N	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide free	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide total	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes
DETSC 2321	Total Sulphate as SO ₄	%	0.01	Air Dried	No	Yes	Yes
DETSC 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETSC 3049	Sulphur (free)	mg/kg	0.75	Air Dried	No	Yes	Yes
DETSC2123	Boron (water soluble)	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Arsenic	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Barium	mg/kg	1.5	Air Dried	No	Yes	Yes
DETSC2301	Beryllium	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Cadmium Available	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cadmium	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cobalt	mg/kg	0.7	Air Dried	No	Yes	Yes
DETSC2301	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETSC2301	Copper	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Manganese	mg/kg	20	Air Dried	No	Yes	Yes
DETSC2301	Molybdenum	mg/kg	0.4	Air Dried	No	Yes	Yes
DETSC2301	Nickel	mg/kg	1	Air Dried	No	Yes	Yes
DETSC2301	Lead	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC2301	Selenium	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC2301	Zinc	mg/kg	1	Air Dried	No	Yes	Yes
DETSC 3072	Ali/Aro C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	1.2	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	0.9	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	0.5	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	0.6	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETS 062	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Ethylbenzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	m+p Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	o Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3311	C10-C24 Diesel Range Organics (DRO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	C24-C40 Lube Oil Range Organics (LORO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	EPH (C10-C40)	mg/kg	10	As Received	No	Yes	Yes

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETS 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETS 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETS 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETS 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETS 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETS 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETS 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETS 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETS 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETS 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETS 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETS 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETS 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETS 3401	PCB 28 + PCB 31	mg/kg	0.01	As Received	No	Yes	Yes
DETS 3401	PCB 52	mg/kg	0.01	As Received	No	Yes	Yes
DETS 3401	PCB 101	mg/kg	0.01	As Received	No	Yes	Yes
DETS 3401	PCB 118	mg/kg	0.01	As Received	No	Yes	Yes
DETS 3401	PCB 153	mg/kg	0.01	As Received	No	Yes	Yes
DETS 3401	PCB 138	mg/kg	0.01	As Received	No	Yes	Yes
DETS 3401	PCB 180	mg/kg	0.01	As Received	No	Yes	Yes
DETS 3401	PCB Total	mg/kg	0.01	As Received	No	Yes	Yes

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS. No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

End of Report



Certificate of Analysis

Certificate Number 21-07626

Issued: 20-Apr-21

Client Geotechnics LTD
The Geotechnical Centre
Unit 1B Borders Ind. Park
River Lane
Saltney
Chester
CH4 8RJ

Our Reference 21-07626

Client Reference PN214198

Order No ON29050

Contract Title Highbay Warehouse Kronospan

Description One Soil sample.

Date Received 13-Apr-21

Date Started 13-Apr-21

Date Completed 20-Apr-21

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Adam Fenwick
Contracts Manager





Summary of Chemical Analysis

Matrix Descriptions

Our Ref 21-07626

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Sample ID	Depth	Lab No	Completed	Matrix Description
BH102	1	1830921	20/04/2021	Brown sandy GRAVEL (sample matrix outside MCERTS scope of accreditation)

Summary of Chemical Analysis

Soil Samples

Our Ref 21-07626

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1830921
Sample ID	BH102
Depth	1.00
Other ID	
Sample Type	ES
Sampling Date	09/04/2021
Sampling Time	n/s

Test	Method	LOD	Units	
Metals				
Antimony	DETSC 2301*	1	mg/kg	1.4
Arsenic	DETSC 2301#	0.2	mg/kg	12
Barium	DETSC 2301#	1.5	mg/kg	32
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	< 0.2
Cadmium	DETSC 2301#	0.1	mg/kg	0.1
Chromium III	DETSC 2301*	0.15	mg/kg	25
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	33
Lead	DETSC 2301#	0.3	mg/kg	18
Mercury	DETSC 2325#	0.05	mg/kg	0.17
Nickel	DETSC 2301#	1	mg/kg	33
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg	26
Zinc	DETSC 2301#	1	mg/kg	75
Inorganics				
pH	DETSC 2008#		pH	8.3
Total Organic Carbon	DETSC 2084#	0.5	%	< 0.5
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	15
Petroleum Hydrocarbons				
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	mg/kg	< 10

Summary of Chemical Analysis

Soil Samples

Our Ref 21-07626

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1830921
Sample ID	BH102
Depth	1.00
Other ID	
Sample Type	ES
Sampling Date	09/04/2021
Sampling Time	n/s

Test	Method	LOD	Units	
PAHs				
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1
PAH Total	DETSC 3301	1.6	mg/kg	< 1.6

Summary of Asbestos Analysis Soil Samples

Our Ref 21-07626

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1830921	BH102 1.00	SOIL	NAD	none	Emma Stacey

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 21-07626
 Client Ref PN214198
 Contract Highbay Warehouse Kronospan

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1830921	BH102 1.00 SOIL	09/04/21	GJ 250ml, GJ 60ml x2, PT 1L		
Key: G-Glass P-Plastic J-Jar T-Tub DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.					

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377. Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis. The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :- Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months
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Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 2002	Organic matter	%	0.1	Air Dried	No	Yes	Yes
DETSC 2003	Loss on ignition	%	0.01	Air Dried	No	Yes	Yes
DETSC 2008	pH	pH Units	1	Air Dried	No	Yes	Yes
DETSC 2024	Sulphide	mg/kg	10	Air Dried	No	Yes	Yes
DETSC 2076	Sulphate Aqueous Extract as SO ₄	mg/l	10	Air Dried	No	Yes	Yes
DETSC 2084	Total Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2084	Total Organic Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2119	Ammoniacal Nitrogen as N	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide free	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide total	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes
DETSC 2321	Total Sulphate as SO ₄	%	0.01	Air Dried	No	Yes	Yes
DETSC 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETSC 3049	Sulphur (free)	mg/kg	0.75	Air Dried	No	Yes	Yes
DETSC2123	Boron (water soluble)	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Arsenic	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Barium	mg/kg	1.5	Air Dried	No	Yes	Yes
DETSC2301	Beryllium	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Cadmium Available	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cadmium	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cobalt	mg/kg	0.7	Air Dried	No	Yes	Yes
DETSC2301	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETSC2301	Copper	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Manganese	mg/kg	20	Air Dried	No	Yes	Yes
DETSC2301	Molybdenum	mg/kg	0.4	Air Dried	No	Yes	Yes
DETSC2301	Nickel	mg/kg	1	Air Dried	No	Yes	Yes
DETSC2301	Lead	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC2301	Selenium	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC2301	Zinc	mg/kg	1	Air Dried	No	Yes	Yes
DETSC 3072	Ali/Aro C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	1.2	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	0.9	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	0.5	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	0.6	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETS 062	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Ethylbenzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	m+p Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	o Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3311	C10-C24 Diesel Range Organics (DRO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	C24-C40 Lube Oil Range Organics (LORO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	EPH (C10-C40)	mg/kg	10	As Received	No	Yes	Yes

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3401	PCB 28 + PCB 31	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 52	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 101	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 118	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 153	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 138	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 180	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB Total	mg/kg	0.01	As Received	No	Yes	Yes

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS. No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

End of Report



DETS

Certificate of Analysis

Certificate Number 21-07754

Issued: 29-Apr-21

Client Geotechnics LTD
The Geotechnical Centre
Unit 1B Borders Ind. Park
River Lane
Saltney
Chester
CH4 8RJ

Our Reference 21-07754

Client Reference PN214198

Order No ON29050

Contract Title Highbay Warehouse Kronospan

Description 1 Soil sample, 2 Leachate samples.

Date Received 14-Apr-21

Date Started 14-Apr-21

Date Completed 29-Apr-21

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By



Adam Fenwick
Contracts Manager





Summary of Chemical Analysis

Matrix Descriptions

Our Ref 21-07754

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Sample ID	Depth	Lab No	Completed	Matrix Description
HBW-BH102	2	1831831	21/04/2021	Brown gravelly, sandy CLAY

Summary of Chemical Analysis

Soil Samples

Our Ref 21-07754

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1831831
Sample ID	HBW-BH102
Depth	2.00
Other ID	
Sample Type	ES
Sampling Date	12/04/2021
Sampling Time	n/s

Test	Method	LOD	Units	
Metals				
Antimony	DETSC 2301*	1	mg/kg	< 1.0
Arsenic	DETSC 2301#	0.2	mg/kg	14
Barium	DETSC 2301#	1.5	mg/kg	26
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	< 0.2
Cadmium	DETSC 2301#	0.1	mg/kg	0.1
Chromium III	DETSC 2301*	0.15	mg/kg	26
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	31
Lead	DETSC 2301#	0.3	mg/kg	17
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05
Nickel	DETSC 2301#	1	mg/kg	32
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg	22
Zinc	DETSC 2301#	1	mg/kg	83
Inorganics				
pH	DETSC 2008#		pH	7.8
Total Organic Carbon	DETSC 2084#	0.5	%	< 0.5
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	15
Petroleum Hydrocarbons				
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	21
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	1500
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	1500
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	6.0
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	870
Aromatic C5-C35	DETSC 3072*	10	mg/kg	880
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	mg/kg	2400

Summary of Chemical Analysis

Soil Samples

Our Ref 21-07754

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1831831
Sample ID	HBW-BH102
Depth	2.00
Other ID	
Sample Type	ES
Sampling Date	12/04/2021
Sampling Time	n/s

Test	Method	LOD	Units	
PAHs				
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1
PAH Total	DETSC 3301	1.6	mg/kg	< 1.6

Summary of Chemical Analysis

Soil Samples

Our Ref 21-07754

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1831831
Sample ID	HBW-BH102
Depth	2.00
Other ID	
Sample Type	ES
Sampling Date	12/04/2021
Sampling Time	n/s

Test	Method	LOD	Units	
VOCs				
Vinyl Chloride	DETSC 3431	0.01	mg/kg	< 0.01
1,1 Dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01
Trans-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01
1,1-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01
Cis-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01
2,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01
Bromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01
Chloroform	DETSC 3431	0.01	mg/kg	< 0.01
1,1,1-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01
1,1-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01
Carbon tetrachloride	DETSC 3431	0.01	mg/kg	< 0.01
Benzene	DETSC 3431	0.01	mg/kg	< 0.01
1,2-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01
Trichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01
1,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01
Dibromomethane	DETSC 3431	0.01	mg/kg	< 0.01
Bromodichloromethane	DETSC 3431	0.01	mg/kg	< 0.01
cis-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01
Toluene	DETSC 3431	0.01	mg/kg	< 0.01
trans-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01
1,1,2-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01
Tetrachloroethylene	DETSC 3431	0.01	mg/kg	< 0.01
1,3-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01
Dibromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01
1,2-dibromoethane	DETSC 3431	0.01	mg/kg	< 0.01
Chlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01
1,1,1,2-tetrachloroethane	DETSC 3431	0.01	mg/kg	< 0.01
Ethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01
m+p-Xylene	DETSC 3431	0.01	mg/kg	< 0.01
o-Xylene	DETSC 3431	0.01	mg/kg	< 0.01
Styrene	DETSC 3431*	0.01	mg/kg	< 0.01
Bromoform	DETSC 3431	0.01	mg/kg	< 0.01
Isopropylbenzene	DETSC 3431	0.01	mg/kg	< 0.01
Bromobenzene	DETSC 3431	0.01	mg/kg	< 0.01
1,2,3-trichloropropane	DETSC 3431	0.01	mg/kg	< 0.01
n-propylbenzene	DETSC 3431	0.01	mg/kg	< 0.01
2-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01
1,3,5-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01
4-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01

Summary of Chemical Analysis

Soil Samples

Our Ref 21-07754

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1831831
Sample ID	HBW-BH102
Depth	2.00
Other ID	
Sample Type	ES
Sampling Date	12/04/2021
Sampling Time	n/s

Test	Method	LOD	Units	
Tert-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01
1,2,4-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01
sec-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01
p-isopropyltoluene	DETSC 3431	0.01	mg/kg	< 0.01
1,3-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01
1,4-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01
n-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01
1,2-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01
1,2-dibromo-3-chloropropane	DETSC 3431	0.01	mg/kg	< 0.01
1,2,4-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01
Hexachlorobutadiene	DETSC 3431	0.01	mg/kg	< 0.01
1,2,3-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01
MTBE	DETSC 3431*	0.01	mg/kg	< 0.01
SVOCs				
Phenol	DETSC 3433	0.1	mg/kg	< 0.1
Aniline	DETSC 3433*	0.1	mg/kg	< 0.1
2-Chlorophenol	DETSC 3433	0.1	mg/kg	< 0.1
Benzyl Alcohol	DETSC 3433	0.1	mg/kg	< 0.1
2-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1
Bis(2-chloroisopropyl)ether	DETSC 3433	0.1	mg/kg	< 0.1
3&4-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1
2,4-Dimethylphenol	DETSC 3433	0.1	mg/kg	< 0.1
Bis-(dichloroethoxy)methane	DETSC 3433	0.1	mg/kg	< 0.1
2,4-Dichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1
1,2,4-Trichlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1
4-Chloro-3-methylphenol	DETSC 3433	0.1	mg/kg	< 0.1
2-Methylnaphthalene	DETSC 3433	0.1	mg/kg	< 0.1
Hexachlorocyclopentadiene	DETSC 3433*	0.1	mg/kg	< 0.1
2,4,6-Trichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1
2,4,5-Trichlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1
2-Chloronaphthalene	DETSC 3433	0.1	mg/kg	< 0.1
2-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1
2,4-Dinitrotoluene	DETSC 3433*	0.1	mg/kg	< 0.1
3-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1
4-Nitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1
Dibenzofuran	DETSC 3433	0.1	mg/kg	< 0.1
2,6-Dinitrotoluene	DETSC 3433	0.1	mg/kg	< 0.1
2,3,4,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1
Diethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1
4-Chlorophenylphenylether	DETSC 3433*	0.1	mg/kg	< 0.1

Summary of Chemical Analysis

Soil Samples

Our Ref 21-07754

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1831831
Sample ID	HBW-BH102
Depth	2.00
Other ID	
Sample Type	ES
Sampling Date	12/04/2021
Sampling Time	n/s

Test	Method	LOD	Units	
4-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1
2-Methyl-4,6-Dinitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1
Diphenylamine	DETSC 3433	0.1	mg/kg	< 0.1
4-Bromophenylphenylether	DETSC 3433	0.1	mg/kg	< 0.1
Hexachlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1
Pentachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1
Di-n-butylphthalate	DETSC 3433	0.1	mg/kg	< 0.1
Butylbenzylphthalate	DETSC 3433*	0.1	mg/kg	< 0.1
Bis(2-ethylhexyl)phthalate	DETSC 3433	0.1	mg/kg	< 0.1
Di-n-octylphthalate	DETSC 3433*	0.1	mg/kg	< 0.1
1,4-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1
Dimethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1
1,3-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1
1,2-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1
2,3,5,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1
Azobenzene	DETSC 3433	0.1	mg/kg	< 0.1
Carbazole	DETSC 3433*	0.1	mg/kg	< 0.1
SVOC TICs				
Blank (TIC)	DETSC 3433*		mg/kg	None

WASTE ACCEPTANCE CRITERIA TESTING ANALYTICAL REPORT

Our Ref 21-07754

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Sample Id HBW-BH102 2.00

Sample Numbers 1831831 1831832 1831833

Date Analysed 21/04/2021

Test Results On Waste		
Determinand and Method Reference	Units	Result
DETS 2084# Total Organic Carbon	%	< 0.5
DETS 2003# Loss On Ignition	%	1.5
DETS 3321# BTEX	mg/kg	< 0.04
DETS 3401# PCBs (7 congeners)	mg/kg	< 0.01
DETS 3311# TPH (C10 - C40)	mg/kg	2700.0
DETS 3301 PAHs	mg/kg	< 1.6
DETS 2008# pH	pH Units	7.8
DETS 2073* Acid Neutralisation Capacity (pH4)	mol/kg	< 1.0
DETS 2073* Acid Neutralisation Capacity (pH7)	mol/kg	< 1.0

WAC Limit Values		
Inert Waste	SNRHW	Hazardous Waste
3	5	6
n/a	n/a	10
6	n/a	n/a
1	n/a	n/a
500	n/a	n/a
100	n/a	n/a
n/a	>6	n/a
n/a	TBE	TBE
n/a	TBE	TBE

Test Results On Leachate				
Determinand and Method Reference	Conc in Eluate ug/l		Amount Leached* mg/kg	
	2:1	8:1	LS2	LS10
DETS 2306 Arsenic as As	1.4	0.38	0.003	< 0.01
DETS 2306 Barium as Ba	5.6	1.2	< 0.02	< 0.1
DETS 2306 Cadmium as Cd	< 0.030	< 0.030	< 0.004	< 0.02
DETS 2306 Chromium as Cr	0.61	< 0.25	< 0.02	< 0.1
DETS 2306 Copper as Cu	1.5	0.41	< 0.004	< 0.02
DETS 2306 Mercury as Hg	0.016	< 0.010	< 0.0004	< 0.002
DETS 2306 Molybdenum as Mo	3.9	1.2	< 0.02	< 0.1
DETS 2306 Nickel as Ni	< 0.50	< 0.50	< 0.02	< 0.1
DETS 2306 Lead as Pb	0.9	0.2	< 0.01	< 0.05
DETS 2306 Antimony as Sb	0.95	0.29	< 0.01	< 0.05
DETS 2306 Selenium as Se	1.1	0.48	< 0.006	< 0.03
DETS 2306 Zinc as Zn	2.3	< 1.3	0.005	< 0.01
DETS 2055 Chloride as Cl	1400	310	< 20	< 100
DETS 2055* Fluoride as F	150	< 100	0.3	0.13
DETS 2055 Sulphate as SO4	1800	600	< 20	< 100
DETS 2009* Total Dissolved Solids	17000	7900	34	86.7
DETS 2130 Phenol Index	< 100	< 100	< 0.2	< 1
DETS 2085 Dissolved Organic Carbon	4300	< 2000	< 10	< 50

WAC Limit Values		
Limit values for LS10 Leachate		
Inert Waste	SNRHW	Hazardous Waste
0.5	2	25
20	100	300
0.04	1	5
0.5	10	70
2	50	100
0.01	0.2	2
0.5	10	30
0.4	10	40
0.5	10	50
0.06	0.7	5
0.1	0.5	7
4	50	200
800	15,000	25,000
10	150	500
1000	20,000	50,000
4000	60,000	100,000
1	n/a	n/a
500	800	1000

Additional Information

DETS 2008 pH	6.8	6.8
DETS 2009 Conductivity uS/cm	23.5	11.3
* Temperature*	18.0	18.0

Mass of Sample Kg*	0.130
Mass of dry Sample Kg*	0.118

Stage 1

Volume of Leachant L2*	0.225
Volume of Eluate VE1*	0.1

Stage 2

Volume of Leachant L8*	0.947
Volume of Eluate VE2*	0.91

TBE - To Be Evaluated
SNRHW - Stable Non-Reactive
Hazardous Waste

Disclaimer: The WAC limit values are provided for guidance only. DETS does not accept responsibility for errors or omissions. Values are correct at time of issue.

Summary of Asbestos Analysis Soil Samples

Our Ref 21-07754

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1831831	HBW-BH102 2.00	SOIL	NAD	none	Jordan Farley

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 21-07754
 Client Ref PN214198
 Contract Highbay Warehouse Kronospan

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1831831	HBW-BH102 2.00 SOIL	12/04/21	GJ 250ml, GJ 60ml x2, PT 1L		
1831832	HBW-BH102 2.00 LEACHATE	12/04/21	GJ 250ml, GJ 60ml x2, PT 1L		
1831833	HBW-BH102 2.00 LEACHATE	12/04/21	GJ 250ml, GJ 60ml x2, PT 1L		

Key: G-Glass P-Plastic J-Jar T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETS 2002	Organic matter	%	0.1	Air Dried	No	Yes	Yes
DETS 2003	Loss on ignition	%	0.01	Air Dried	No	Yes	Yes
DETS 2008	pH	pH Units	1	Air Dried	No	Yes	Yes
DETS 2024	Sulphide	mg/kg	10	Air Dried	No	Yes	Yes
DETS 2076	Sulphate Aqueous Extract as SO ₄	mg/l	10	Air Dried	No	Yes	Yes
DETS 2084	Total Carbon	%	0.5	Air Dried	No	Yes	Yes
DETS 2084	Total Organic Carbon	%	0.5	Air Dried	No	Yes	Yes
DETS 2119	Ammoniacal Nitrogen as N	mg/kg	0.5	Air Dried	No	Yes	Yes
DETS 2130	Cyanide free	mg/kg	0.1	Air Dried	No	Yes	Yes
DETS 2130	Cyanide total	mg/kg	0.1	Air Dried	No	Yes	Yes
DETS 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETS 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes
DETS 2321	Total Sulphate as SO ₄	%	0.01	Air Dried	No	Yes	Yes
DETS 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETS 3049	Sulphur (free)	mg/kg	0.75	Air Dried	No	Yes	Yes
DETS 2123	Boron (water soluble)	mg/kg	0.2	Air Dried	No	Yes	Yes
DETS 2301	Arsenic	mg/kg	0.2	Air Dried	No	Yes	Yes
DETS 2301	Barium	mg/kg	1.5	Air Dried	No	Yes	Yes
DETS 2301	Beryllium	mg/kg	0.2	Air Dried	No	Yes	Yes
DETS 2301	Cadmium Available	mg/kg	0.1	Air Dried	No	Yes	Yes
DETS 2301	Cadmium	mg/kg	0.1	Air Dried	No	Yes	Yes
DETS 2301	Cobalt	mg/kg	0.7	Air Dried	No	Yes	Yes
DETS 2301	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETS 2301	Copper	mg/kg	0.2	Air Dried	No	Yes	Yes
DETS 2301	Manganese	mg/kg	20	Air Dried	No	Yes	Yes
DETS 2301	Molybdenum	mg/kg	0.4	Air Dried	No	Yes	Yes
DETS 2301	Nickel	mg/kg	1	Air Dried	No	Yes	Yes
DETS 2301	Lead	mg/kg	0.3	Air Dried	No	Yes	Yes
DETS 2301	Selenium	mg/kg	0.5	Air Dried	No	Yes	Yes
DETS 2301	Zinc	mg/kg	1	Air Dried	No	Yes	Yes
DETS 3072	Ali/Aro C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETS 3072	Aliphatic C10-C12	mg/kg	1.5	As Received	No	Yes	Yes
DETS 3072	Aliphatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETS 3072	Aliphatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETS 3072	Aliphatic C12-C16	mg/kg	1.2	As Received	No	Yes	Yes
DETS 3072	Aliphatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETS 3072	Aliphatic C16-C21	mg/kg	1.5	As Received	No	Yes	Yes
DETS 3072	Aliphatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETS 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETS 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETS 3072	Aromatic C10-C12	mg/kg	0.9	As Received	No	Yes	Yes
DETS 3072	Aromatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETS 3072	Aromatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETS 3072	Aromatic C12-C16	mg/kg	0.5	As Received	No	Yes	Yes
DETS 3072	Aromatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETS 3072	Aromatic C16-C21	mg/kg	0.6	As Received	No	Yes	Yes
DETS 3072	Aromatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETS 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETS 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETS 062	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Ethylbenzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	m+p Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	o Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 3311	C10-C24 Diesel Range Organics (DRO)	mg/kg	10	As Received	No	Yes	Yes
DETS 3311	C24-C40 Lube Oil Range Organics (LORO)	mg/kg	10	As Received	No	Yes	Yes
DETS 3311	EPH (C10-C40)	mg/kg	10	As Received	No	Yes	Yes

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3401	PCB 28 + PCB 31	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 52	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 101	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 118	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 153	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 138	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 180	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB Total	mg/kg	0.01	As Received	No	Yes	Yes

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS. No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

End of Report

APPENDIX 7

Laboratory Test Results - Contamination (Groundwater)



Certificate of Analysis

Certificate Number 21-08981

Issued: 10-May-21

Client Geotechnics LTD
The Geotechnical Centre
Unit 1B Borders Ind. Park
River Lane
Saltney
Chester
CH4 8RJ

Our Reference 21-08981

Client Reference PN214198

Order No ON29050

Contract Title Highbay Warehouse Kronospan

Description 4 Water samples.

Date Received 29-Apr-21

Date Started 29-Apr-21

Date Completed 10-May-21

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Adam Fenwick
Contracts Manager



Summary of Chemical Analysis

Water Samples

Our Ref 21-08981

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1839601	1839602	1839603	1839604
Sample ID	WS105	WS102	BH102	BH102
Depth	0.03	0.03	0.05	0.03
Other ID				
Sample Type	WATER	WATER	WATER	WATER
Sampling Date	27/04/2021	27/04/2021	27/04/2021	27/04/2021
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
Metals							
Antimony, Dissolved	DETSC 2306	0.17	ug/l	0.29		< 0.17	< 0.17
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	0.45		1.6	1.3
Barium, Dissolved	DETSC 2306	0.26	ug/l	44		98	110
Boron, Dissolved	DETSC 2306*	12	ug/l	100		23	21
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	0.05		< 0.03	0.04
Chromium III, Dissolved	DETSC 2306*	1	ug/l	1.2		< 1.0	< 1.0
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0		< 7.0	< 7.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	2.9		1.2	1.3
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.46		0.89	0.15
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01		< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	1.7		3.8	1.6
Selenium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25		0.53	< 0.25
Vanadium, Dissolved	DETSC 2306	0.6	ug/l	< 0.6		< 0.6	< 0.6
Zinc, Dissolved	DETSC 2306	1.3	ug/l	< 1.3		12	2.8
Inorganics							
Conductivity	DETSC 2009	1	uS/cm	503		689	628
pH	DETSC 2008		pH	7.1		7.0	7.0
Total Hardness as CaCO3	DETSC 2303	0.1	mg/l	171		215	186
Ammoniacal Nitrogen as N	DETSC 2207	0.015	mg/l	0.069		0.12	0.13
Formaldehyde	DETSC 2047*	20	ug/l	< 20		< 20	< 20
Sulphate as SO4	DETSC 2055	0.1	mg/l	28		47	33
Total Organic Carbon	DETSC 2085	1	mg/l	17		15	15
Petroleum Hydrocarbons							
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	3.7	1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	500	120	93
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	500	120	93
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	12	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	990	110	90
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	1000	110	90
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	ug/l	< 10	1500	230	180

Summary of Chemical Analysis

Water Samples

Our Ref 21-08981

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1839601	1839602	1839603	1839604
Sample ID	WS105	WS102	BH102	BH102
Depth	0.03	0.03	0.05	0.03
Other ID				
Sample Type	WATER	WATER	WATER	WATER
Sampling Date	27/04/2021	27/04/2021	27/04/2021	27/04/2021
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
PAHs							
Naphthalene	DETSC 3304	0.05	ug/l	< 0.50		< 0.05	< 0.05
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.10		< 0.01	< 0.01
Acenaphthene	DETSC 3304	0.01	ug/l	< 0.10		< 0.01	< 0.01
Fluorene	DETSC 3304	0.01	ug/l	0.11		< 0.01	0.01
Phenanthrene	DETSC 3304	0.01	ug/l	0.51		0.03	0.04
Anthracene	DETSC 3304	0.01	ug/l	< 0.10		< 0.01	< 0.01
Fluoranthene	DETSC 3304	0.01	ug/l	0.33		0.02	0.02
Pyrene	DETSC 3304	0.01	ug/l	0.30		0.03	0.02
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	< 0.10		0.03	< 0.01
Chrysene	DETSC 3304	0.01	ug/l	< 0.10		< 0.01	< 0.01
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	< 0.10		< 0.01	< 0.01
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.10		0.03	< 0.01
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	< 0.10		0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	DETSC 3304	0.01	ug/l	< 0.10		< 0.01	< 0.01
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.10		0.01	< 0.01
Benzo(g,h,i)perylene	DETSC 3304	0.01	ug/l	< 0.10		< 0.01	< 0.01
PAH Total	DETSC 3304	0.2	ug/l	< 2.00		0.23	< 0.20

Summary of Chemical Analysis

Water VOC/SVOC Samples

Our Ref 21-08981

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1839601	1839602	1839604
Sample ID	WS105	WS102	BH102
Depth	0.03	0.03	0.03
Other ID			
Sample Type	WATER	WATER	WATER
Sampling Date	27/04/2021	27/04/2021	27/04/2021
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
VOCs						
Dichlorodifluoromethane	DETSC 3432	1	ug/l	< 1	< 1	< 1
Chloromethane	DETSC 3432	1	ug/l	< 1	< 1	< 1
Vinyl Chloride	DETSC 3432	1	ug/l	< 1	< 1	< 1
Bromomethane	DETSC 3432	1	ug/l	< 1	< 1	< 1
Chloroethane	DETSC 3432	1	ug/l	< 1	< 1	< 1
Trichlorofluoromethane	DETSC 3432*	1	ug/l	< 1	< 1	< 1
1,1-dichloroethylene	DETSC 3432	1	ug/l	< 1	< 1	< 1
Methylene Chloride	DETSC 3432*	27	ug/l	< 27	< 27	< 27
Trans-1,2-dichloroethylene	DETSC 3432	1	ug/l	< 1	< 1	< 1
1,1-dichloroethane	DETSC 3432	1	ug/l	< 1	< 1	< 1
Cis-1,2-dichloroethylene	DETSC 3432	1	ug/l	< 1	< 1	< 1
2,2-dichloropropane	DETSC 3432	2	ug/l	< 2	< 2	< 2
Bromochloromethane	DETSC 3432	4	ug/l	< 4	< 4	< 4
Chloroform	DETSC 3432	1	ug/l	< 1	< 1	< 1
1,1,1-trichloroethane	DETSC 3432	1	ug/l	< 1	< 1	< 1
1,1-dichloropropene	DETSC 3432	1	ug/l	< 1	< 1	< 1
Carbon tetrachloride	DETSC 3432	1	ug/l	< 1	< 1	< 1
Benzene	DETSC 3432	1	ug/l	< 1	< 1	< 1
1,2-dichloroethane	DETSC 3432	1	ug/l	< 1	< 1	< 1
Trichloroethylene	DETSC 3432*	1	ug/l	< 1	< 1	< 1
1,2-dichloropropane	DETSC 3432	1	ug/l	< 1	< 1	< 1
Dibromomethane	DETSC 3432	1	ug/l	< 1	< 1	< 1
Bromodichloromethane	DETSC 3432	4	ug/l	< 4	< 4	< 4
cis-1,3-dichloropropene	DETSC 3432	1	ug/l	< 1	< 1	< 1
Toluene	DETSC 3432	1	ug/l	< 1	< 1	< 1
trans-1,3-dichloropropene	DETSC 3432	1	ug/l	< 1	< 1	< 1
1,1,2-trichloroethane	DETSC 3432	1	ug/l	< 1	< 1	< 1
Tetrachloroethylene	DETSC 3432	1	ug/l	< 1	< 1	< 1
1,3-dichloropropane	DETSC 3432	1	ug/l	< 1	< 1	< 1
Dibromochloromethane	DETSC 3432	1	ug/l	< 1	< 1	< 1
1,2-dibromoethane	DETSC 3432	1	ug/l	< 1	< 1	< 1
Chlorobenzene	DETSC 3432	1	ug/l	< 1	< 1	< 1
1,1,1,2-tetrachloroethane	DETSC 3432	1	ug/l	< 1	< 1	< 1
Ethylbenzene	DETSC 3432	1	ug/l	< 1	< 1	< 1
m+p-Xylene	DETSC 3432	2	ug/l	< 2	< 2	< 2
o-Xylene	DETSC 3432	1	ug/l	< 1	< 1	< 1
Styrene	DETSC 3432	1	ug/l	< 1	< 1	< 1
Bromoform	DETSC 3432	1	ug/l	< 1	< 1	< 1
Isopropylbenzene	DETSC 3432	1	ug/l	< 1	< 1	< 1
1,1,2,2-tetrachloroethane	DETSC 3432	1	ug/l	< 1	< 1	< 1
Bromobenzene	DETSC 3432	1	ug/l	< 1	< 1	< 1

Summary of Chemical Analysis

Water VOC/SVOC Samples

Our Ref 21-08981

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1839601	1839602	1839604
Sample ID	WS105	WS102	BH102
Depth	0.03	0.03	0.03
Other ID			
Sample Type	WATER	WATER	WATER
Sampling Date	27/04/2021	27/04/2021	27/04/2021
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
1,2,3-trichloropropane	DETS 3432	1	ug/l	< 1	< 1	< 1
n-propylbenzene	DETS 3432	1	ug/l	< 1	< 1	< 1
2-chlorotoluene	DETS 3432	1	ug/l	< 1	< 1	< 1
1,3,5-trimethylbenzene	DETS 3432	1	ug/l	< 1	< 1	< 1
4-chlorotoluene	DETS 3432	1	ug/l	< 1	< 1	< 1
Tert-butylbenzene	DETS 3432	1	ug/l	< 1	< 1	< 1
1,2,4-trimethylbenzene	DETS 3432	1	ug/l	< 1	< 1	< 1
sec-butylbenzene	DETS 3432	1	ug/l	< 1	< 1	< 1
p-isopropyltoluene	DETS 3432	1	ug/l	< 1	< 1	< 1
1,3-dichlorobenzene	DETS 3432	2	ug/l	< 2	< 2	< 2
1,4-dichlorobenzene	DETS 3432	1	ug/l	< 1	< 1	< 1
n-butylbenzene	DETS 3432	1	ug/l	< 1	< 1	< 1
1,2-dichlorobenzene	DETS 3432	1	ug/l	< 1	< 1	< 1
1,2-dibromo-3-chloropropane	DETS 3432	1	ug/l	< 1	< 1	< 1
1,2,4-trichlorobenzene	DETS 3432	1	ug/l	< 1	< 1	< 1
Hexachlorobutadiene	DETS 3432	1	ug/l	< 1	< 1	< 1
Naphthalene	DETS 3432	1	ug/l		< 1	
1,2,3-trichlorobenzene	DETS 3432	1	ug/l	< 1	< 1	< 1
MTBE	DETS 3432*	1	ug/l	< 1	< 1	< 1
SVOCs						
Phenol	DETS 3434*	1	ug/l	< 1.0		< 1.0
Aniline	DETS 3434*	1	ug/l	< 1.0		< 1.0
2-Chlorophenol	DETS 3434*	1	ug/l	< 1.0		< 1.0
Benzyl Alcohol	DETS 3434*	1	ug/l	< 1.0		< 1.0
2-Methylphenol	DETS 3434*	1	ug/l	< 1.0		< 1.0
Bis(2-chloroisopropyl)ether	DETS 3434*	1	ug/l	< 1.0		< 1.0
3&4-Methylphenol	DETS 3434*	1	ug/l	< 1.0		< 1.0
Bis(2-chloroethoxy)methane	DETS 3434*	1	ug/l	< 1.0		< 1.0
2,4-Dimethylphenol	DETS 3434*	1	ug/l	< 1.0		< 1.0
2,4-Dichlorophenol	DETS 3434*	1	ug/l	< 1.0		< 1.0
1,2,4-Trichlorobenzene	DETS 3434*	1	ug/l	< 1.0		< 1.0
4-Chloro-3-methylphenol	DETS 3434*	1	ug/l	< 1.0		< 1.0
2-Methylnaphthalene	DETS 3434*	1	ug/l	< 1.0		< 1.0
Hexachlorocyclopentadiene	DETS 3434*	1	ug/l	< 1.0		< 1.0
2,4,6-Trichlorophenol	DETS 3434*	1	ug/l	< 1.0		< 1.0
2,4,5-Trichlorophenol	DETS 3434*	1	ug/l	< 1.0		< 1.0
2-Chloronaphthalene	DETS 3434*	1	ug/l	< 1.0		< 1.0
2-Nitroaniline	DETS 3434*	1	ug/l	< 1.0		< 1.0
2,4-Dinitrotoluene	DETS 3434*	1	ug/l	< 1.0		< 1.0
3-Nitroaniline	DETS 3434*	1	ug/l	< 1.0		< 1.0
4-Nitrophenol	DETS 3434*	1	ug/l	< 1.0		< 1.0
Dibenzofuran	DETS 3434*	1	ug/l	< 1.0		< 1.0

Summary of Chemical Analysis

Water VOC/SVOC Samples

Our Ref 21-08981

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1839601	1839602	1839604
Sample ID	WS105	WS102	BH102
Depth	0.03	0.03	0.03
Other ID			
Sample Type	WATER	WATER	WATER
Sampling Date	27/04/2021	27/04/2021	27/04/2021
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
2,6-Dinitrotoluene	DETSC 3434*	1	ug/l	< 1.0		< 1.0
2,3,4,6-Tetrachlorophenol	DETSC 3434*	1	ug/l	< 1.0		< 1.0
Diethylphthalate	DETSC 3434*	1	ug/l	< 1.0		< 1.0
4-Chlorophenylphenylether	DETSC 3434*	1	ug/l	< 1.0		< 1.0
4-Nitroaniline	DETSC 3434*	1	ug/l	< 1.0		< 1.0
Diphenylamine	DETSC 3434*	1	ug/l	< 1.0		< 1.0
4-Bromophenylphenylether	DETSC 3434*	1	ug/l	< 1.0		< 1.0
Hexachlorobenzene	DETSC 3434*	1	ug/l	< 1.0		< 1.0
Bis(2-ethylhexyl)ester	DETSC 3434*	1	ug/l	< 1.0		< 1.0
Pentachlorophenol	DETSC 3434*	1	ug/l	< 1.0		< 1.0
Di-n-butylphthalate	DETSC 3434*	1	ug/l	< 1.0		< 1.0
Butylbenzylphthalate	DETSC 3434*	1	ug/l	< 1.0		< 1.0
Bis(2-ethylhexyl)phthalate	DETSC 3434*	1	ug/l	< 1.0		< 1.0
Di-n-octylphthalate	DETSC 3434*	1	ug/l	< 1.0		< 1.0
1,4-Dinitrobenzene	DETSC 3434*	1	ug/l	< 1.0		< 1.0
Dimethylphthalate	DETSC 3434*	1	ug/l	< 1.0		< 1.0
1,3-Dinitrobenzene	DETSC 3434*	1	ug/l	< 1.0		< 1.0
2,3,5,6-Tetrachlorophenol	DETSC 3434*	1	ug/l	< 1.0		< 1.0
Azobenzene	DETSC 3434*	1	ug/l	< 1.0		< 1.0
Carbazole	DETSC 3434*	1	ug/l	< 1.0		< 1.0
1-Methylnaphthalene	DETSC 3434*	1	ug/l	< 1.0		< 1.0

Information in Support of the Analytical Results

Our Ref 21-08981
 Client Ref PN214198
 Contract Highbay Warehouse Kronospan

Containers Received & Deviating Samples

Lab No	Sample ID	Date		Containers Received	Holding time exceeded for tests	Inappropriate container for tests
		Sampled				
1839601	WS105 0.03 WATER	27/04/21		GB 1L, GV	pH/Cond/TDS (1 days)	
1839602	WS102 0.03 WATER	27/04/21		GV, PB 1L		
1839603	BH102 0.05 WATER	27/04/21		GB 1L, GV, PB 1L	pH/Cond/TDS (1 days)	
1839604	BH102 0.03 WATER	27/04/21		GB 1L, GV, PB 1L	pH/Cond/TDS (1 days)	

Key: G-Glass B-Bottle V-Vial P-Plastic

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-
 Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report



DETS

Certificate of Analysis

Certificate Number 21-10129

Issued: 19-May-21

Client Geotechnics LTD
The Geotechnical Centre
Unit 1B Borders Ind. Park
River Lane
Saltney
Chester
CH4 8RJ

Our Reference 21-10129

Client Reference PN214198

Order No ON29050

Contract Title Highbay Warehouse Kronospan

Description 4 Water samples.

Date Received 13-May-21

Date Started 13-May-21

Date Completed 19-May-21

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By



Adam Fenwick
Contracts Manager



Summary of Chemical Analysis

Water Samples

Our Ref 21-10129

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1846540	1846541	1846542	1846543
Sample ID	BH101	BH101	BH103	WS102
Depth	4.90	33.90		
Other ID				
Sample Type	WATER	WATER	WATER	WATER
Sampling Date	07/05/2021	07/05/2021	07/05/2021	07/05/2021
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
Metals							
Antimony, Dissolved	DETSC 2306	0.17	ug/l	0.31	< 0.17	0.17	0.25
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	1.6	0.35	1.9	2.1
Barium, Dissolved	DETSC 2306	0.26	ug/l	170	290	37	52
Boron, Dissolved	DETSC 2306*	12	ug/l	22	51	17	34
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	0.09	< 0.03	< 0.03	< 0.03
Chromium III, Dissolved	DETSC 2306*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0	< 7.0	< 7.0	< 7.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	1.6	1.1	1.3	0.5
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.59	0.12	0.36	0.50
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	5.7	1.5	2.2	1.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	0.50	0.53	< 0.25	0.26
Vanadium, Dissolved	DETSC 2306	0.6	ug/l	< 0.6	< 0.6	< 0.6	< 0.6
Zinc, Dissolved	DETSC 2306	1.3	ug/l	4.0	68	9.2	7.1
Inorganics							
Conductivity	DETSC 2009	1	uS/cm	717	520	485	602
pH	DETSC 2008		pH	6.8	7.0	7.0	7.0
Total Hardness as CaCO3	DETSC 2303	0.1	mg/l	265	182	172	222
Ammoniacal Nitrogen as N	DETSC 2207	0.015	mg/l	0.070	0.080	0.040	0.060
Formaldehyde	DETSC 2047*	20	ug/l	< 20	< 20	29	< 20
Sulphate as SO4	DETSC 2055	0.1	mg/l	76	27	38	43
Total Organic Carbon	DETSC 2085	1	mg/l	230	190	< 1.0	110
Petroleum Hydrocarbons							
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	5.3	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	8.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	68	< 1.0	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	82	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	1.8	< 1.0	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	47	< 1.0	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	49	< 10	< 10	< 10
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	ug/l	130	< 10	< 10	< 10

Summary of Chemical Analysis

Water Samples

Our Ref 21-10129

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1846540	1846541	1846542	1846543
Sample ID	BH101	BH101	BH103	WS102
Depth	4.90	33.90		
Other ID				
Sample Type	WATER	WATER	WATER	WATER
Sampling Date	07/05/2021	07/05/2021	07/05/2021	07/05/2021
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
PAHs							
Naphthalene	DETSC 3304	0.05	ug/l	0.07	< 0.05	< 0.05	< 0.05
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	DETSC 3304	0.01	ug/l	0.02	< 0.01	< 0.01	< 0.01
Fluorene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	DETSC 3304	0.01	ug/l	0.02	0.02	< 0.01	0.01
Fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
PAH Total	DETSC 3304	0.2	ug/l	< 0.20	< 0.20	< 0.20	< 0.20



Summary of Chemical Analysis

Water VOC/SVOC Samples

Our Ref 21-10129

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1846540	1846542	1846543
Sample ID	BH101	BH103	WS102
Depth	4.90		
Other ID			
Sample Type	WATER	WATER	WATER
Sampling Date	07/05/2021	07/05/2021	07/05/2021
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
VOCs						
Dichlorodifluoromethane	DETS 3432	1	ug/l	< 1	< 1	< 1
Chloromethane	DETS 3432	1	ug/l	< 1	< 1	< 1
Vinyl Chloride	DETS 3432	1	ug/l	< 1	< 1	< 1
Bromomethane	DETS 3432	1	ug/l	< 1	< 1	< 1
Chloroethane	DETS 3432	1	ug/l	< 1	< 1	< 1
Trichlorofluoromethane	DETS 3432*	1	ug/l	< 1	< 1	< 1
1,1-dichloroethylene	DETS 3432	1	ug/l	< 1	< 1	< 1
Methylene Chloride	DETS 3432*	27	ug/l	< 27	< 27	< 27
Trans-1,2-dichloroethylene	DETS 3432	1	ug/l	< 1	< 1	< 1
1,1-dichloroethane	DETS 3432	1	ug/l	< 1	< 1	< 1
Cis-1,2-dichloroethylene	DETS 3432	1	ug/l	< 1	< 1	< 1
2,2-dichloropropane	DETS 3432	2	ug/l	< 2	< 2	< 2
Bromochloromethane	DETS 3432	4	ug/l	< 4	< 4	< 4
Chloroform	DETS 3432	1	ug/l	< 1	< 1	< 1
1,1,1-trichloroethane	DETS 3432	1	ug/l	< 1	< 1	< 1
1,1-dichloropropene	DETS 3432	1	ug/l	< 1	< 1	< 1
Carbon tetrachloride	DETS 3432	1	ug/l	< 1	< 1	< 1
Benzene	DETS 3432	1	ug/l	< 1	< 1	< 1
1,2-dichloroethane	DETS 3432	1	ug/l	< 1	< 1	< 1
Trichloroethylene	DETS 3432*	1	ug/l	< 1	< 1	< 1
1,2-dichloropropane	DETS 3432	1	ug/l	< 1	< 1	< 1
Dibromomethane	DETS 3432	1	ug/l	< 1	< 1	< 1
Bromodichloromethane	DETS 3432	4	ug/l	< 4	< 4	< 4
cis-1,3-dichloropropene	DETS 3432	1	ug/l	< 1	< 1	< 1
Toluene	DETS 3432	1	ug/l	< 1	< 1	< 1
trans-1,3-dichloropropene	DETS 3432	1	ug/l	< 1	< 1	< 1
1,1,2-trichloroethane	DETS 3432	1	ug/l	< 1	< 1	< 1
Tetrachloroethylene	DETS 3432	1	ug/l	< 1	< 1	< 1
1,3-dichloropropane	DETS 3432	1	ug/l	< 1	< 1	< 1
Dibromochloromethane	DETS 3432	1	ug/l	< 1	< 1	< 1
1,2-dibromoethane	DETS 3432	1	ug/l	< 1	< 1	< 1
Chlorobenzene	DETS 3432	1	ug/l	< 1	< 1	< 1
1,1,1,2-tetrachloroethane	DETS 3432	1	ug/l	< 1	< 1	< 1
Ethylbenzene	DETS 3432	1	ug/l	< 1	< 1	< 1
m+p-Xylene	DETS 3432	2	ug/l	< 2	< 2	< 2
o-Xylene	DETS 3432	1	ug/l	< 1	< 1	< 1
Styrene	DETS 3432	1	ug/l	< 1	< 1	< 1
Bromoform	DETS 3432	1	ug/l	< 1	< 1	< 1
Isopropylbenzene	DETS 3432	1	ug/l	< 1	< 1	< 1
1,1,2,2-tetrachloroethane	DETS 3432	1	ug/l	< 1	< 1	< 1

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis

Water VOC/SVOC Samples

Our Ref 21-10129

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1846540	1846542	1846543
Sample ID	BH101	BH103	WS102
Depth	4.90		
Other ID			
Sample Type	WATER	WATER	WATER
Sampling Date	07/05/2021	07/05/2021	07/05/2021
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
Bromobenzene	DETSC 3432	1	ug/l	< 1	< 1	< 1
1,2,3-trichloropropane	DETSC 3432	1	ug/l	< 1	< 1	< 1
n-propylbenzene	DETSC 3432	1	ug/l	< 1	< 1	< 1
2-chlorotoluene	DETSC 3432	1	ug/l	< 1	< 1	< 1
1,3,5-trimethylbenzene	DETSC 3432	1	ug/l	< 1	< 1	< 1
4-chlorotoluene	DETSC 3432	1	ug/l	< 1	< 1	< 1
Tert-butylbenzene	DETSC 3432	1	ug/l	< 1	< 1	< 1
1,2,4-trimethylbenzene	DETSC 3432	1	ug/l	< 1	< 1	< 1
sec-butylbenzene	DETSC 3432	1	ug/l	< 1	< 1	< 1
p-isopropyltoluene	DETSC 3432	1	ug/l	< 1	< 1	< 1
1,3-dichlorobenzene	DETSC 3432	2	ug/l	< 2	< 2	< 2
1,4-dichlorobenzene	DETSC 3432	1	ug/l	< 1	< 1	< 1
n-butylbenzene	DETSC 3432	1	ug/l	< 1	< 1	< 1
1,2-dichlorobenzene	DETSC 3432	1	ug/l	< 1	< 1	< 1
1,2-dibromo-3-chloropropane	DETSC 3432	1	ug/l	< 1	< 1	< 1
1,2,4-trichlorobenzene	DETSC 3432	1	ug/l	< 1	< 1	< 1
Hexachlorobutadiene	DETSC 3432	1	ug/l	< 1	< 1	< 1
1,2,3-trichlorobenzene	DETSC 3432	1	ug/l	< 1	< 1	< 1
MTBE	DETSC 3432*	1	ug/l	< 1	< 1	< 1
SVOCs						
Phenol	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
Aniline	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
2-Chlorophenol	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
Benzyl Alcohol	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
2-Methylphenol	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
Bis(2-chloroisopropyl)ether	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
3&4-Methylphenol	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
Bis(2-chloroethoxy)methane	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
2,4-Dimethylphenol	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
2,4-Dichlorophenol	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
1,2,4-Trichlorobenzene	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
4-Chloro-3-methylphenol	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
2-Methylnaphthalene	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
Hexachlorocyclopentadiene	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
2,4,6-Trichlorophenol	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
2,4,5-Trichlorophenol	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
2-Chloronaphthalene	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
2-Nitroaniline	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
2,4-Dinitrotoluene	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
3-Nitroaniline	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0

Summary of Chemical Analysis

Water VOC/SVOC Samples

Our Ref 21-10129

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1846540	1846542	1846543
Sample ID	BH101	BH103	WS102
Depth	4.90		
Other ID			
Sample Type	WATER	WATER	WATER
Sampling Date	07/05/2021	07/05/2021	07/05/2021
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
4-Nitrophenol	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
Dibenzofuran	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
2,6-Dinitrotoluene	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
2,3,4,6-Tetrachlorophenol	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
Diethylphthalate	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
4-Chlorophenylphenylether	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
4-Nitroaniline	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
Diphenylamine	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
4-Bromophenylphenylether	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
Hexachlorobenzene	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
Bis(2-ethylhexyl)ester	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
Pentachlorophenol	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
Di-n-butylphthalate	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
Butylbenzylphthalate	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
Bis(2-ethylhexyl)phthalate	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
Di-n-octylphthalate	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
1,4-Dinitrobenzene	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
Dimethylphthalate	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
1,3-Dinitrobenzene	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
2,3,5,6-Tetrachlorophenol	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
Azobenzene	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
Carbazole	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
1-Methylnaphthalene	DETSC 3434*	1	ug/l	< 2.0	< 1.0	< 1.0
SVOC TICs						
Blank (TIC)	DETSC 3433*		mg/kg	None	None	None

Information in Support of the Analytical Results

Our Ref 21-10129
 Client Ref PN214198
 Contract Highbay Warehouse Kronospan

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1846540	BH101 4.90 WATER	07/05/21	GB 1L, GV, PB 1L	Aliphatics/Aromatics (4 days), Chromium, Hexavalent (4 days), Kone (4 days), pH/Cond/TDS (1 days), PAH MS (4 days)	
1846541	BH101 33.90 WATER	07/05/21	GB 1L, GV, PB 1L	Aliphatics/Aromatics (4 days), Chromium, Hexavalent (4 days), Kone (4 days), pH/Cond/TDS (1 days), PAH MS (4 days)	
1846542	BH103 WATER	07/05/21	GB 1L, GV, PB 1L	Aliphatics/Aromatics (4 days), Chromium, Hexavalent (4 days), Kone (4 days), pH/Cond/TDS (1 days), PAH MS (4 days)	
1846543	WS102 WATER	07/05/21	GB 1L, GV, PB 1L	Aliphatics/Aromatics (4 days), Chromium, Hexavalent (4 days), Kone (4 days), pH/Cond/TDS (1 days), PAH MS (4 days)	

Key: G-Glass P-Plastic B-Bottle V-Vial

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report



Certificate of Analysis

Certificate Number 21-12881

Issued: 29-Jun-21

Client Geotechnics LTD
The Geotechnical Centre
Unit 1B Borders Ind. Park
River Lane
Saltney
Chester
CH4 8RJ

Our Reference 21-12881

Client Reference PN214198

Order No ON29050

Contract Title Highbay Warehouse Kronospan

Description 2 Water samples.

Date Received 18-Jun-21

Date Started 18-Jun-21

Date Completed 29-Jun-21

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Adam Fenwick
Contracts Manager



Summary of Chemical Analysis

Water Samples

Our Ref 21-12881

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1864176	1864177
Sample ID	BH102	BH102
Depth	4.00	14.00
Other ID		
Sample Type	WATER	WATER
Sampling Date	16/06/2021	16/06/2021
Sampling Time	n/s	n/s

Test	Method	LOD	Units		
Metals					
Antimony, Dissolved	DETSC 2306	0.17	ug/l	< 0.17	< 0.17
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	0.34	0.54
Barium, Dissolved	DETSC 2306	0.26	ug/l	82	110
Boron, Dissolved	DETSC 2306*	12	ug/l	39	38
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	0.03	0.07
Chromium III, Dissolved	DETSC 2306*	1	ug/l	2.3	1.3
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0	< 7.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	0.7	1.8
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.15	0.24
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	1.8	2.0
Selenium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	< 0.25
Vanadium, Dissolved	DETSC 2306	0.6	ug/l	< 0.6	< 0.6
Zinc, Dissolved	DETSC 2306	1.3	ug/l	2.3	8.3
Inorganics					
Conductivity	DETSC 2009	1	uS/cm	577	554
pH	DETSC 2008		pH	6.7	6.9
Total Hardness as CaCO ₃	DETSC 2303	0.1	mg/l	126	177
Ammoniacal Nitrogen as N	DETSC 2207	0.015	mg/l	0.080	0.070
Formaldehyde	DETSC 2047*	20	ug/l	< 20	23
Sulphate as SO ₄	DETSC 2055	0.1	mg/l	28	28
Total Organic Carbon	DETSC 2033	0.1	mg/l	2.2	2.9
Petroleum Hydrocarbons					
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	360
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	15
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	2.6
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	370
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	150
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	9.7
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	6.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	5.9
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	170
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	ug/l	< 10	550
PAHs					
Naphthalene	DETSC 3304	0.05	ug/l	< 0.05	< 0.05

Summary of Chemical Analysis

Water Samples

Our Ref 21-12881

Client Ref PN214198

Contract Title Highbay Warehouse Kronospan

Lab No	1864176	1864177
Sample ID	BH102	BH102
Depth	4.00	14.00
Other ID		
Sample Type	WATER	WATER
Sampling Date	16/06/2021	16/06/2021
Sampling Time	n/s	n/s

Test	Method	LOD	Units		
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Acenaphthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Fluorene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Phenanthrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Chrysene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
PAH Total	DETSC 3304	0.2	ug/l	< 0.20	< 0.20

Information in Support of the Analytical Results

Our Ref 21-12881
 Client Ref PN214198
 Contract Highbay Warehouse Kronospan

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	inappropriate container for tests
1864176	BH102 4.00 WATER	16/06/21	GB 1L, GV, PB 1L	pH/Cond/TDS (1 days)	
1864177	BH102 14.00 WATER	16/06/21	GB 1L, GV, PB 1L	pH/Cond/TDS (1 days)	

Key: G-Glass P-Plastic B-Bottle V-Vial

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

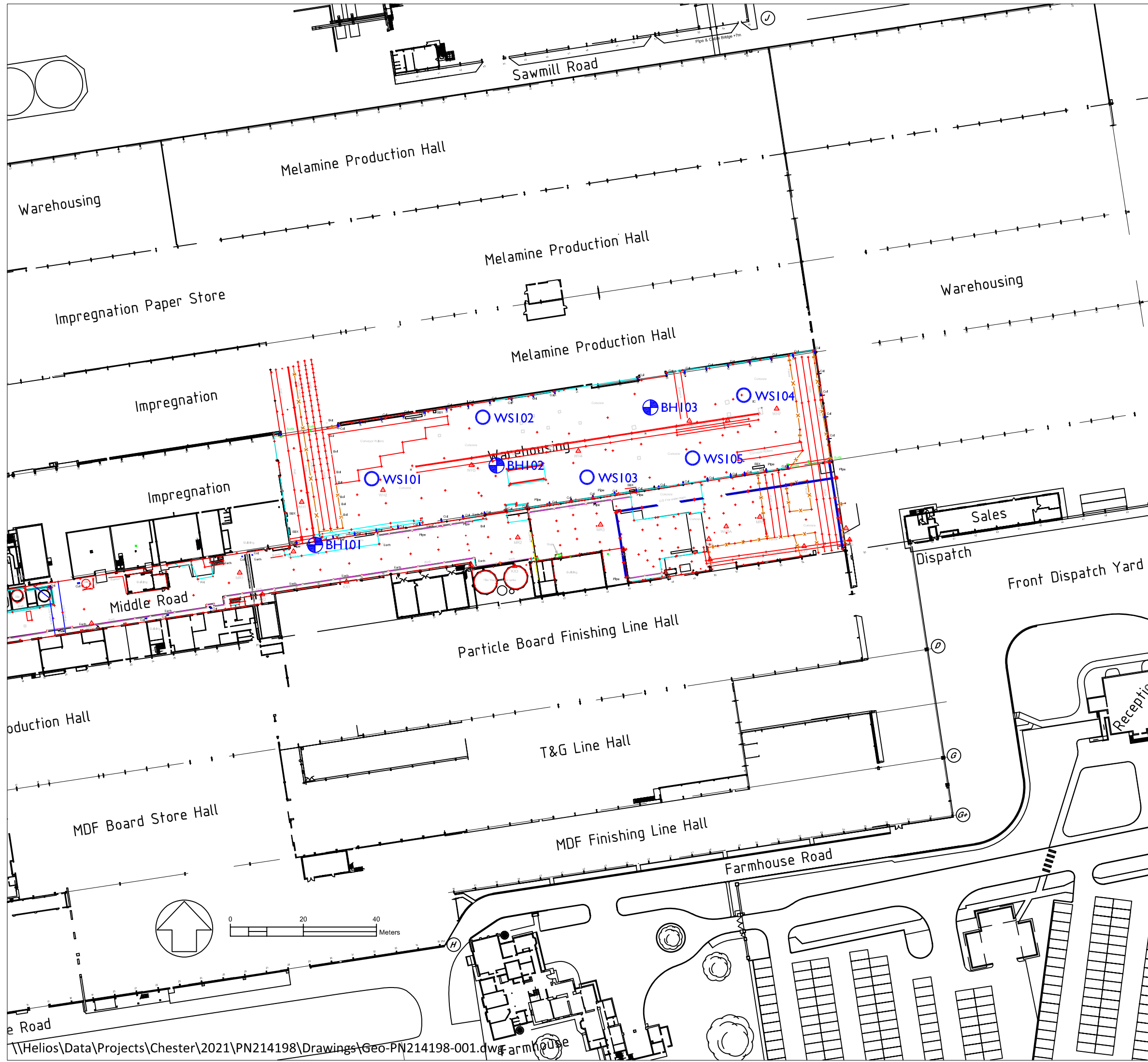
Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-
 Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report

APPENDIX 8

Exploratory Hole Location Plan



- Key
- Cable Percussive Borehole
 - Dynamic Sample Borehole

Hole ID	Easting (mE)	Northing (mN)	Level (mOD)
BH101	328647.2	338374.6	101.01
BH102	328696.9	338396.3	101.00
BH103	328739.0	338412.2	100.80
WS101	328662.7	338392.7	101.01
WS102	328693.1	338409.5	101.00
WS103	328721.6	338393.1	101.01
WS104	328764.5	338415.5	100.80
WS105	328750.5	338398.3	101.00

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Engineer:
Ramboll

Client:
Kronospan

Project:
Kronospan - Raw Board Storage

Drawing Title:
Exploratory Hole Location Plan

Scale: 1:1000@A3

Date:
April 2021

Project No:
PN214198

File Name:
Geo-PN214198-001(1)

APPENDIX 9

Investigation Techniques and General Notes

INTRODUCTION

The following brief review of Ground Investigation techniques, generally used as part of most Site Investigations in the UK, summarises their methodology, advantages and limitations. Detailed descriptions of the techniques are available and can be provided on request. This review should be read in conjunction with the accompanying General Notes.

TRIAL PITS

The trial pit is amongst the simplest yet most effective means of identifying shallow ground conditions on a site. Its advantages include simplicity, speed, potential accuracy and cost-effectiveness. The trial pit is most commonly formed using a back-acting excavator which can typically determine ground conditions to some 4 metres below ground level. Hand excavation is often used to locate, expose and detail existing foundations, features or services. In general, it is difficult to extend pits significantly below the water table in predominantly granular soils, where flows can cause instability. Unless otherwise stated, the trial pits will not have been provided with temporary side support during their construction. Under such circumstances, entrance into the pit is not permitted and hence observations will have been made from the ground surface and samples taken from the excavator bucket.

Where access for personnel is required to allow close observation of the exposed strata, the taking of samples and the carrying out of in situ tests, the sides of the trial pits (Observation Pits in BS 5930:2015) will be made safe using temporary supports or the sides battered back to a stable angle. Some limited access to such Trial Pits (Observation Pits) at depths less than 1m may be allowed in stable conditions or where the sides are benched or battered back to a safe angle.

Trends in strata type, level and thickness can be determined, shear surfaces identified and the behaviour of plant, excavation sides and excavated materials can be related to the construction process. They are particularly valuable in land slip investigations. Some types of in situ test can be undertaken in such pits and large disturbed or block samples obtained.

CABLE PERCUSSION BORING

The light Cable Percussion technique of soft ground boring, typically at a diameter of 150mm, is a well-established simple and flexible method of boring vertical holes and generally allows data to be obtained in respect of strata conditions other than rock. A tubular cutter (for cohesive soils) or shell with a flap valve (for granular soils) is repeatedly lifted and dropped using a winch and rope operating from an "A" frame. Soil which enters these tools is regularly removed and either sampled for subsequent examination or test, or laid to one side for later removal off site and licensed disposal or, if permitted by the Client, use as backfill. Steel casing will have been used to prevent collapse of the borehole sides where necessary. A degree of disturbance of soil and mixing of layers is inevitable and the presence of very thin layers of different soils within a particular stratum may not be identified. Changes in strata type can only be detected on recognition of a change in soil samples at the surface, after the interface has been passed. For the foregoing reasons, depth measurements should not be considered to be more accurate than 0.10 metre. The technique can determine ground conditions to depths in excess of 30 metres under suitable circumstances and usually causes less surface disturbance than trial pitting.

In cohesive soils cylindrical samples are retrieved by driving or pushing in 100mm nominal diameter tubes. In soft soils, piston sampling or vane testing may be undertaken. In granular soils and often in cohesive materials, in situ Standard Penetration Tests (SPT's) are performed. The SPT records the number of standard blows required to drive a 50mm diameter open or cone ended probe for 300mm after an initial 150mm penetration. A modified method of recording is used in denser strata. Small disturbed samples are obtained throughout.

ROTARY DRILLING

Rotary Drilling to produce cores by rotating an annular diamond-impregnated tube or barrel into the ground is the technique most appropriate to the forming of site investigation boreholes through rock or other hard strata. It has the advantage of being able to be used vertically or at an angle. Core diameters of less than 100mm are most common for site investigation purposes. Core is normally retrieved in plastic lining tubes. A flushing fluid such as air, water or foam is used to cool the bit and carry cuttings to the surface. Depths in excess of 60 metres can be achieved under suitable circumstances using rotary techniques, with minimal surface disturbance.

Examination of cores allows detailed rock description and generally enables angled discontinuity surfaces to be observed. However, vertical holes do not necessarily reveal the presence of vertical or near-vertical fissures or joint discontinuities. The core type and/or techniques used will depend on the ground conditions. Where open hole rotary drilling is employed, descriptions of strata result from examination at the surface of small particles ejected from the borehole in the flushing medium. In consequence, no indication of fissuring, bedding, consistency or degree of weathering can be obtained.

DYNAMIC SAMPLING

This technique involves the driving of an open-ended tube into the ground and retrieval of the soil which enters the tube. It was previously called window or windowless sampling. The term "window sample" arose from the original device which had a "window" or slot cut into the side of the tube through which samples were taken. This was superseded by the use of a thin-walled plastic liner to retrieve the soil sample from within a sampler (windowless sampling) which has a solid wall. Line diameters range from 36 to 86mm. Such samples can be used for qualitative logging, selection of samples for classification and chemical analysis and for obtaining a rudimentary assessment of strength.

Driving devices can be hand-held or machine mounted and the drive tubes are typically in 1m lengths. Depending on the type of rig used, the hole formed can be cased to prevent collapse of the borehole sides. Where the type of rig does not allow the insertion of casing, the success of this technique can be limited when soils and groundwater conditions are such that the sides of the hole collapse on withdrawal of the sampler. Obstructions within the ground, the density of the material or its strength can also limit the depth and rate of penetration of this light-weight investigation technique. Nevertheless, it is a valuable tool where access is constrained such as within buildings or on embankments. Depths of up to 10m can be achieved in suitable circumstances depending on the rig type but depths of 5m to 6m are more common.

EXPLORATORY HOLE RECORDS

The data obtained by these techniques are generally presented on Trial Pit, Borehole, Drillhole or Dynamic Sample Records. The descriptions of strata result from information gathered from a number of sources which may include published geological data, preliminary field observations and descriptions, in situ test results, laboratory test results and specimen descriptions. A key to the symbols and abbreviations used accompanies the records. The descriptions on the exploratory hole records accommodate but may not necessarily be identical to those on any preliminary records or the laboratory summaries.

The records show ground conditions at the exploratory hole locations. The degree to which they can be used to represent conditions between or beyond such holes, however, is a matter for geological interpretation rather than factual reporting and the associated uncertainties must be recognised.

DYNAMIC PROBING

This technique typically measures the number of blows of a standard weight falling over a standard height to advance a cone-ended rod over sequential standard distances (typically 100mm). Some devices measure the penetration of the probe per standard blow. It is essentially a profiling tool and is best used in conjunction with other investigation techniques where site-specific correlation can be used to delineate the distribution of soft or loose soils or the upper horizon of a dense or strong layer such as rock.

Both machine-driven and hand-driven equipment is available, the selection depending upon access restrictions and the depth of penetration required. It is particularly useful where access for larger equipment is not available, disturbance is to be minimised or where there are cost constraints. No samples are recovered and some techniques leave a sacrificial cone head in the ground. As with other lightweight techniques, progress is limited in strong or dense soils. The results are presented both numerically and graphically. Depths of up to 10m are commonly achieved in suitable circumstances.

The hand-driven DCP probing device has been calibrated by the Highways Agency to provide a profile of CBR values over a range of depths.

INSTRUMENTATION

The most common form of instrument used in site investigation is either the standpipe or else the standpipe piezometer which can be installed in investigation holes. They are used to facilitate monitoring of groundwater levels and water sampling over a period of time following site work. Normally a standpipe would be formed using rigid plastic tubing which has been perforated or slotted over much of its length whilst a standpipe piezometer would have a filter tip which would be placed at a selected level and the hole sealed above and sometimes below to isolate the zone of interest. Groundwater levels are determined using an electronic "dip meter" to measure the depth to the water surface from ground level. Piezometers can also be used to measure permeability. They are simple and inexpensive instruments for long term monitoring but response times can limit their use in tidal areas and access to the ground surface at each instrument is necessary. Remote reading requires more sophisticated hydraulic, electronic or pneumatic equipment.

Settlement can be monitored using surface or buried target plates whilst lateral movement over a range of depths is monitored using slip indicator or inclinometer equipment.

1. The report is prepared for the exclusive use of the Client named in the document and copyright subsists with Geotechnics Limited. Prior written permission must be obtained to reproduce all or part of the report. It is prepared on the understanding that its contents are only disclosed to parties directly involved in the current investigation, preparation and development of the site.
2. Further copies may be obtained with the Client's written permission, from Geotechnics Limited with whom the master copy of the document will be retained.
3. The report and/or opinion is prepared for the specific purpose stated in the document and in relation to the nature and extent of proposals made available to Geotechnics Limited at that time. Re-consideration will be necessary should those details change. The recommendations should not be used for other schemes on or adjacent to the site without further reference to Geotechnics Limited.
4. The assessment of the significance of the factual data, where called for, is provided to assist the Client and their Engineer and/or Advisers in the preparation of their designs.
5. The report is based on the ground conditions encountered in the exploratory holes together with the results of field and laboratory testing in the context of the proposed development. The data from any commissioned desk study and site reconnaissance are also drawn upon. There may be special conditions appertaining to the site, however, which are not revealed by the investigation and which may not be taken into account in the report.
6. Methods of construction and/or design other than those proposed by the designers or referred to in the report may require consideration during the evolution of the proposals and further assessment of the geotechnical and any geoenvironmental data would be required to provide discussion and evaluations appropriate to these methods.
7. The accuracy of results reported depends upon the technique of measurement, investigation and test used and these values should not be regarded necessarily as characteristics of the strata as a whole (see accompanying notes on Investigation Techniques). Where such measurements are critical, the technique of investigation will need to be reviewed and supplementary investigation undertaken in accordance with the advice of the Company where necessary.
8. The samples selected for laboratory test are prepared and tested in accordance with the relevant Clauses and Parts of BS EN ISO 17892 and BS 1377 Parts 1 to 8, where appropriate, in Geotechnics Limited's UKAS accredited Laboratory, where possible. A list of tests is given.
9. Tests requiring the use of another laboratory having UKAS accreditation where possible are identified.
10. Any unavoidable variations from specified procedures are identified in the report.
11. Specimens are cut vertically, where this is relevant and can be identified, unless otherwise stated
12. All the data required by the test procedures are recorded on individual test sheets but the results in the report are presented in summary form to aid understanding and assimilation for design purposes. Where all details are required, these can be made available.
13. Whilst the report may express an opinion on possible configurations of strata between or beyond exploratory holes, or on the possible presence of features based on either visual, verbal, written, cartographical, photographic or published evidence, this is for guidance only and no liability can be accepted for its accuracy.
14. The Code of Practice for Ground Investigations – BS 5930:2015 calls for man-made soils to be described as Anthropogenic Ground with soils placed in an un-controlled manner classified as Made Ground and soils placed in a controlled manner as Fill. In view of the difficulty in always accurately determining the origin of man-made soils in exploratory holes, Geotechnics Limited classify such materials as Made Ground. Where soils can be clearly identified as being placed in a controlled manner then further classification of the soils as Fill has been added to the Exploratory Hole Records.
15. Classification of man-made soils is based on the inspection of retrieved samples or exposed excavations. Where it is obvious that foreign matter such as paper, plastic or metal is present, classification is clear. Frequently, however, for man-made soils that arise from the adjacent ground or from the backfilling of excavations, their visual characteristics can closely resemble those of undisturbed ground. Other evidence such as site history, exploratory hole location or other tests may need to be drawn upon to provide clarification. For these reasons, classification of soils on the exploratory hole records as either Made Ground or naturally occurring strata, the boundary between them and any interpretation that this gives rise to should be regarded as provisional and subject to re-evaluation in the light of further data.
16. The classification of materials as Topsoil is generally based on visual description and should not be interpreted to mean that the material so described complies with the criteria for Topsoil used in BS 3882:2015. Specific testing would be necessary where such a definition is a requirement.
17. Ground conditions should be monitored during the construction of the works and the report should be re-evaluated in the light of these data by the supervising geotechnical engineers.
18. Any comments on groundwater conditions are based on observations made at the time of the investigation, unless specifically stated otherwise. It should be noted, however, that the observations are subject to the method and speed of boring, drilling or excavation and that groundwater levels will vary due to seasonal or other effects.
19. Any bearing capacities for conventional spread foundations which are given in the report and interpreted from the investigation are for bases at a minimum depth of 1m below finished ground level in naturally occurring strata and at broadly similar levels throughout individual structures, unless otherwise stated. Typically they are based on serviceability criteria taking account of an assessment of the shear strength and/or density data obtained by the investigation. The foundations should be designed in accordance with the good practice embodied in BS 8004:2015 - Foundations, supplemented for housing by NHBC Standards. Foundation design is an iterative process and bearing pressures may need adjustment or other measures may need to be taken in the context of final layouts and levels prior to finalisation of proposals.
20. Unless specifically stated, the investigation does not take account of the possible effects of mineral extraction or of gases from fill or natural sources within, below or outside the site.
21. The costs or economic viability of the proposals referred to in the report, or of the solutions put forward to any problems encountered, will depend on very many factors in addition to geotechnical or geoenvironmental considerations and hence their evaluation is outside the scope of the report.

APPENDIX 2

GROUNDWATER DQRA

GROUNDWATER DQRA

Contaminant Specific Input Parameters

Model input parameters specific to each of the contaminants of concern reported in groundwater are summarised in Table 1 below. For each contaminant the highest value detected has been used in the assessment.

Table A2-1: Contaminant Specific Input Parameters

Contaminant	Parameter	Units	Value	Source
Petroleum Hydrocarbons				
Aliphatic >C10-C12	Log Koc	l/kg	5.38 (239883)	S4ULs
	Half-life	Days	300	Refer to C10-C12 aromatic *
Aliphatic >C12-C16	Log Koc	l/kg	6.73 (5370318)	S4ULs
	Half-life	Days	417	Based on C12-C16 aromatic for acenaphthylene as the indicator compound (125 to 417 days) *
Aliphatic >C16-C21	Log Koc	l/kg	8.76 (575439937)	S4ULs
	Half-life	Days	1250	Refer to C16-C21 aromatic *
Aliphatic >C21-C35	Log Koc	l/kg	8.76 (575439937)	S4ULs
	Half-life	Days	1250	Refer to C21-C35 aromatic *
Aromatic >C10-C12	Log Koc	l/kg	3.40 (2512)	S4ULs
	Half-life	Days	300	Environment Agency 2002 R&D P2-228/TR for naphthalene as indicator compound (42 to 125 days in R&D P2-228/TR).
Aromatic >EC16-EC21	Log Koc	l/kg	4.15 (14125)	S4ULs
	Half-life	Days	417	P5-079/TR1 reference to: Mackay, D., W. Shiu, et al. (1991) for fluorene, phenanthrene and anthracene as indicator compounds (125 to 417 days)
Aromatic C21-C35	Log Koc	l/kg	5.1 (125893)	S4ULs
	Half-life	Days	1250	TPHCWG Volume 3 (1997) indicates chrysene and fluoranthene are both good indicator compounds (417 to 1250 days). Consim half life for chrysene range of 1314-2957 days, fluoranthene half life in ConSim 1132-2847 days.
Notes:				
* Research indicates degradation rates for aliphatic and aromatic fractions are similar or aromatic degradation is slower than aliphatic compounds in aerobic environments. Rapid degradation rates for isoalkane hydrocarbons are indicated in https://echa.europa.eu/registration-dossier/-/registered-dossier/13655/5/1				
Koc: Organic carbon partition coefficient				
Values in brackets relate to un-logged Koc				
S4UL – Nathanail, C. P., <i>et al.</i> (2015). The LQM/CIEH S4ULs for Human Health Risk Assessment.				

Contaminant	Parameter	Units	Value	Source
Environment Agency, 2003, P5-079/TR1 Review of the Fate and Transport of Selected Contaminants in the Soil Environment. With reference to: Mackay, D., W. Shiu, et al. (1991).				
Environment Agency, 2002. R&D P2-228/TR The Effects of Contaminant Concentration on the Potential for Natural Attenuation				

The remedial targets have been derived in RTW model using the Ogata-Banks analytical solution which the RTW User Manual indicates is the Environment Agency's preferred solution for calculating Level 3 remedial targets for pollutants subject to first-order degradation in a homogeneous aquifer.

The approach for simulating degradation of pollutants in the RTW model has been based on applying degradation rates to the dissolved phase only.

The remedial target concentration for petroleum hydrocarbons has been based on the lower limit of detection (1 µg/l).

Aquifer Pathway and Receptor Input Parameters

The parameters used within the RTW model are included in Table A3 below, including justifications which are obtained from site observations, where available, and literature values and references.

Table A2-2: Level 3 Groundwater - Saturated Zone Migration Pathway Parameters

Parameter (Aquifer)	Units	Model Value	Justification / Reference
Fraction of organic carbon	fraction	0.002	Soil testing for organic carbon in glaciofluvial deposits. No results for granular upper Glacial Till, adopted value from the glaciofluvial deposits
Width of contaminant source	m	10	Assumed width of source for shallow and deep strata perpendicular to groundwater flow based on BH102.
Plume thickness - shallow	m	0.75	Set to maximum so that dispersed plume thickness does not exceed aquifer thickness.
Plume thickness - deep	m	1	Assumed thickness for contaminants entering granular upper Glacial Till from downward vertical migration (monitoring well screen length in BH102 of 1.3m).
Saturated Aquifer Thickness - shallow	m	1.0	Glaciofluvial deposits highly variable. Saturated thickness of shallow glaciofluvial deposits recorded from ground investigation at WS102 where highest concentrations of petroleum hydrocarbons were obtained.
Saturated Aquifer Thickness - deep	m	8.3	Recorded thickness of upper granular Glacial Till in BH102.
Bulk Density	g/cm ³	2.0	Range values were derived from weight density values given in BS 8004:2015 for sand and gravel of medium density and below the groundwater table.
Effective Porosity	fraction	0.30	Value falls within the range of literature values for effective porosity provided by McWorter and Sunada (1977) for fine to coarse sand and gravel.
Hydraulic Gradient	fraction	0.004	Calculated from groundwater levels within glaciofluvial deposits from WS105 to WS102 based on flow to the northwest (0.003 and 0.004). No data for granular upper Glacial Till as wells are located approximately perpendicular to the hydraulic gradient so similar value to glaciofluvial deposits adopted.
Hydraulic Conductivity - shallow	m/day	4.65	Estimated from particle size distribution testing on glaciofluvial deposits using Kozeny-Carmen formula. Estimated hydraulic conductivity values range from 5.63×10^{-7} m/s to 2.03×10^{-3} m/s, with a median value of 5.4×10^{-5} m/s (4.65 m/day).
Hydraulic Conductivity - deep	m/day	19.4	Estimated from particle size distribution testing on granular upper Glacial Till using Kozeny-Carmen formula. Estimated hydraulic conductivity values range from 6.25×10^{-8} m/s to 1.0×10^{-1} m/s, with a median value of 2.25×10^{-4} m/s (19.4 m/day).
Distance to Compliance Point	m	250m	Based on distance from RBS to closest site boundary in direction of groundwater flow to the west / northwest.
Dispersivity	m	-	Model calculated based on: Longitudinal Dispersivity: 10% of pathway length Transverse Dispersivity: 1% of pathway length Vertical Dispersivity: 0.1% of pathway length
Time since pollutant entered groundwater	Days	1E+99	Set to a large number to simulate steady-state conditions.

Remedial Target Worksheets - Shallow Groundwater

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

Contaminant	C12-16 Aliphatic	From Level 1
Target Concentration	C _T 1.00E-03	mg/l from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks	Equations in HRA publication
-------------	------------------------------

Approach for simulating vertical dispersion:

Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants:

Apply degradation rate to dissolved pollutants only

Initial contaminant concentration in groundwater at plume core	C ₀	5.30E-03	mg/l	
Half life for degradation of contaminant in water	t _{1/2}	4.15E+02	days	
Calculated decay rate	λ	1.67E-03	days ⁻¹	
Width of plume in aquifer at source (perpendicular to flow)	Sz	1.00E+01	m	
Plume thickness at source	Sy	7.50E-01	m	
Saturated aquifer thickness	da	1.00E+00	m	
Bulk density of aquifer materials	p	2.00E+00	g/cm ³	
Effective porosity of aquifer	n	3.00E-01	fraction	
Hydraulic gradient	I	4.00E-03	fraction	
Hydraulic conductivity of aquifer	K	4.65E+00	m/d	
Distance to compliance point	x	2.50E+02	m	
Distance (lateral) to compliance point perpendicular to flow direction	z	0.00E+00	m	
Distance (depth) to compliance point perpendicular to flow direction	y	0.00E+00	m	
Time since pollutant entered groundwater	t	9.99E+99	days	time variant options only
Parameters values determined from options				
Partition coefficient	Kd	1.07E+04	l/kg	see options
Longitudinal dispersivity	ax	2.50E+01	m	see options
Transverse dispersivity	az	2.50E+00	m	see options
Vertical dispersivity	ay	2.50E-01	m	see options

Calculated Parameters

Groundwater flow velocity	v	6.20E-02	m/d
Retardation factor	Rf	7.16E+04	fraction
Decay rate used	λ	2.33E-08	d ⁻¹
Rate of contaminant flow due to retardation	u	8.66E-07	m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C _{ED}	3.17E-07	mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	AF	1.67E+04	

Remedial Targets

Remedial Target	1.67E+01	mg/l	For comparison with measured groundwater concentration.
Ogata Banks			
Distance to compliance point	250	m	
Concentration of contaminant at compliance point after	C _{ED} /C ₀ 3.17E-07	mg/l	Ogata Banks
	1.0E+100	days	

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target. The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

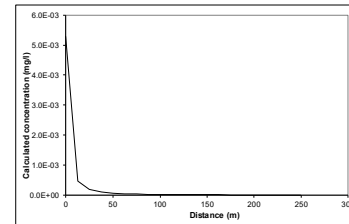
Entry if specify partition coefficient (option)

Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	f _{oc}	2.00E-03	fraction
Organic carbon partition coefficient	K _{oc}	5.37E+06	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	K _{oc,r}		l/kg
Sorption coefficient for ionised species	K _{oc,i}		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	f _{oc}		fraction
Soil water partition coefficient	Kd	1.07E+04	l/kg

Define dispersivity (click brown cell and use pull down list)

Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value Xu & Eckstein	m
Longitudinal dispersivity	ax	0.00E+00	2.50E+01	0.00E+00
Transverse dispersivity	az	0.00E+00	2.50E+00	0.00E+00
Vertical dispersivity	ay	0.00E+00	2.50E-01	0.00E+00
Note values of dispersivity must be > 0				
For calculated value, assumes ax = 0.1 * x, az = 0.01 * x, ay = 0.001 * x				
Xu & Eckstein (1995) report ax = 0.83(log ₁₀ x) ^{0.414} ; az = ax/10, ay = ax/100 are assumed				



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source. Three solution methods are included; the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action. Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best described by an electron limited degradation such as oxidation by O₂, NO₃, SO₄ etc than an alternative solution should be used

Site being assessed:	Enter site name
Completed by:	Enter user name
Date:	Enter date
Version:	x.xx

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

Contaminant	C21-35 Aromatic	from Level 1
Target Concentration	C _T 1.00E-03	mg/l from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks	Equations in HRA publication
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Approach for simulating vertical dispersion:

Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants:

Apply degradation rate to dissolved pollutants only

Initial contaminant concentration in groundwater at plume core	C ₀	9.00E-01	mg/l	
Half life for degradation of contaminant in water	t _{1/2}	1.25E+03	days	
Calculated decay rate	λ	5.55E-04	days ⁻¹	
Width of plume in aquifer at source (perpendicular to flow)	Sz	1.00E+01	m	
Plume thickness at source	Sy	7.50E-01	m	
Saturated aquifer thickness	da	1.00E+00	m	
Bulk density of aquifer materials	p	2.00E+00	g/cm ³	
Effective porosity of aquifer	n	3.00E-01	fraction	
Hydraulic gradient	I	4.00E-03	fraction	
Hydraulic conductivity of aquifer	K	4.65E+00	m/d	
Distance to compliance point	x	2.50E+02	m	
Distance (lateral) to compliance point perpendicular to flow direction	z	0.00E+00	m	
Distance (depth) to compliance point perpendicular to flow direction	y	0.00E+00	m	
Time since pollutant entered groundwater	t	9.99E+99	days	time variant options only
Parameters values determined from options				
Partition coefficient	Kd	2.52E+02	l/kg	see options
Longitudinal dispersivity	ax	2.50E+01	m	see options
Transverse dispersivity	az	2.50E+00	m	see options
Vertical dispersivity	ay	2.50E-01	m	see options

Calculated Parameters

Groundwater flow velocity	v	6.20E-02	m/d
Retardation factor	Rf	1.68E+03	fraction
Decay rate used	λ	3.30E-07	d ⁻¹
Rate of contaminant flow due to retardation	u	3.69E-05	m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C _{ED}	8.24E-04	mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	AF	1.09E+03	

Remedial Targets

Remedial Target	1.09E+00	mg/l	For comparison with measured groundwater concentration.
Ogata Banks			
Distance to compliance point	250	m	
Concentration of contaminant at compliance point after	C _{ED} /C ₀ 8.24E-04	mg/l	Ogata Banks
	1.0E+100	days	

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target. The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

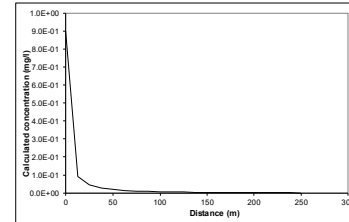
Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)		
Soil water partition coefficient	Kd	
Entry for non-polar organic chemicals (option)		
Fraction of organic carbon in aquifer	foc	2.00E-03
Organic carbon partition coefficient	Koc	1.26E+05
Entry for ionic organic chemicals (option)		
Sorption coefficient for related species	K _{oc,r}	
Sorption coefficient for ionised species	K _{oc,i}	
pH value	pH	
acid dissociation constant	pKa	
Fraction of organic carbon in aquifer	foc	
Soil water partition coefficient	Kd	2.52E+02

Define dispersivity (click brown cell and use pull down list)

Dispersivities 10%, 1%, 0.1% of pathway length

Longitudinal dispersivity	ax	Enter value	Calc value Xu & Eckstein	m
Transverse dispersivity	az	0.00E+00	2.50E+00	0.00E+00
Vertical dispersivity	ay	0.00E+00	2.50E-01	0.00E+00
Note values of dispersivity must be > 0				
For calculated value, assumes ax = 0.1 * x, az = 0.01 * x, ay = 0.001 * x				
Xu & Eckstein (1995) report ax = 0.83(log ₁₀ x) ^{0.414} ; az = ax/10, ay = ax/100 are assumed				



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source. Three solution methods are included; the preferred option is Ogata Banks. By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action. Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best described by an electron limited degradation such as oxidation by O₂, NO₃, SO₄ etc than an alternative solution should be used

Site being assessed:	Enter site name
Completed by:	Enter user name
Date:	Enter date
Version:	x.xx

Calculated concentrations for distance-concentration graph

Ogata Banks	
From calculation sheet	
Distance	Concentration

0	9.0E-01
12.5	9.14E-02
25.0	4.32E-02
37.5	2.66E-02
50.0	1.83E-02
62.5	1.34E-02
75.0	1.02E-02
87.5	7.94E-03
100.0	6.34E-03
112.5	5.13E-03
125.0	4.21E-03
137.5	3.48E-03
150.0	2.91E-03
162.5	2.48E-03
175.0	2.07E-03
187.5	1.76E-03
200.0	1.50E-03
212.5	1.29E-03
225.0	1.11E-03
237.5	9.53E-04
250.0	8.24E-04

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

Contaminant	C16-21 Aromatic	From Level 1
Target Concentration	C _T 1.00E-03	mg/l from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks	Equations in HRA publication
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Approach for simulating vertical dispersion:

Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants:

Apply degradation rate to dissolved pollutants only

Initial contaminant concentration in groundwater at plume core	C ₀	1.20E-02	mg/l	
Half life for degradation of contaminant in water	t _{1/2}	3.00E+03	days	
Calculated decay rate	λ	2.31E-04	days ⁻¹	
Width of plume in aquifer at source (perpendicular to flow)	Sz	1.00E+01	m	
Plume thickness at source	Sy	7.50E-01	m	
Saturated aquifer thickness	da	1.00E+00	m	
Bulk density of aquifer materials	p	2.00E+00	g/cm ³	
Effective porosity of aquifer	n	3.00E-01	fraction	
Hydraulic gradient	I	4.00E-03	fraction	
Hydraulic conductivity of aquifer	K	4.65E+00	m/d	
Distance to compliance point	x	2.50E+02	m	
Distance (lateral) to compliance point perpendicular to flow direction	z	0.00E+00	m	
Distance (depth) to compliance point perpendicular to flow direction	y	0.00E+00	m	
Time since pollutant entered groundwater	t	9.99E+99	days	time variant options only

Parameters values determined from options				
Partition coefficient	Kd	2.83E+01	l/kg	see options
Longitudinal dispersivity	ax	2.50E+01	m	see options
Transverse dispersivity	az	2.50E+00	m	see options
Vertical dispersivity	ay	2.50E-01	m	see options

Calculated Parameters

Groundwater flow velocity	v	6.20E-02	m/d	
Retardation factor	Rf	1.89E+02	fraction	
Decay rate used	λ	1.22E-06	d ⁻¹	
Rate of contaminant flow due to retardation	u	3.27E-04	m/d	
Contaminant concentration at distance x, assuming one-way vertical dispersion	C _{ED}	3.06E-05	mg/l	
Attenuation factor (one way vertical dispersion, CO/CED)	AF	3.92E+02		

Remedial Targets

Remedial Target	3.92E-01	mg/l	For comparison with measured groundwater concentration.
Ogata Banks			
Distance to compliance point	250	m	
Concentration of contaminant at compliance point after	C _{ED} /C ₀ 1.0E+100	mg/l days	Ogata Banks

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target. The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

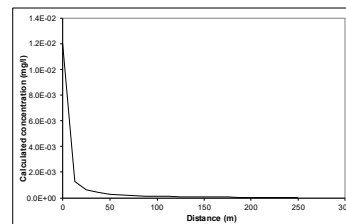
Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)		
Soil water partition coefficient	Kd	2.83E+01 l/kg
Entry for non-polar organic chemicals (option)		
Fraction of organic carbon in aquifer	f _{oc}	2.00E-03 fraction
Organic carbon partition coefficient	K _{oc}	1.41E+04 l/kg
Entry for ionic organic chemicals (option)		
Sorption coefficient for related species	K _{oc,r}	l/kg
Sorption coefficient for ionised species	K _{oc,i}	l/kg
pH value	pH	
acid dissociation constant	pKa	
Fraction of organic carbon in aquifer	f _{oc}	fraction
Soil water partition coefficient	Kd	2.83E+01 l/kg

Define dispersivity (click brown cell and use pull down list)

Dispersivities 10%, 1%, 0.1% of pathway length

Longitudinal dispersivity	ax	Enter value 1.00E+00	Calc value Xu & Eckstein 2.50E+01	3.92E+01 m
Transverse dispersivity	az	0.00E+00	2.50E+00	6.86E-01 m
Vertical dispersivity	ay	0.00E+00	2.50E-01	6.86E-02 m
Note values of dispersivity must be > 0				
For calculated value, assumes ax = 0.1 * x, az = 0.01 * x, ay = 0.001 * x				
Xu & Eckstein (1995) report ax = 0.83(log ₁₀ x) ^{0.414} ; az = ax/10, ay = ax/100 are assumed				



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source. Three solution methods are included; the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action. Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best described by an electron limited degradation such as oxidation by O₂, NO₃, SO₄ etc than an alternative solution should be used

Site being assessed:	Enter site name
Completed by:	Enter user name
Date:	Enter date
Version:	x.xx

Calculated concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Concentration
	mg/l
0	1.2E-02
12.5	1.28E-03
25.0	6.39E-04
37.5	4.13E-04
50.0	2.99E-04
62.5	2.30E-04
75.0	1.84E-04
87.5	1.52E-04
100.0	1.27E-04
112.5	1.08E-04
125.0	9.36E-05
137.5	8.16E-05
150.0	7.17E-05
162.5	6.34E-05
175.0	5.65E-05
187.5	5.05E-05
200.0	4.54E-05
212.5	4.09E-05
225.0	3.70E-05
237.5	3.36E-05
250.0	3.06E-05

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

Contaminant	C21-35 Aliphatic	From Level 1
Target Concentration	C _T 1.00E-03	mg/l from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks	Equations in HRA publication
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Approach for simulating vertical dispersion:

Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants:

Apply degradation rate to dissolved pollutants only

Initial contaminant concentration in groundwater at plume core	C ₀	5.00E-01	mg/l	
Half life for degradation of contaminant in water	t _{1/2}	1.25E+03	days	
Calculated decay rate	λ	5.55E-04	days ⁻¹	
Width of plume in aquifer at source (perpendicular to flow)	Sz	1.00E+01	m	
Plume thickness at source	Sy	7.50E-01	m	
Saturated aquifer thickness	da	1.00E+00	m	
Bulk density of aquifer materials	p	2.00E+00	g/cm ³	
Effective porosity of aquifer	n	3.00E-01	fraction	
Hydraulic gradient	I	4.00E-03	fraction	
Hydraulic conductivity of aquifer	K	4.65E+00	m/d	
Distance to compliance point	x	2.50E+02	m	
Distance (lateral) to compliance point perpendicular to flow direction	z	0.00E+00	m	
Distance (depth) to compliance point perpendicular to flow direction	y	0.00E+00	m	
Time since pollutant entered groundwater	t	9.99E+99	days	time variant options only
Parameters values determined from options				
Partition coefficient	Kd	1.15E+06	l/kg	see options
Longitudinal dispersivity	ax	2.50E+01	m	see options
Transverse dispersivity	az	2.50E+00	m	see options
Vertical dispersivity	ay	2.50E-01	m	see options

Calculated Parameters

Groundwater flow velocity	v	6.20E-02	m/d
Retardation factor	Rf	7.67E+06	fraction
Decay rate used	λ	7.23E-11	d ⁻¹
Rate of contaminant flow due to retardation	u	8.08E-09	m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C _{ED}	4.58E-04	mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	AF	1.09E+03	

Remedial Targets

Remedial Target	1.09E+00	mg/l	For comparison with measured groundwater concentration.
Ogata Banks			
Distance to compliance point	250	m	
Concentration of contaminant at compliance point after	C _{ED} /C ₀ 4.58E-04	mg/l	Ogata Banks
	1.0E+100	days	

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target. The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

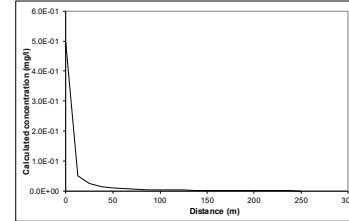
Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)		
Soil water partition coefficient	Kd	1.15E+06 l/kg
Entry for non-polar organic chemicals (option)		
Fraction of organic carbon in aquifer	f _{oc}	2.00E-03 fraction
Organic carbon partition coefficient	K _{oc}	5.75E+08 l/kg
Entry for ionic organic chemicals (option)		
Sorption coefficient for related species	K _{oc,r}	l/kg
Sorption coefficient for ionised species	K _{oc,i}	l/kg
pH value	pH	
acid dissociation constant	pKa	
Fraction of organic carbon in aquifer	f _{oc}	fraction
Soil water partition coefficient	Kd	1.15E+06 l/kg

Define dispersivity (click brown cell and use pull down list)

Dispersivities 10%, 1%, 0.1% of pathway length

Longitudinal dispersivity	ax	Enter value 1.00E+00	Calc value Xu & Eckstein 2.50E+01	m
Transverse dispersivity	az	0.00E+00	2.50E+00	m
Vertical dispersivity	ay	0.00E+00	2.50E-01	m
Note values of dispersivity must be > 0				
For calculated value, assumes ax = 0.1 * x, az = 0.01 * x, ay = 0.001 * x				
Xu & Eckstein (1995) report ax = 0.83(log ₁₀ x) ^{0.414} ; az = ax/10, ay = ax/100 are assumed				



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source. Three solution methods are included; the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action. Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best described by an electron limited degradation such as oxidation by O₂, NO₃, SO₄ etc than an alternative solution should be used

Site being assessed:	Enter site name
Completed by:	Enter user name
Date:	Enter date
Version:	x.xx

Calculated concentrations for distance-concentration graph

Ogata Banks	
From calculation sheet	
Distance	Concentration

0	5.0E-01
12.5	5.00E-02
25.0	2.40E-02
37.5	1.48E-02
50.0	1.02E-02
62.5	7.42E-03
75.0	5.66E-03
87.5	4.41E-03
100.0	3.52E-03
112.5	2.85E-03
125.0	2.34E-03
137.5	1.94E-03
150.0	1.62E-03
162.5	1.36E-03
175.0	1.15E-03
187.5	9.76E-04
200.0	8.33E-04
212.5	7.14E-04
225.0	6.14E-04
237.5	5.30E-04
250.0	4.58E-04

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

Contaminant	C16-21 Aliphatic	From Level 1
Target Concentration	C _T 1.00E-03	mg/l from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks	Equations in HRA publication
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Approach for simulating vertical dispersion:

Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants:

Apply degradation rate to dissolved pollutants only

Initial contaminant concentration in groundwater at plume core	C ₀	8.00E-03	mg/l	
Half life for degradation of contaminant in water	t _{1/2}	1.75E+03	days	
Calculated decay rate	λ	3.96E-04	days ⁻¹	
Width of plume in aquifer at source (perpendicular to flow)	Sz	1.00E+01	m	
Plume thickness at source	Sy	7.50E-01	m	
Saturated aquifer thickness	da	1.00E+00	m	
Bulk density of aquifer materials	p	2.00E+00	g/cm ³	
Effective porosity of aquifer	n	3.00E-01	fraction	
Hydraulic gradient	I	4.00E-03	fraction	
Hydraulic conductivity of aquifer	K	4.65E+00	m/d	
Distance to compliance point	x	2.50E+02	m	
Distance (lateral) to compliance point perpendicular to flow direction	z	0.00E+00	m	
Distance (depth) to compliance point perpendicular to flow direction	y	0.00E+00	m	
Time since pollutant entered groundwater	t	9.99E+99	days	time variant options only

Parameters values determined from options				
Partition coefficient	Kd	1.15E+06	l/kg	see options
Longitudinal dispersivity	ax	2.50E+01	m	see options
Transverse dispersivity	az	2.50E+00	m	see options
Vertical dispersivity	ay	2.50E-01	m	see options

Calculated Parameters

Groundwater flow velocity	v	6.20E-02	m/d	
Retardation factor	Rf	7.67E+06	fraction	
Decay rate used	λ	5.16E-11	d ⁻¹	
Rate of contaminant flow due to retardation	u	8.08E-09	m/d	
Contaminant concentration at distance x, assuming one-way vertical dispersion	C _{ED}	1.19E-05	mg/l	
Attenuation factor (one way vertical dispersion, CO/CED)	AF	6.75E+02		

Remedial Targets

Remedial Target	6.75E-01	mg/l	For comparison with measured groundwater concentration.
Ogata Banks			
Distance to compliance point	250	m	
Concentration of contaminant at compliance point after	C _{ED} /C ₀ 1.19E-05	mg/l	Ogata Banks
	1.0E+100	days	

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target. The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	f _{oc}	2.00E-03	fraction
Organic carbon partition coefficient	K _{oc}	5.75E+08	l/kg

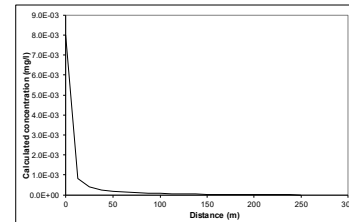
Entry for ionic organic chemicals (option)

Sorption coefficient for related species	K _{oc,r}		l/kg
Sorption coefficient for ionised species	K _{oc,i}		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	f _{oc}		fraction
Soil water partition coefficient	Kd	1.15E+06	l/kg

Define dispersivity (click brown cell and use pull down list)

Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value Xu & Eckstein	m
Longitudinal dispersivity	ax	0.00E+00	2.50E+01	0.00E+00
Transverse dispersivity	az	0.00E+00	2.50E+00	0.00E+00
Vertical dispersivity	ay	0.00E+00	2.50E-01	0.00E+00
Note values of dispersivity must be > 0				
For calculated value, assumes ax = 0.1 * x, az = 0.01 * x, ay = 0.001 * x				
Xu & Eckstein (1995) report ax = 0.83(log ₁₀ x) ^{0.416} ; az = ax/10, ay = ax/100 are assumed				



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source. Three solution methods are included; the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action. Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best described by an electron limited degradation such as oxidation by O₂, NO₃, SO₄ etc than an alternative solution should be used

Site being assessed: Enter site name
Completed by: Enter user name
Date: Enter date
Version: x.xx

Calculated concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Concentration
	mg/l
0	8.0E-03
12.5	8.32E-04
25.0	4.03E-04
37.5	2.54E-04
50.0	1.79E-04
62.5	1.34E-04
75.0	1.04E-04
87.5	8.36E-05
100.0	6.83E-05
112.5	5.66E-05
125.0	4.76E-05
137.5	4.04E-05
150.0	3.45E-05
162.5	2.97E-05
175.0	2.57E-05
187.5	2.24E-05
200.0	1.96E-05
212.5	1.72E-05
225.0	1.51E-05
237.5	1.34E-05
250.0	1.19E-05

Remedial Target Worksheets - Deep Groundwater

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

Contaminant	C10-12 Aliphatic	From Level 1
Target Concentration	C _T 1.00E-03	mg/l from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks	Equations in HRA publication
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Approach for simulating vertical dispersion: Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

Initial contaminant concentration in groundwater at plume core	C ₀	3.60E-01	mg/l	
Half life for degradation of contaminant in water	t _{1/2}	3.00E+02	days	
Calculated decay rate	λ	2.31E-03	days ⁻¹	
Width of plume in aquifer at source (perpendicular to flow)	Sz	1.00E+01	m	
Plume thickness at source	Sy	1.00E+00	m	
Saturated aquifer thickness	da	8.30E+00	m	
Bulk density of aquifer materials	p	2.00E+00	g/cm ³	
Effective porosity of aquifer	n	3.00E-01	fraction	
Hydraulic gradient	I	4.00E-03	fraction	
Hydraulic conductivity of aquifer	K	1.94E+01	m/d	
Distance to compliance point	x	2.50E+02	m	
Distance (lateral) to compliance point perpendicular to flow direction	z	0.00E+00	m	
Distance (depth) to compliance point perpendicular to flow direction	y	0.00E+00	m	
Time since pollutant entered groundwater	t	9.99E+99	days	time variant options only
Parameters values determined from options				
Partition coefficient	Kd	4.80E+02	l/kg	see options
Longitudinal dispersivity	ax	2.50E+01	m	see options
Transverse dispersivity	az	2.50E+00	m	see options
Vertical dispersivity	ay	2.50E-01	m	see options

Calculated Parameters

Groundwater flow velocity	v	2.59E-01	m/d
Retardation factor	Rf	3.20E+03	fraction
Decay rate used	λ	7.22E-07	d ⁻¹
Rate of contaminant flow due to retardation	u	8.08E-05	m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C _{ED}	4.40E-04	mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	AF	8.17E+02	

Remedial Targets

Remedial Target	8.17E-01	mg/l	For comparison with measured groundwater concentration.
Ogata Banks			
Distance to compliance point	250	m	
Concentration of contaminant at compliance point after	C _{ED} /C ₀ 4.40E-04	mg/l	Ogata Banks
	1.0E+100	days	

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target. The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

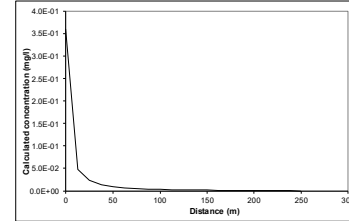
Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)		
Soil water partition coefficient	Kd	
Entry for non-polar organic chemicals (option)		
Fraction of organic carbon in aquifer	foc	2.00E-03 fraction
Organic carbon partition coefficient	Koc	2.40E+05 l/kg
Entry for ionic organic chemicals (option)		
Sorption coefficient for related species	K _{oc,1}	
Sorption coefficient for ionised species	K _{oc,2}	
pH value	pH	
acid dissociation constant	pKa	
Fraction of organic carbon in aquifer	foc	
Soil water partition coefficient	Kd	4.80E+02 l/kg

Define dispersivity (click brown cell and use pull down list)

Dispersivities 10%, 1%, 0.1% of pathway length

Longitudinal dispersivity	ax	Enter value	Calc value Xu & Eckstein	m
Transverse dispersivity	az	0.00E+00	2.50E+00	0.00E+00
Vertical dispersivity	ay	0.00E+00	2.50E-01	0.00E+00
Note values of dispersivity must be > 0				
For calculated value, assumes ax = 0.1 * x, az = 0.01 * x, ay = 0.001 * x				
Xu & Eckstein (1995) report ax = 0.83(log ₁₀ x) ^{0.414} ; az = ax/10, ay = ax/100 are assumed				



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source. Three solution methods are included; the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action. Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best described by an electron limited degradation such as oxidation by O₂, NO₃, SO₄ etc than an alternative solution should be used

Site being assessed:	Enter site name
Completed by:	Enter user name
Date:	Enter date
Version:	x.xx

Calculated concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Concentration
0	3.6E-01
12.5	4.82E-02
25.0	2.29E-02
37.5	1.41E-02
50.0	9.72E-03
62.5	7.11E-03
75.0	5.41E-03
87.5	4.23E-03
100.0	3.38E-03
112.5	2.74E-03
125.0	2.24E-03
137.5	1.86E-03
150.0	1.55E-03
162.5	1.30E-03
175.0	1.10E-03
187.5	9.38E-04
200.0	8.01E-04
212.5	6.86E-04
225.0	5.90E-04
237.5	5.09E-04
250.0	4.40E-04

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

Contaminant	C16-21 Aromatic	From Level 1
Target Concentration	C _T 1.00E-03	mg/l from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks	Equations in HRA publication
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Approach for simulating vertical dispersion:

Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants:

Apply degradation rate to dissolved pollutants only

Initial contaminant concentration in groundwater at plume core	C ₀	9.70E-03	mg/l	
Half life for degradation of contaminant in water	t _{1/2}	3.00E+03	days	
Calculated decay rate	λ	2.31E-04	days ⁻¹	
Width of plume in aquifer at source (perpendicular to flow)	Sz	2.00E+00	m	
Plume thickness at source	Sy	1.00E+00	m	
Saturated aquifer thickness	da	8.30E+00	m	
Bulk density of aquifer materials	p	2.00E+00	g/cm ³	
Effective porosity of aquifer	n	3.00E-01	fraction	
Hydraulic gradient	I	4.00E-03	fraction	
Hydraulic conductivity of aquifer	K	1.94E+01	m/d	
Distance to compliance point	x	2.50E+02	m	
Distance (lateral) to compliance point perpendicular to flow direction	z	0.00E+00	m	
Distance (depth) to compliance point perpendicular to flow direction	y	0.00E+00	m	
Time since pollutant entered groundwater	t	9.99E+99	days	time variant options only
Parameters values determined from options				
Partition coefficient	Kd	2.83E+01	l/kg	see options
Longitudinal dispersivity	ax	2.50E+01	m	see options
Transverse dispersivity	az	2.50E+00	m	see options
Vertical dispersivity	ay	2.50E-01	m	see options

Calculated Parameters

Groundwater flow velocity	v	2.59E-01	m/d	
Retardation factor	Rf	1.89E+02	fraction	
Decay rate used	λ	1.22E-06	d ⁻¹	
Rate of contaminant flow due to retardation	u	1.37E-03	m/d	
Contaminant concentration at distance x, assuming one-way vertical dispersion	C _{ED}	1.25E-05	mg/l	
Attenuation factor (one way vertical dispersion, CO/CED)	AF	7.74E+02		

Remedial Targets

Remedial Target	7.74E-01	mg/l	For comparison with measured groundwater concentration.
Ogata Banks			
Distance to compliance point	250	m	
Concentration of contaminant at compliance point after	C _{ED} /C ₀ 1.25E-05	mg/l	Ogata Banks
	1.0E+100	days	

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target. The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

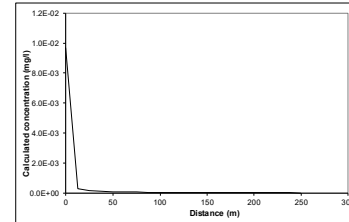
Entry if specify partition coefficient (option)

Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	f _{oc}	2.00E-03	fraction
Organic carbon partition coefficient	K _{oc}	1.41E+04	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	K _{oc,r}		l/kg
Sorption coefficient for ionised species	K _{oc,i}		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	f _{oc}		fraction
Soil water partition coefficient	Kd	2.83E+01	l/kg

Define dispersivity (click brown cell and use pull down list)

Dispersivities 10%, 1%, 0.1% of pathway length

Longitudinal dispersivity	ax	Enter value 1.00E+00	Calc value Xu & Eckstein 2.50E+01	m
Transverse dispersivity	az	0.00E+00	2.50E+00	m
Vertical dispersivity	ay	0.00E+00	2.50E-01	m
Note values of dispersivity must be > 0				
For calculated value, assumes ax = 0.1 * x, az = 0.01 * x, ay = 0.001 * x				
Xu & Eckstein (1995) report ax = 0.83(log ₁₀ x) ^{0.414} ; az = ax/10, ay = ax/100 are assumed				



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source. Three solution methods are included; the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action. Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best described by an electron limited degradation such as oxidation by O₂, NO₃, SO₄ etc than an alternative solution should be used

Site being assessed:	Enter site name
Completed by:	Enter user name
Date:	Enter date
Version:	x.xx

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

Contaminant	C10-12 Aromatic	From Level 1
Target Concentration	C _T 1.00E-03	mg/l from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks	Equations in HRA publication
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Approach for simulating vertical dispersion:

Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants:

Apply degradation rate to dissolved pollutants only

Initial contaminant concentration in groundwater at plume core	C ₀	1.50E-01	mg/l	
Half life for degradation of contaminant in water	t _{1/2}	3.00E+02	days	
Calculated decay rate	λ	2.31E-03	days ⁻¹	
Width of plume in aquifer at source (perpendicular to flow)	Sz	1.00E+01	m	
Plume thickness at source	Sy	1.00E+00	m	
Saturated aquifer thickness	da	8.30E+00	m	
Bulk density of aquifer materials	p	2.00E+00	g/cm ³	
Effective porosity of aquifer	n	3.00E-01	fraction	
Hydraulic gradient	I	4.00E-03	fraction	
Hydraulic conductivity of aquifer	K	1.94E+01	m/d	
Distance to compliance point	x	2.50E+02	m	
Distance (lateral) to compliance point perpendicular to flow direction	z	0.00E+00	m	
Distance (depth) to compliance point perpendicular to flow direction	y	0.00E+00	m	
Time since pollutant entered groundwater	t	9.99E+99	days	time variant options only
Parameters values determined from options				
Partition coefficient	Kd	5.02E+00	l/kg	see options
Longitudinal dispersivity	ax	2.50E+01	m	see options
Transverse dispersivity	az	2.50E+00	m	see options
Vertical dispersivity	ay	2.50E-01	m	see options

Calculated Parameters

Groundwater flow velocity	v	2.59E-01	m/d
Retardation factor	Rf	3.45E+01	fraction
Decay rate used	λ	6.70E-05	d ⁻¹
Rate of contaminant flow due to retardation	u	7.50E-03	m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C _{ED}	1.83E-04	mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	AF	8.17E+02	

Remedial Targets

Remedial Target	8.17E-01	mg/l	For comparison with measured groundwater concentration.
Ogata Banks			
Distance to compliance point	250	m	
Concentration of contaminant at compliance point after	C _{ED} /C ₀ 1.83E-04	mg/l	Ogata Banks
	1.0E+100	days	

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target. The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

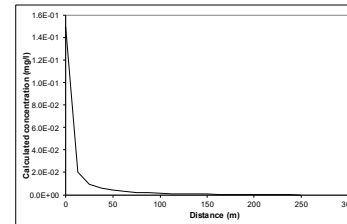
Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)		
Soil water partition coefficient	Kd	5.02E+00 l/kg
Entry for non-polar organic chemicals (option)		
Fraction of organic carbon in aquifer	f _{oc}	2.00E-03 fraction
Organic carbon partition coefficient	K _{oc}	2.51E+03 l/kg
Entry for ionic organic chemicals (option)		
Sorption coefficient for related species	K _{oc,r}	l/kg
Sorption coefficient for ionised species	K _{oc,i}	l/kg
pH value	pH	
acid dissociation constant	pKa	
Fraction of organic carbon in aquifer	f _{oc}	fraction
Soil water partition coefficient	Kd	5.02E+00 l/kg

Define dispersivity (click brown cell and use pull down list)

Dispersivities 10%, 1%, 0.1% of pathway length

Longitudinal dispersivity	ax	Enter value 1.83E+00	Calc value Xu & Eckstein 2.50E+01	3.36E+01	m
Transverse dispersivity	az	0.00E+00	2.50E+00	6.86E-01	m
Vertical dispersivity	ay	0.00E+00	2.50E-01	6.86E-02	m
Note values of dispersivity must be > 0					
For calculated value, assumes ax = 0.1 * x, az = 0.01 * x, ay = 0.001 * x					
Xu & Eckstein (1995) report ax = 0.83(log ₁₀ x) ^{0.414} ; az = ax/10, ay = ax/100 are assumed					



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source. Three solution methods are included; the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action. Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best described by an electron limited degradation such as oxidation by O₂, NO₃, SO₄ etc than an alternative solution should be used

Site being assessed:	Enter site name
Completed by:	Enter user name
Date:	Enter date
Version:	x.xx

Calculated concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Concentration
	mg/l
0	1.3E-01
12.5	2.01E-02
25.0	9.56E-03
37.5	5.89E-03
50.0	4.05E-03
62.5	2.96E-03
75.0	2.26E-03
87.5	1.76E-03
100.0	1.41E-03
112.5	1.14E-03
125.0	9.35E-04
137.5	7.74E-04
150.0	6.47E-04
162.5	5.44E-04
175.0	4.60E-04
187.5	3.91E-04
200.0	3.34E-04
212.5	2.86E-04
225.0	2.46E-04
237.5	2.12E-04
250.0	1.83E-04

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

Contaminant	C21-35 Aliphatic	From Level 1
Target Concentration	C _T 1.00E-03	mg/l from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks	Equations in HRA publication
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Approach for simulating vertical dispersion:

Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants:

Apply degradation rate to dissolved pollutants only

Initial contaminant concentration in groundwater at plume core	C ₀	2.60E-03	mg/l	
Half life for degradation of contaminant in water	t _{1/2}	1.25E+03	days	
Calculated decay rate	λ	5.55E-04	days ⁻¹	
Width of plume in aquifer at source (perpendicular to flow)	Sz	1.00E+01	m	
Plume thickness at source	Sy	1.00E+00	m	
Saturated aquifer thickness	da	8.30E+00	m	
Bulk density of aquifer materials	p	2.00E+00	g/cm ³	
Effective porosity of aquifer	n	3.00E-01	fraction	
Hydraulic gradient	I	4.00E-03	fraction	
Hydraulic conductivity of aquifer	K	1.04E+01	m/d	
Distance to compliance point	x	2.50E+02	m	
Distance (lateral) to compliance point perpendicular to flow direction	z	0.00E+00	m	
Distance (depth) to compliance point perpendicular to flow direction	y	0.00E+00	m	
Time since pollutant entered groundwater	t	9.99E+99	days	time variant options only

Parameters values determined from options				
Partition coefficient	Kd	1.15E+06	l/kg	see options
Longitudinal dispersivity	ax	2.50E+01	m	see options
Transverse dispersivity	az	2.50E+00	m	see options
Vertical dispersivity	ay	2.50E-01	m	see options

Calculated Parameters

Groundwater flow velocity	v	2.50E-01	m/d	
Retardation factor	Rf	7.67E+06	fraction	
Decay rate used	λ	7.23E-11	d ⁻¹	
Rate of contaminant flow due to retardation	u	3.37E-08	m/d	
Contaminant concentration at distance x, assuming one-way vertical dispersion	C _{ED}	1.25E-05	mg/l	
Attenuation factor (one way vertical dispersion, CO/CED)	AF	2.08E+02		

Remedial Targets

Remedial Target	2.08E-01	mg/l	For comparison with measured groundwater concentration.
Ogata Banks			
Distance to compliance point	250	m	
Concentration of contaminant at compliance point after	C _{ED} /C ₀ 1.25E-05	mg/l	Ogata Banks
	1.0E+100	days	

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target. The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

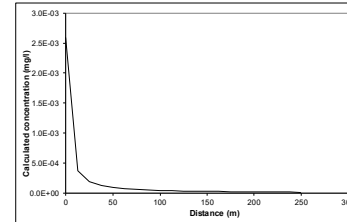
Entry if specify partition coefficient (option)

Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	f _{oc}	2.00E-03	fraction
Organic carbon partition coefficient	K _{oc}	5.75E+08	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	K _{oc,r}		l/kg
Sorption coefficient for ionised species	K _{oc,i}		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	f _{oc}		fraction
Soil water partition coefficient	Kd	1.15E+06	l/kg

Define dispersivity (click brown cell and use pull down list)

Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value Xu & Eckstein	m
Longitudinal dispersivity	ax	0.00E+00	2.50E+01	0.00E+00
Transverse dispersivity	az	0.00E+00	2.50E+00	0.00E+00
Vertical dispersivity	ay	0.00E+00	2.50E-01	0.00E+00
Note values of dispersivity must be > 0				
For calculated value, assumes ax = 0.1 * x, az = 0.01 * x, ay = 0.001 * x				
Xu & Eckstein (1995) report ax = 0.83(log ₁₀ x) ^{0.414} ; az = ax/10, ay = ax/100 are assumed				



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source. Three solution methods are included; the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action. Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best described by an electron limited degradation such as oxidation by O₂, NO₃, SO₄ etc than an alternative solution should be used

Site being assessed:	Enter site name
Completed by:	Enter user name
Date:	Enter date
Version:	x.xx

Calculated concentrations for distance-concentration graph

Ogata Banks	
From calculation sheet	
Distance	Concentration

	mg/l
0	2.6E-03
12.5	3.73E-04
25.0	1.90E-04
37.5	1.25E-04
50.0	9.24E-05
62.5	7.24E-05
75.0	5.90E-05
87.5	4.94E-05
100.0	4.22E-05
112.5	3.66E-05
125.0	3.21E-05
137.5	2.85E-05
150.0	2.55E-05
162.5	2.30E-05
175.0	2.08E-05
187.5	1.89E-05
200.0	1.73E-05
212.5	1.59E-05
225.0	1.46E-05
237.5	1.35E-05
250.0	1.25E-05

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

Contaminant	C12-16 Aliphatic	From Level 1
Target Concentration	C _T 1.00E-03	mg/l from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks	Equations in HRA publication
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Approach for simulating vertical dispersion:

Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants:

Apply degradation rate to dissolved pollutants only

Initial contaminant concentration in groundwater at plume core	C ₀	1.50E-02	mg/l	
Half life for degradation of contaminant in water	t _{1/2}	4.15E+02	days	
Calculated decay rate	λ	1.67E-03	days ⁻¹	
Width of plume in aquifer at source (perpendicular to flow)	Sz	1.00E+01	m	
Plume thickness at source	Sy	1.00E+00	m	
Saturated aquifer thickness	da	8.30E+00	m	
Bulk density of aquifer materials	p	2.00E+00	g/cm ³	
Effective porosity of aquifer	n	3.00E-01	fraction	
Hydraulic gradient	I	4.00E-03	fraction	
Hydraulic conductivity of aquifer	K	1.94E+01	m/d	
Distance to compliance point	x	2.50E+02	m	
Distance (lateral) to compliance point perpendicular to flow direction	z	0.00E+00	m	
Distance (depth) to compliance point perpendicular to flow direction	y	0.00E+00	m	
Time since pollutant entered groundwater	t	9.99E+99	days	time variant options only

Parameters values determined from options				
Partition coefficient	Kd	1.07E+04	l/kg	see options
Longitudinal dispersivity	ax	2.50E+01	m	see options
Transverse dispersivity	az	2.50E+00	m	see options
Vertical dispersivity	ay	2.50E-01	m	see options

Calculated Parameters

Groundwater flow velocity	v	2.59E-01	m/d	
Retardation factor	Rf	7.16E+04	fraction	
Decay rate used	λ	2.33E-08	d ⁻¹	
Rate of contaminant flow due to retardation	u	3.61E-06	m/d	
Contaminant concentration at distance x, assuming one-way vertical dispersion	C _{ED}	2.92E-05	mg/l	
Attenuation factor (one way vertical dispersion, CO/CED)	AF	5.13E+02		

Remedial Targets

Remedial Target	5.13E-01	mg/l	For comparison with measured groundwater concentration.
Ogata Banks			
Distance to compliance point	250	m	
Concentration of contaminant at compliance point after	C _{ED} /C ₀ 2.92E-05	mg/l	Ogata Banks
	1.0E+100	days	

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target. The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

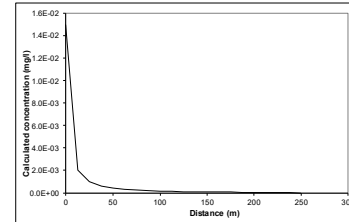
Entry if specify partition coefficient (option)

Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	f _{oc}	2.00E-03	fraction
Organic carbon partition coefficient	K _{oc}	5.37E+06	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	K _{oc,r}		l/kg
Sorption coefficient for ionised species	K _{oc,i}		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	f _{oc}		fraction
Soil water partition coefficient	Kd	1.07E+04	l/kg

Define dispersivity (click brown cell and use pull down list)

Dispersivities 10%, 1%, 0.1% of pathway length

		Enter value	Calc value Xu & Eckstein	m
Longitudinal dispersivity	ax	0.00E+00	2.50E+01	0.00E+00
Transverse dispersivity	az	0.00E+00	2.50E+00	0.00E+00
Vertical dispersivity	ay	0.00E+00	2.50E-01	0.00E+00
Note values of dispersivity must be > 0				
For calculated value, assumes ax = 0.1 * x, az = 0.01 * x, ay = 0.001 * x				
Xu & Eckstein (1995) report ax = 0.83(log ₁₀ x) ^{0.414} ; az = ax/10, ay = ax/100 are assumed				



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source. Three solution methods are included; the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action. Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best described by an electron limited degradation such as oxidation by O₂, NO₃, SO₄ etc than an alternative solution should be used

Site being assessed:	Enter site name
Completed by:	Enter user name
Date:	Enter date
Version:	x.xx



R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

Contaminant	C21-35 Aromatic	From Level 1
Target Concentration	C _T 1.00E-03	mg/l from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks	Equations in HRA publication
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Approach for simulating vertical dispersion:

Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants:

Apply degradation rate to dissolved pollutants only

Initial contaminant concentration in groundwater at plume core	C ₀	6.00E-03	mg/l	Source of parameter value
Half life for degradation of contaminant in water	t _{1/2}	1.25E+03	days	
Calculated decay rate	λ	5.55E-04	days ⁻¹	
Width of plume in aquifer at source (perpendicular to flow)	Sz	1.00E+01	m	
Plume thickness at source	Sy	1.00E+00	m	
Saturated aquifer thickness	da	8.30E+00	m	
Bulk density of aquifer materials	p	2.00E+00	g/cm ³	
Effective porosity of aquifer	n	3.00E-01	fraction	
Hydraulic gradient	I	4.00E-03	fraction	
Hydraulic conductivity of aquifer	K	1.94E+01	m/d	
Distance to compliance point	x	2.50E+02	m	
Distance (lateral) to compliance point perpendicular to flow direction	z	0.00E+00	m	
Distance (depth) to compliance point perpendicular to flow direction	y	0.00E+00	m	
Time since pollutant entered groundwater	t	9.99E+99	days	time variant options only
Parameters values determined from options				
Partition coefficient	Kd	2.52E+02	l/kg	see options
Longitudinal dispersivity	ax	2.50E+01	m	see options
Transverse dispersivity	az	2.50E+00	m	see options
Vertical dispersivity	ay	2.50E-01	m	see options

Calculated Parameters

Groundwater flow velocity	v	2.59E-01	m/d
Retardation factor	Rf	1.68E+03	fraction
Decay rate used	λ	3.30E-07	d ⁻¹
Rate of contaminant flow due to retardation	u	1.54E-04	m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C _{ED}	2.89E-05	mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	AF	2.08E+02	

Remedial Targets

Remedial Target	2.08E-01	mg/l	For comparison with measured groundwater concentration.
Ogata Banks			
Distance to compliance point	250	m	
Concentration of contaminant at compliance point after	C _{ED} /C ₀ 2.89E-05	mg/l	Ogata Banks
	1.0E+100	days	

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target. The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

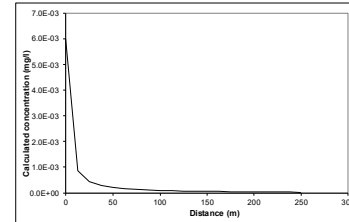
Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)		
Soil water partition coefficient	Kd	2.52E+02 l/kg
Entry for non-polar organic chemicals (option)		
Fraction of organic carbon in aquifer	f _{oc}	2.00E-03 fraction
Organic carbon partition coefficient	K _{oc}	1.26E+05 l/kg
Entry for ionic organic chemicals (option)		
Sorption coefficient for related species	K _{oc,r}	l/kg
Sorption coefficient for ionised species	K _{oc,i}	l/kg
pH value	pH	
acid dissociation constant	pKa	
Fraction of organic carbon in aquifer	f _{oc}	fraction
Soil water partition coefficient	Kd	2.52E+02 l/kg

Define dispersivity (click brown cell and use pull down list)

Dispersivities 10%, 1%, 0.1% of pathway length

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Vertical dispersivity	ay	0.00E+00	2.50E-01	0.00E+00
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For calculated value, assumes ax = 0.1 * x, az = 0.01 * x, ay = 0.001 * x				
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Site being assessed:	Enter site name
Completed by:	Enter user name
Date:	Enter date
Version:	x.xx

Calculated concentrations for distance-concentration graph

Ogata Banks	
From calculation sheet	
Distance	Concentration

	mg/l
0	6.0E-03
12.5	8.80E-04
25.0	4.38E-04
37.5	2.89E-04
50.0	2.13E-04
62.5	1.67E-04
75.0	1.36E-04
87.5	1.14E-04
100.0	9.74E-05
112.5	8.45E-05
125.0	7.42E-05
137.5	6.58E-05
150.0	5.88E-05
162.5	5.30E-05
175.0	4.80E-05
187.5	4.37E-05
200.0	3.99E-05
212.5	3.66E-05
225.0	3.38E-05
237.5	3.12E-05
250.0	2.89E-05