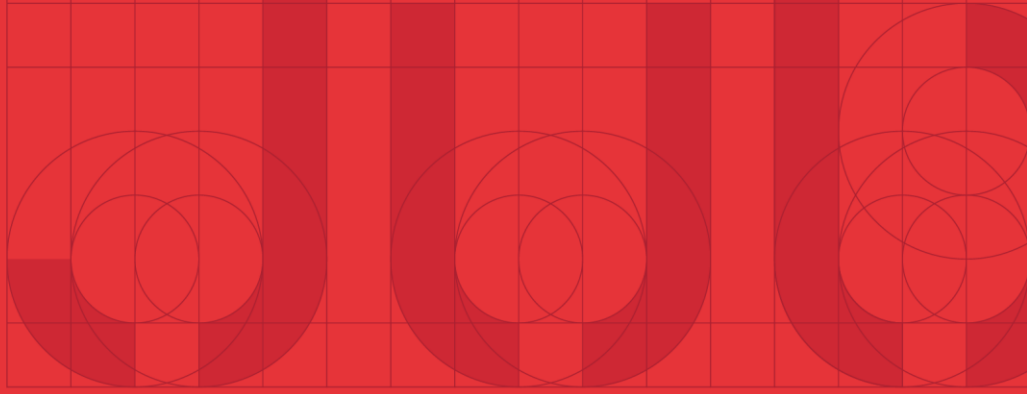




# Gnoll Country Park, Neath

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# Jubb

## Table of Contents

|                                                                                                                  |    |
|------------------------------------------------------------------------------------------------------------------|----|
| EXECUTIVE SUMMARY .....                                                                                          | 4  |
| 1 Introduction .....                                                                                             | 7  |
| 1.1 Commission .....                                                                                             | 7  |
| 1.2 Objectives .....                                                                                             | 7  |
| 1.3 Scope, Sources & Limitations .....                                                                           | 7  |
| 2 Site Setting .....                                                                                             | 9  |
| 2.1 Site Location .....                                                                                          | 9  |
| 2.2 Site Description .....                                                                                       | 9  |
| 2.3 Site Proposals .....                                                                                         | 11 |
| 3 Desk Study Information .....                                                                                   | 12 |
| 3.1 Published Geology .....                                                                                      | 12 |
| 3.2 Coal Mining Risk .....                                                                                       | 12 |
| 3.3 Hydrogeology .....                                                                                           | 12 |
| 3.4 Hydrology .....                                                                                              | 13 |
| 3.5 Radon Risk .....                                                                                             | 13 |
| 3.6 Site History .....                                                                                           | 13 |
| 3.7 Preliminary Risk Assessment (Contamination .....                                                             | 13 |
| 4 Ground Investigation Works .....                                                                               | 14 |
| 4.1 General .....                                                                                                | 14 |
| 4.2 Geotechnical Testing .....                                                                                   | 15 |
| 4.3 Contamination Testing .....                                                                                  | 15 |
| 5 Ground Conditions .....                                                                                        | 17 |
| 5.1 Ground Conditions Encountered .....                                                                          | 17 |
| 5.2 Groundwater .....                                                                                            | 18 |
| 6 Material Properties .....                                                                                      | 19 |
| 6.1 Weathered Pennant Sandstone Formation .....                                                                  | 19 |
| 7 Generic Quantitative Risk Assessment (Contamination) (Area 2 – Visitor Centre & Area 3 – Pond Cottage only) 21 |    |
| 7.1 General .....                                                                                                | 21 |
| 7.2 Risks to Human Health .....                                                                                  | 21 |
| 7.3 Risk to Controlled Waters .....                                                                              | 23 |
| 7.4 Risks to Flora and Fauna .....                                                                               | 23 |
| 7.5 Risks to Adjacent Land and Third Parties .....                                                               | 23 |
| 7.6 Potential Geo-Environmental Liabilities .....                                                                | 24 |
| 7.7 Off Site Disposal .....                                                                                      | 24 |
| 7.8 Updated Conceptual Site Model .....                                                                          | 24 |
| 7.9 Contamination Risk Summary .....                                                                             | 26 |
| 7.10 Outstanding Investigation Areas .....                                                                       | 26 |

|           |                                                                                           |           |
|-----------|-------------------------------------------------------------------------------------------|-----------|
| <b>8</b>  | <b>GEOTECHNICAL ASSESSMENT (Area 2 – Visitor Centre &amp; Area 3 – Pond Cottage only)</b> | <b>27</b> |
| 8.1       | Introduction                                                                              | 27        |
| 8.2       | Excavations                                                                               | 27        |
| 8.3       | Foundation Options                                                                        | 27        |
| 8.4       | Floor Slabs                                                                               | 28        |
| 8.5       | Protection of Buried Concrete                                                             | 28        |
| 8.6       | Earthworks                                                                                | 29        |
| 8.7       | Pavement Design                                                                           | 29        |
| 8.8       | Soakaway Design                                                                           | 29        |
| 8.9       | Coal Mining Risk                                                                          | 29        |
| 8.10      | Outstanding Investigation Areas                                                           | 30        |
| <b>9</b>  | <b>GEOTECHNICAL RISK REGISTER</b>                                                         | <b>31</b> |
| <b>10</b> | <b>References</b>                                                                         | <b>32</b> |
|           | Appendix A: Site Location Plan                                                            | i         |
|           | Appendix B: Proposed Site Development Plan                                                | ii        |
|           | Appendix C: Exploratory Hole Location Plan                                                | iii       |
|           | Appendix D: Contamination Risk Assessment Methodology and Definitions                     | iv        |
|           | Appendix E: Hazwaste Assessment                                                           | ix        |
|           | Appendix F: Geotechnical Risk Register                                                    | x         |
|           | Appendix G: Terra Firma – Preliminary Factual Information                                 | xi        |
|           | Appendix H: Limitations and Exceptions                                                    | xii       |

## List of Figures

|                                                                       |    |
|-----------------------------------------------------------------------|----|
| Figure 1: Site Location                                               | 9  |
| Figure 2: Summary of Plasticity Tests for Pennant Sandstone Formation | 20 |
| Figure 3: Weathered Pennant Sandstone Formation PSD Curve             | 20 |

## List of Tables

|                                                                 |    |
|-----------------------------------------------------------------|----|
| Table 1: Sampling Strategy                                      | 14 |
| Table 2: Geotechnical Testing                                   | 15 |
| Table 3: Contamination Suite                                    | 15 |
| Table 4: Soil Contamination Testing                             | 16 |
| Table 5: Ground Conditions Summary                              | 17 |
| Table 6: Atterberg Limit Tests                                  | 19 |
| Table 7: Particle size distribution testing                     | 20 |
| Table 8: Geotechnical Characteristics – Swansea Member          | 20 |
| Table 9: Summary of Soil Contamination – Metals and Semi Metals | 21 |
| Table 10: Summary of Soil Contamination – PAHs                  | 22 |
| Table 11 - Conceptual Site Model                                | 25 |
| Table 12: BRE Sulphate Test Results                             | 28 |

## **PROJECT INFORMATION**

### **Project Information**

**Client** Andrew Scott Limited

### **Project Details**

**Project Name** Gnoll Country Park

**Location** 134 Fairyland, Neath, SA11 3EF.

**Jubb Project Number** 23157

**Title** Ground Conditions Assessment Report

### **Report Details**

**Version** 1

**Status** First Issue

**Date** August 2023

### **Report Authorisation**

**Prepared By**

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**Job Title**

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**Signed**

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**Checked By**

I Squibbs

Principal Engineering Geologist

I Squibbs

### **Issue History**

| <b>Version</b> | <b>Date</b> | <b>Details</b>                |
|----------------|-------------|-------------------------------|
| 1              | 22/08/2023  | First Issue on Areas 2 and 3. |

## **EXECUTIVE SUMMARY**

| <b>Site Information</b>              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Client</b>                        | Andrew Scott Limited                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Project</b>                       | Gnoll Country Park, Neat                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>OS Co-ordinates</b>               | E276468, N197398.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Proposals</b>                     | Jubb understands that specific sections of the park are to be re-developed with infrastructure enhancements and a new visitor centre.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Site Description</b>              | The site is split into six specific areas within the existing Gnoll Country Park although this report only focusses on Area 2 comprising the existing visitors centre and Area 3 comprising the existing Pond Cottage.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Ground Conditions</b>             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Geology</b>                       | The online BGS Geology of Britain Viewer,) and the 1:10,560 Geological Sheet (Sheet SS79NE) show the Area 1 and 2 to the north to be underlain by the Brithdir Sandstone Member, which is overlain by superficial deposits of Glacial Till (Diamicton) in the eastern area only. Areas 3 to 6 to the south are underlain by the Swansea Sandstone Member both described as micaceous sandstones with thin interbeds of mudstone/siltstone and thin coals beds. These formations form part of the Pennant Sandstone parent group.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Ground Conditions Encountered</b> | <p>Thin veneer of topsoil extending to a maximum depth of 0.30m was encountered around the grassed areas within Areas 1, 2 and 5.</p> <p>Made Ground was encountered from ground level extending to depths of around 0.35m – 1.40m below existing ground levels within Areas 3 and 4. The material typically comprised a sandy silty gravel comprising of sandstone and anthropogenic components of brick, concrete, coal, slag, glass and timber.</p> <p>Made Ground in form of gravel surfacing extending to depths of 0.20 and brown sandy gravelly clay fill with gravels of sandstone, mudstone, slate, mortar and shale extending to depths &gt;12.0m, were also encountered in Area 1 (Gnoll Ruins).</p> <p>Residual deposits of the Pennant Sandstone Formation bedrock was encountered typically underlying the topsoil and/or Made Ground, encountered around 0.30 – 1.40m extending to the base of exploratory hole depths. The material typically comprised a firm brown, slightly sandy, slightly gravelly, silt/clay at shallow depths before sandy, silty, gravel was encountered likely to be weathered sandstone bedrock.</p> <p>No groundwater encountered during the investigation.</p> |
| <b>Geo-environmental Assessment</b>  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

|                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Contamination Assessment</b>          | <p>In summary, the following contamination risks are noted for the soils tested in Areas 2 and 3:</p> <p>One sample tested from natural soils were found to contain exceedances of the Generic Assessment Criteria for 'Commercial end-use' from the contaminant Dibenz[ah]anthracene. This is thought to be attributed to coal fragment within the weathered rock. Given the depth of the soil, the contaminants are unlikely to come into contact with future end-users, therefore low risk.</p> <p>All of the samples tested were classified as non-hazardous.</p> <p>No groundwater was encountered during the investigation. Given the absence of significant contamination within the Made Ground and the underlying natural soils being cohesive, the leaching risk to groundwater is considered very low.</p> <p>Based on topographic levels, the elevated PAH around TP07 is likely down gradient from the southwest surface water flow and associated streams which feed the River Neath and is underlain by cohesive deposits. Therefore, the risk to surface waters is considered low.</p> |
| <b>Contamination Risk Classification</b> | Low Risk                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Radon</b>                             | <p>The radon risk is reported on the UK Radon Atlas (<a href="http://ukradon.org">ukradon.org</a>). The guidance indicates that the site is in a moderate probability radon area (5 – 10% of homes are estimated to be at or above the Action Level) and therefore basic radon protection methods are required for construction of new buildings/dwellings.</p> <p>A site-specific radon report is recommended to confirm this guidance is correct.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Ground Gas</b>                        | No significant source of ground gas was identified within Areas 2 and 3. No gas protection measures therefore required other than that for basic radon protection.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Geotechnical Assessment</b>           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Foundations and Floor Slabs</b>       | <p>Traditional strip foundations will likely be suitable within Area 2 extending through any Made Ground and into the granular weathered Pennant Sandstone Formation, where an allowable bearing pressure of 125kPa is available.</p> <p>In Area 3 foundations should extend around 1.1m into the cohesive deposits that are at least firm in strength. A traditional 0.6m wide foundation, founding in the firm clay with an undrained shear strength of 50kPa, would give an allowable bearing pressure in the order 100kPa.</p> <p>The site is underlain by a mixture of cohesive and granular residual soils. In the area of the proposed visitor centre a ground bearing floor slab should be suitable, but given the cohesive nature of the material around Pond Cottage and that a greater thickness of made ground was encountered in HP04, a suspended floor slab is recommended, as recommended in the National House-Building Council (NHBC) standards.</p>                                                                                                                                 |
| <b>Excavations</b>                       | Standard mechanical plant should be suitable for site excavations, although the use of a breaker may be required if excavations extend into the more competent bedrock.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

|                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                       | <p>Temporary excavations within the cohesive residual soils should be stable in the short term at angles of no greater than 1V:1.5H (33°) but where the excavations extend into the more granular material then these should be reduced to 1V:2H (26°). Where space does not permit battering of excavation sides then suitable temporary shoring will be required.</p>                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Earthworks</b>                     | <p>No proposed site levels have been provided but given the topography no significant earthworks are expected across Area 2 and Area 3.</p> <p>Based on the classification testing of the residual soils of the Pennant Sandstone Member, the cohesive soils would either fall into Class 2A (Wet cohesive material) or 2C (Stoney Cohesive Material) when used as general fill, and the granular soils would either fall into Class 1A (Well graded granular material) or 2B (Uniformly graded granular material )in accordance with the SHW Series 600 – Manual of Contract Documents for Highway Works.</p>                                                                                                                                                                              |
| <b>Buried Concrete Classification</b> | <p>Based on the soil results a design sulphate class of DS-1 and aggressive environment for concrete (ACEC) class of AC-1, should be adopted for the concrete specification for shallow foundations.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Pavement Design</b>                | <p>Given the cohesive nature of the subgrade, a design equilibrium CBR value of <b>5%</b> should be used across the site for any pavement design, subject to proof rolling and removal of any soft spots.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Drainage</b>                       | <p>Two soakaways were carried out in Area 2 at depths 1.40m below ground level within TP02 and TP03 the base of the trial pits within the residual soils gave an infiltration design rate of <math>6.94 \times 10^{-5} \text{m/s}</math>, which can be used in the design.</p> <p>One soakaway test was carried out in Area 3 at a depth of 1.10m within TP07 and the base of the pit within the cohesive residual deposits. The test completed three repeat fills for an infiltration rate to be determined as <math>4.74 \times 10^{-5} \text{m/s}</math>, however given the cohesive nature of the base of the pit the majority of infiltration was likely through the sides of the pit in the more granular deposits, so infiltration below this level will likely not be suitable.</p> |
| <b>Geotechnical Risk Category</b>     | <p>Geotechnical Category 2</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

## 1 Introduction

### 1.1 Commission

Andrew Scott Limited working on behalf of the local council is proposing infrastructure enhancements at specific sections of the Gnoll Estate Country Park in Neath, including the construction of a new visitor centre. To assist with the development of the site proposals, Jubb Consulting Engineers (Jubb) have been appointed to undertake a geotechnical and geo-environmental assessment of the ground conditions for the proposed site use.

The development is understood to include a new visitor centre, an extension to the existing car park, with the creation of new footpaths and future enhancement throughout the park. The proposed development, based on the Project Overview plan prepared by The Environment Partnership (Dwg No. D9457.100.001), is presented in **Appendix B**.

This report constitutes a Ground Conditions Assessment (GCA) to support the planning application for the proposed development, with this issue relating to areas of the **Visitor Centre (Area 2) and Pond Cottage (Area 3) only** and provides advice for the geotechnical and geo-environmental design of the development and associated ground contamination or geotechnical hazards.

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### 1.2 Objectives

The objectives of this assessment are:

- to assess the geo-environmental ground conditions at the site with due regard to any previous investigation, remediation and validation works undertaken as part of the site enabling works. If necessary, to provide outline recommendations for risk mitigation based on the findings;
- to analyse the intrusive ground investigation results to determine ground conditions, obtain representative values for geotechnical analysis, and identify any geotechnical issues which may affect the proposed development;
- to make an evaluation of any potential environmental or geotechnical hazards, risks and liabilities to the planned development of the site on the basis of the foregoing studies, and to provide engineering and environmental recommendations for the site, in view of the potential development of the site.

### 1.3 Scope, Sources & Limitations

Jubb have been provided with the following report carried out by Earth Science Partnership for Andrew Scott Ltd.

- Phase 1 Coal Mining Risk Assessment. Rep No. ESP.8603.3901-00, dated June 2023.

A Phase 1 Geo-environmental desk study report was not commissioned as part of this assessment however a brief search of site history has been undertaken, see section 3.0 for more details.

A Ground Investigation was commissioned for a detailed assessment of the site, see section 4.0 for more details.

This report has been carried out in accordance with the following UK legislation and regulatory guidance for site investigations: -

- BS EN 1997-1:2004 +A1:2013 Eurocode 7 Geotechnical design – Part 1 General rules;
- BS EN 1997-2 (2007) Eurocode 7 Geotechnical design – Part 2 Ground Investigation and testing;
- NA+A1:2014 to BS EN 1997-1:2004 +A1:2013 UK National Annex to Eurocode 7: Geotechnical design – Part 1: General rules,

- NA to BS EN 1997-2:2007 UK National Annex to Eurocode 7: Geotechnical design – Part 2: Ground investigation and testing;
- BS 5930 (2015) + A1 (2020) Code of Practice for site investigations;
- BS 8004 (2015) + A1 (2020) Code of Practice for Foundations;
- BS 10175 (2011) + A2: (2017) Investigation of Potentially Contaminated Sites – Code of Practice;
- CLR 11 (2004) Contaminated Land Research Report, Defra/EA - Model Procedures for the Management of land contamination;
- BS EN 14688 – 1 (2002) + A1 (2013) Geotechnical investigation and testing. Identification and classification of soil. Identification and description.
- BS EN 14688 – 2 (2004) + A1 (2013) Geotechnical investigation and testing. Identification and classification of soil. Principles for a classification.
- BS EN 14689 – 1 (2003) Geotechnical investigation and testing. Identification and classification of rock. Identification and description.

It should be noted that any ground investigation provides only a small sampling of any site and that ground conditions may differ both laterally (across the site) and vertically (with depth) between sample points. Such differing conditions may thus remain undetected by fieldwork. Certain areas may not have been accessible to intrusive survey due to vegetation, live services or other obstructions.

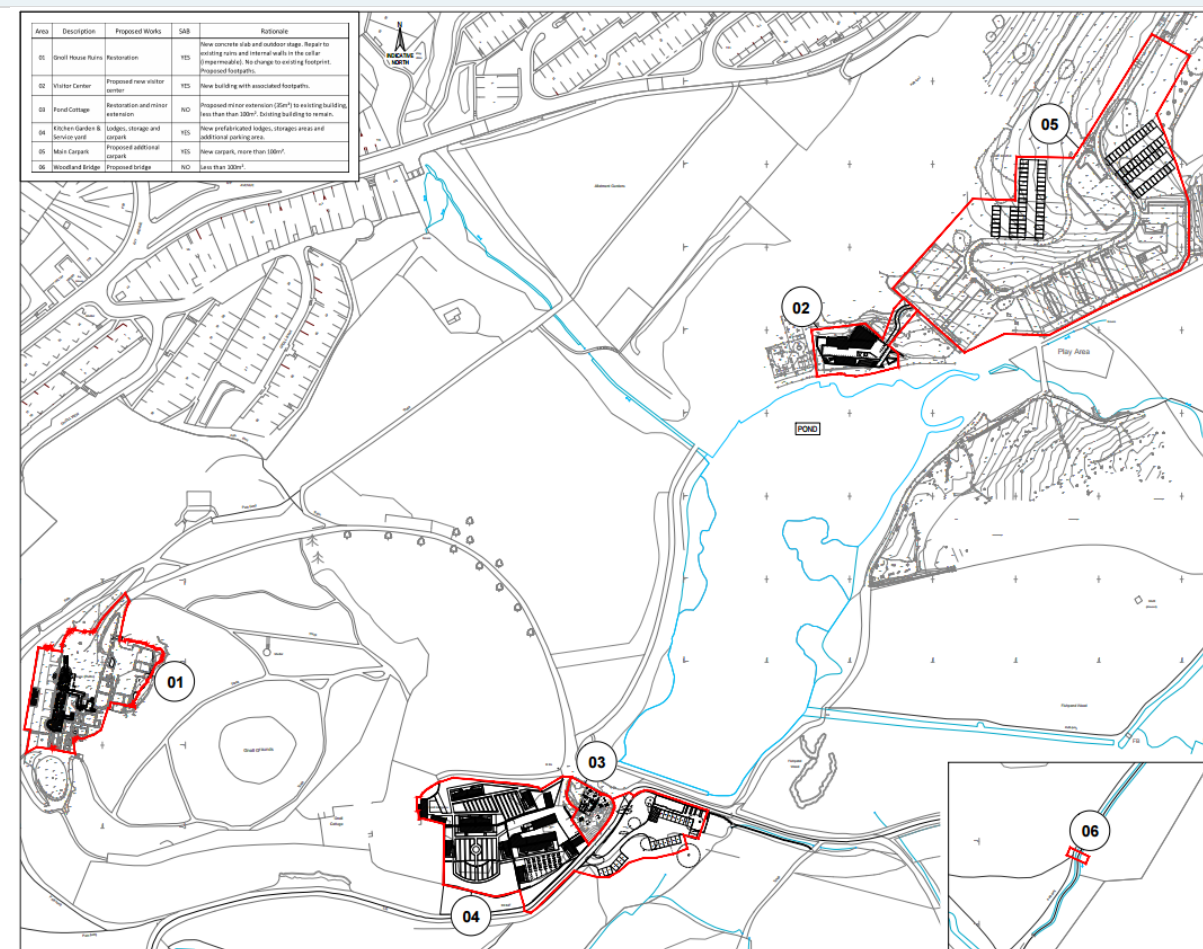
## 2 Site Setting

### 2.1 Site Location

The site is located around the Gnoll Country Park situated in the town of Neath, in South Wales, approximately 11km to the northeast of Swansea. The site is situated on the eastern fringes of the town with the main entrance over the northern part of the estate accessed off Fairyland, with a second entrance from the southern end via Rockwood Close off Cimla Road. The different areas of the site referred to in this report are outlined in Figure 1 below.

The River Neath is located just over 500m to the northwest of the site.

Figure 1: Site Location



The Ordnance Survey grid reference at the centre of the site is: E276468, N197398.

A site location plan and aerial photograph are reproduced in **Appendix A**.

### 2.2 Site Description

The proposed site development is split into six specific areas of the wider country park as per Figure 1. A description of each area and what it is referred to is as follows, although this issue of the report is only focussing on Areas 2 and 3.

### **2.2.1 Area 1 – Gnoll House Ruins**

The Area 1 boundary is situated at the western side of the park around the Gnoll House Ruins. This area comprises a mixture of exposed walls and partly demolished structures associated with the historic Gnoll House. The areas around and in between the structures is a mix of gravel surfacing and soft landscaping. Area 1 is generally flat and level and is noted to be situated on the crest of Gnoll Hill. The topography beyond the area boundary slopes steeply down towards the northwest, west and southwest with residential housing below. The Area 1 elevation is approximately 30m above the adjacent Gnoll Crescent level, which is accommodated by a heavily vegetated slope on the western boundary of Area 1.

### **2.2.2 Area 2 – Gnoll Park Visitor Centre**

Area 2 currently comprises the existing Gnoll Park visitors centre, with the surrounding area consisting of concrete slab/gravel footpaths and soft landscaping areas. A small wooden area borders the visitors centre to the north with the pedestrian access to the main car park (Area 5). A children's play area borders Area 2 to the west with tarmac surfacing. Area 2 is generally flat and level with levels between 63.2 to 63.8mAOD with wider topographic levels gently increasing north towards the main car park.

### **2.2.3 Area 3 – Pond Cottage**

Area 3 currently comprises an existing 2-storey cottage known as 'Pond Cottage' with a rear and side garden. The cottage is understood to be vacant with access into the building from the north side, with semi-mature to mature trees bordering the site. The area is generally flat and level, with a general elevation of around 63.5mAOD. The site begins to gently slope beyond southern boundary into the Kitchens Gardens (Area 4) with elevations between 64mAOD to 61mAOD.

### **2.2.4 Area 4 – Kitchen Gardens and Service Yard**

Area 4 is located over the southern area of the estate and currently comprises an area known as 'Kitchen Gardens' to the west and 'Service Yard' to the east. The Kitchen Gardens area currently comprises a collection of vacant one-storey barns, stone sheds and storage containers with an overgrown gravel area surrounded with historic masonry walls to the north. The surfacing predominantly consists of gravel with soft scaping areas around the edge of the gardens, bordered by a variety of mature trees. The Kitchen Gardens is accessed via a gravel track through metal gates just west of Pond Cottage (Area 3). This area slopes to the south towards the southern boundary from 64mAOD to 61mAOD. The area is bordered by a retaining wall to the south for a road cutting which is the main southern access road into the country park off Cimla Road, the road level is approximately 58mAOD.

The service yard to the east is occupied by a collection of vacant one-storey stone sheds and shipping containers with access into the area just off the main road to the south. Based on historical maps from the ESP Coal Mining Risk Assessment, the buildings were once associated with Gnoll Cottage to the west of Area 4 but their historical use is not indicated on mapping. The area is covered by gravel surfacing with overgrown areas on the border along with a variety of mature trees. The area is bordered to the north by a brick retaining wall/dam for the central fishing lake, which is cut into the sides of the embankments with a pedestrian path along the top. The service yard sits at a lower level of approximately 56mAOD with the surrounding areas at a level of 62mAOD.

### **2.2.5 Area 5 – Main Car Park**

Area 5 is located around the main carpark for the country park over the north western end of the estate. The area is split into predominantly three parking areas located to the east, south east and eastern sides of the access road with tarmac surfacing for the associated roads and parking spaces. Landscaping areas with shrubs and juvenile trees divide the parking areas. A wooded area to the south west divides Area 5 from Area 2 (Visitor Centre). The area gentle slopes down to the southeast towards the fishing lake, with a larger wooded area to the south.

### **2.2.6 Area 6 – Footbridge**

Area 6 is currently located around Fishpond Wood, which is a wooded area situated over the eastern end of the country park. The area is accessed along the pedestrian footpath from pond cottage to the south west. The area

is located over a shallow stream cutting through banks on a rocky channel. Banks are composed of exposed soil and cobbles of sandstone with roots from existing trees. The stream is noted to form part of the surface water network which feeds the cascades through the woods adjacent to the fishing lake.

Ordinance survey maps show topographic levels of wooden area around Area 6 slopes down to the west towards the fishing lake with a drop in level of around 30m AOD.

## **2.3 Site Proposals**

It is understood that the client is proposing to submit five different planning applications as part of this project, associated with the different areas described above. The current proposals for each area are as follows although this version of the report is only being submitted for the planning application associated with Area 2 and Area 3.

### **2.3.1 Area 1 – Gnoll House Ruins**

This area is to be developed with following modifications:

- A raised platform to be formed to create performance space/ outdoor cinema. Platform to be formed with a low blockwork wall on foundations. The wall to support beam and block floor with floor to be screeded and finished with pavers.
- A new hoggin surface to replace former paths of formal Garden to Gnoll House. The hoggin surface is to be laid within new natural stone edging strips set in concrete haunching.
- Former footprint of Gnoll House to be reinstated with a new flexible terrace area.

### **2.3.2 Area 2 – Gnoll Visitor Centre**

The existing visitor centre is proposed to be demolished and replaced with a 2-storey building with a steep podium and a first-floor timber frame building, with two cascade seating areas on the first floor and an external terrace.

### **2.3.3 Area 3 – Pond Cottage**

The existing cottage is proposed to be refurbished into a café with public toilets and seating areas. The associated gardens will be outside seating areas with landscape areas. A one storey timber extension with a cantilever viewing platform is also proposed on the southern side of the existing cottage.

### **2.3.4 Area 4 – Kitchen Gardens and Service Yard**

The Kitchen Gardens to the west are proposed to be converted into a mixture of approximately 16 no 1-2 bed holiday lodges/ cabins with the existing access road retained. The surrounding areas will consist of ornamental gardens and landscaping areas with the existing woodland to the south retained. A bike shed and Linen store is proposed to the east along the access road.

The Service Yard to the east is proposed for improvements to create more appropriate storage facilities and car parking for the accommodation proposal in the Kitchen Gardens to the west.

### **2.3.5 Areas 5 & 6– Main Carpark/Footbridge/Adventure Play Area**

The main car park to the north of Gnoll Country Park is proposed for expansion with the creation of two new car parking areas with one to the north and the other northeast of the existing access road within the current grass areas, with associated plants and shrubs dividing the parking lanes. The proposal is mainly for overflow parking to cater for increase visitor numbers.

In Area 6 a pedestrian footbridge is proposed over an existing water course to connect the Country Park to Woodland Trust land to the east.

An adventure playground is proposed within the wooded areas between the two areas.

A site proposal plan is included in **Appendix B**.

### 3 Desk Study Information

A Phase 1 desk-based study was not commissioned as part of this assessment. However, the historical maps from the previous Coal Mining Risk Assessment undertaken by Earth Science Partnership Ltd (*Ref: Phase One Coal Mining Risk Assessment, ESP.8603.3901, dated June 2023*) have been briefly assessed to understand the potential geoenvironmental and geotechnical risks associated with the site's history.

#### 3.1 Published Geology

The online BGS Geology of Britain Viewer,) and the 1:10,560 Geological Sheet (Sheet SS79NE) show the Area 1 and 2 to the north to be underlain by the Brithdir Sandstone Member, which is overlain by superficial deposits of Glacial Till (Diamicton) in the eastern area only. Areas 3 to 6 to the south are underlain by the Swansea Sandstone Member. both Members are described as micaceous sandstones with thin interbeds of mudstone/siltstone and thin coals beds. These formations form part of the Pennant Sandstone parent group.

The Brithdir beds lies within a triangular fault block defined by the Gnoll Fault to the west and two unnamed faults to the north and south. In the west of this fault block the strata is indicated to dip to the west at 30 to 40°. However, based on the outcrop pattern, the bedrock in the east of the fault block appears to dip to the east. The Swansea Beds strata is indicated to dip to the north-east at between 12 and 15°.

The outcrop of the Swansea Five Feet coal seam is shown to loop around to the west in the area of Gnoll House (Area 1) and is shown east-west across Area 3 and 4.

#### 3.2 Coal Mining Risk

The Earth Science Partnership Ltd (ESP), were initially instructed by Andrew Scott to prepare a Phase One (desk study based) Coal Mining Risk Assessment (CMRA) to evaluate the potential risks to the development from past abandoned mine workings beneath the site.

To summarise, the main area of the site where there appears to be risk from coal mining is to the southwest around Area 3 and Area 4. The outcrop of the Swansea Five Feet coal seam is shown to loop around to the west in the area of Gnoll House (Area 1) and is shown east-west across Area 3 and 4. These areas are therefore deemed 'high development risk' would have likely been worked by shallow mining methods before records began. This presents a risk of deep made ground where the seam was worked and backfilled or there's the possibility of unrecorded mine entries such as bell pits.

The report also shows the wooded area to the southeast of existing reservoir has a recorded mine shaft entry according to historical records, therefore the Coal Authority have also deemed this area also a 'high development risk zone'.

The other area to the north of the reservoir around Areas 2 and 5 appears to be at less of a risk from mining. The probable Brithdir Rider coal seam is shown to crop out in a south-west to north-east orientation some 240m to the north-west, in the area of the former mine entries identified on historical maps. The conjectural outcrop of the Glyngwilym coal seam is shown some 360m to the east. Given the distance the risk of shallow mining activities in these areas is considered low.

The area of the ruins (Area 1) was outside the CMRA but there are no shafts recorded in that area and the house was built in the 1700s so could be argued that it predates any historical mining.

#### 3.3 Hydrogeology

The solid geology (Pennant Sandstone Formation) beneath the site is classed as Secondary 'A' Aquifer, based on the Environment Agency's (EA) interactive aquifer designation map, and as reproduced in the Envirocheck Report.

Secondary A aquifers are defined as “*secondary A aquifers comprise permeable layers that can support local water supplies and may form an important source of base flow to rivers*”.

The EA describes the vulnerability of the aquifers in terms of high, medium and low risk. The solid geology is classified as medium vulnerability.

The site is not within a groundwater Source Protection Zone (SPZ).

### 3.4 Hydrology

The main surface water features in the immediate vicinity of the site is the River Neath is located just over 500m to the northwest of the site.

Other surface water features on site includes the central fishing lake in the middle of the country park and a smaller fishing lake located to the north east of the park. The two reservoirs are fed by a network of streams which appear to flow from the north east/east up gradient from the wooden area. Water is discharged from the central lake via a stream flowing down gradient to the west before assumed culverted from Ivy Lane.

Given the greenfield nature of the site, most surface water will drain through the soft scaping areas and little surface water runoff is expected.

The site is not located within a floodplain from rivers and sea or surface water flooding.

### 3.5 Radon Risk

The radon risk is reported on the UK Radon Atlas ([ukradon.org](http://ukradon.org)). The guidance indicates that the site is in a moderate probability radon area (5 – 10% of homes are estimated to be at or above the Action Level) and therefore basic radon protection methods are required for construction of new buildings/dwellings.

A site-specific radon report is recommended to confirm this guidance is correct.

### 3.6 Site History

In summary, the site appears to have remained similar in terms of its features with the exception of the extension of the woodland by the 1960s and in the 1980s, when the visitors centre was built. There is evidence of past mining features, in the form of the old mine shaft located within the woods in the south-east part of the site.

### 3.7 Preliminary Risk Assessment (Contamination)

The potential contaminants described below have been identified from a study of the site history. The principal contaminative sources are as follows:

- Metals, metalloids – from unknown Made Ground sources or unknown coal mining areas.
- Hydrocarbons, PAHs, organics – from existing car parks or Made Ground sources/unknown coal mining areas.
- Asbestos/ACM – from Made Ground sources and existing shed/barns and outbuildings in Area 4.

## 4 Ground Investigation Works

This section covers all proposed areas (Areas 1 to 6) of the site.

### 4.1 General

A ground investigation was undertaken by Terra Firma (Wales) after being part scoped by the client and part by Jubb. The ground investigation comprised trial pitting, soakaways, hand pits and TRL DCP's. The site works were carried out between the dates 5<sup>th</sup> to 7<sup>th</sup> June and 2<sup>nd</sup> to 3<sup>rd</sup> August 2023.

The site investigation works comprised:

- 12no Machine Excavated Trial Pits.
- 10no BRE 365 Soakaway Tests.
- 21no TRL DCPs.
- 8no Hand Excavated Foundation Pits.

The exploratory hole locations were decided via consultation between Jubb and Andrew Scott, based on the proposed development layouts with holes being moved accordingly with regards to site constraints at the time of the siteworks. No known previous investigations have been undertaken on site.

The factual ground investigation works are detailed in the Terra Firma factual ground investigation report which is still to be issued. The exploratory hole logs and pertinent information from the report are contained in **Appendix G**.

A site walkover was undertaken by Jubb during the site investigation being undertaken, and the existing site conditions were inspected. This walkover, in combination with the review of site history, allowed the investigation to be targeted as follows:

| Exploratory Hole                                     | Area works carried out                                                                                     | Notes/Rational                                                                                                                                                                                 |
|------------------------------------------------------|------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TP01, TP11, TP12                                     | Area 5                                                                                                     | Trial pits were positioned in the proposed car park locations to confirm ground conditions and perform soakaway tests.                                                                         |
| TP02, TP03, TP04, TP05, TP06, TP07, TP08, TP09, TP10 | Area 2, Area 3, Area 4                                                                                     | Trial Pits were positioned in proposed building areas to confirm ground conditions and inform Geotechnical/foundation design. Also potential soakaway locations for the proposed developments. |
| HP01 to HP08                                         | Area 1, Area 2, Area 3, Area 4, Area 6                                                                     | Hand excavated pits were positioned around the existing buildings to prove foundation type, depth and dimensions.                                                                              |
| DCP1 to DCP21                                        | Area 1, Area 4, Area 5. Area 6 and proposed areas of pavement improvements as shown in <b>Appendix C</b> . | The DCP TRL locations were positioned in areas proposed for pavements and roads.                                                                                                               |

Table 1: Sampling Strategy

#### 4.1.1 Trial Pits

Twelve trial pits (TP01 to TP12) were excavated using a 13-tonne tracked excavator and extended to depths of between 0.9m and 2.1m below existing ground levels. After detailed examination, measurement and sampling, the excavations were backfilled with arisings and compacted in layers using the machines bucket.

#### 4.1.2 Soakaway Testing

Ten soakaway tests were undertaken within selected trial pits (TP01, TP02, TP03, TP04, TP06, TP07, TP08, TP09, TP11, TP12) at depths ranging between 1.10 to 2.10m below existing ground levels. Three fillings were achieved in the majority of pits except for TP04 and TP09 where insufficient drainage occurred during the first test.

#### 4.1.3 Hand Excavated Pits

Eight hand excavated pits were excavated using appropriate hand tools and extended to a maximum depth of 1.20m below existing ground levels. After detailed examination, measurement and sampling, the excavations were backfilled with arisings and compacted in layers with any hardstanding reinstated.

### 4.2 Geotechnical Testing

An initial phase of geotechnical testing was carried out by ASL Ltd in accordance with *BS1377: Methods of test for soils for civil engineering purposes*, as listed in the table below.

| No. of Tests                | Test                                                                                           | Test Method     |
|-----------------------------|------------------------------------------------------------------------------------------------|-----------------|
| <b>Classification Tests</b> |                                                                                                |                 |
| 6                           | Liquid and plastic (Atterberg) limits.                                                         | BS1377: Part 2. |
| 6                           | Moisture Content                                                                               | BS1377: Part 2. |
| 5                           | Particle Size Distribution Sieving                                                             | BS1377: Part 2. |
| <b>Compaction Tests</b>     |                                                                                                |                 |
| 3                           | Dry Density/OMC with 2.5kg rammer                                                              | BS1377: Part 4  |
| <b>Chemical Test: Soil</b>  |                                                                                                |                 |
| 6                           | Water soluble sulphate, total (acid soluble) sulphate and total sulphur contents and pH value. | BRE SD 1        |

Table 2: Geotechnical Testing

### 4.3 Contamination Testing

The sampling strategy was based on obtaining sufficient samples from across the site. Relevant samples were submitted for a general 'greenfield' and 'brownfield' suite of testing, determinants as detailed below.

| Suite                           | Determinants                                                                                                                          |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| Pathfinder Suite A - Greenfield | As, Cd, Cr, Cu, Pb, Ni, Se, V, Zn, Hg, pH, B, Cr(III), Cr(IV), PAH's                                                                  |
| Pathfinder Suite B – Brownfield | As, Cd, Cr, Cu, Pb, Ni, Se, V, Zn, Hg, pH, B, Cr(III), Cr(IV), PAH's and Speciated Hydrocarbons (C10-C40), TOC and Asbestos screening |

Table 3: Contamination Suite

The geo-environmental testing was carried out by Eurofins Ltd, a UKAS and MCERTS accredited laboratory. Sub-samples were taken from the exploratory holes and placed in appropriate environmental containers before being sent by courier to the laboratory in cool boxes. The number of soil and leachate samples tested are summarised in the table below:

| Exploratory Hole                                           | Depth (mbgl)                                            | Analysis Undertaken             |
|------------------------------------------------------------|---------------------------------------------------------|---------------------------------|
| TP01, TP03                                                 | 0.50, 0.20                                              | Pathfinder Suite A - Greenfield |
| TP02, TP04, TP05, TP06,<br>TP07, TP08, TP09, TP10,<br>HP06 | 0.20, 0.30, 0.60, 0.4, 1.15, 0.50, 0.50,<br>0.60, 0.30. | Pathfinder Suite B – Brownfield |

*Table 4: Soil Contamination Testing*

## 5 Ground Conditions

This section covers all proposed areas (Areas 1 to 6) of the site.

### 5.1 Ground Conditions Encountered

The ground conditions encountered across the site are summarised in the table below:

| Description                                                                                                                                                          | Stratum                               | Encountered in                                                                                 | Typical depth to top of stratum (m bgl) | Typical depth to base of stratum (m bgl) | Average thickness (m) |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|------------------------------------------------------------------------------------------------|-----------------------------------------|------------------------------------------|-----------------------|
| Grass over firm light brown slightly sandy gravelly silty CLAY                                                                                                       | Topsoil                               | TP02, TP03, TP11, TP12, HP-B                                                                   | G.L                                     | 0.30                                     | 0.30                  |
| Dark grey very sandy silty angular and subangular fine to coarse brick fragment, concrete, slag, glass and sandstone GRAVEL. Occasional bricks and timber fragments. | Made Ground                           | TP04, TP05, TP06, TP08, TP09, TP10, HP01, HP02, HP03, HP04, HP05, HP06, HP-A                   | G.L                                     | 0.35 – 1.40                              | 0.80                  |
| Firm brown sandy gravelly silty CLAY or Brown medium dense to dense at base sandy silty angular and subrounded fine to coarse tabulate sandstone GRAVEL              | Weathered Pennant Sandstone Formation | TP01, TP02, TP03, TP11, TP12, TP04, TP05, TP06, TP07, TP08, TP09, TP10, HP02, HP03, HP07, HP-B | 0.35 – 1.40                             | >3.20                                    | -                     |

Table 5: Ground Conditions Summary for Areas 1 - 6

#### 5.1.1 Topsoil

##### 5.1.1.1 Area 1

Topsoil was only encountered within a wooded grass area outside the Gnoll house ruins to the south with HP-B. The material comprised a brown sandy gravelly silty clay to a depth of 0.40m below ground level.

##### 5.1.1.2 Area 2

Topsoil was encountered TP02 and TP03 within the grassed area west of the existing visitors' centre. The material typically comprised a brown sandy silty gravelly clay in TP02 and a brown silty sandy gravel in TP03 to a depth of 0.30m below ground level.

##### 5.1.1.3 Area 5

Topsoil was encountered in TP11 and TP12 in the northern grass areas around the existing access road into the country park. The material typically comprised a brown sandy gravelly silty clay to a depth between 0.20m to 0.40m below ground level.

#### 5.1.2 Made Ground

##### 5.1.2.1 Area 1

Made Ground was encountered in HP02, HP03 and HP-A within Gnoll house ruins. The material typically comprised imported gravel surfacing over natural soils within HP02 and HP03, extending to depths between 0.12 to 0.20m below ground level.

HP-A encountered Made Ground in the form a brow sandy clay with gravels of sandstone, mudstone, slate, mortar and shale with the base of the material not proven (>1.20m). This material is likely backfill during the historic removal/demolition of Gnoll House.

#### 5.1.2.2 Area 3

Made Ground was encountered in HP04 during foundation exposure of Pond Cottage. The material comprised an 80mm thick crushed concrete gavel at surface, overlying a brown sandy gravelly ashy clay with anthropogenic components of clinker, coal, ash, glass and brick fragments. The depth of the material could not be proven beyond 0.80m below ground level. This fill material likely used a backfill for the foundation excavations during the construction of Pond Cottage.

#### 5.1.2.3 Area 4

Made Ground was encountered in TP04, TP05, TP06, TP08, TP09 and TP10 which typically comprised a sandy silty gravel comprising sandstone and anthropogenic components of brick, concrete, slag, coal, clinker, glass and timber. The material extended to depths between 0.35m to 1.40m below existing ground levels.

The composition of the material specifically the presence of slag and clinker within TP04, TP05, TP06 and TP08 suggests the Kitchen Garden Area (Area 4) was used previously used for unknown industrial activities associated with the former Goll Cottage. The presence of coal within TP08 provides evidence of potential shallow coal workings of the outcropping Swansea Five Fleet seam around the southern area of the Kitchen Gardens.

The Made Ground was encountered to a maximum depth of 1.40m within TP10. Based on historical maps from 1964, this area is shown to be a playground. This could be attributed to past site level raising to form a level platform for the playground.

### 5.1.3 Weathered Pennant Sandstone Formation

The weathered Pennant Sandstone Formation was encountered across all areas of site underlying the topsoil and made ground. The material typically comprised a firm brown, slightly sandy, gravelly silty clay at shallow depths before becoming brown slightly silty, gravel of sandstone.

The trial pits (TP01 to TP12) terminated between 1.20 to 2.40m depth with base of the weathered bedrock not proven. However, the termination of the pits was due to hard digging/ground so the termination depths could give an approximate indication of the depth of rock head.

## 5.2 Groundwater

No groundwater was encountered during the site works and no longer term groundwater monitoring was carried out.

## 6 Material Properties

### 6.1 Weathered Pennant Sandstone Formation

The residual deposits of the weathered bedrock typically comprised a firm brown, slightly sandy, gravelly silty clay at shallow depths before typically grading into a medium dense to dense brown slightly silty, gravel of sandstone.

#### 6.1.1 Classification Properties

8no. samples were obtained from the residual soils for Atterberg testing, 3no. tests were undertaken on the shallow cohesive material. During the time of writing this report only five sample results were currently available. This section will be updated accordingly when results become available.

The six samples of cohesive soil had natural moisture contents between 9% and 22% and a modified plasticity index of between 1% and 8% indicating the soil to be non-shrinkable. The sample comprised between 11% and 62% clay/ silt content.

The results are summarised in the table below and plotted on the A-Line chart in Figure 2.

|                           | Minimum | Maximum | Average |
|---------------------------|---------|---------|---------|
| Natural Moisture Content  | 9       | 22      | 14      |
| Liquid Limit              | 25      | 36      | 31      |
| Plastic Limit             | 16      | 36      | 20      |
| Modified Plasticity Index | 1       | 8       | 4       |

Table 6: Atterberg Limit Tests

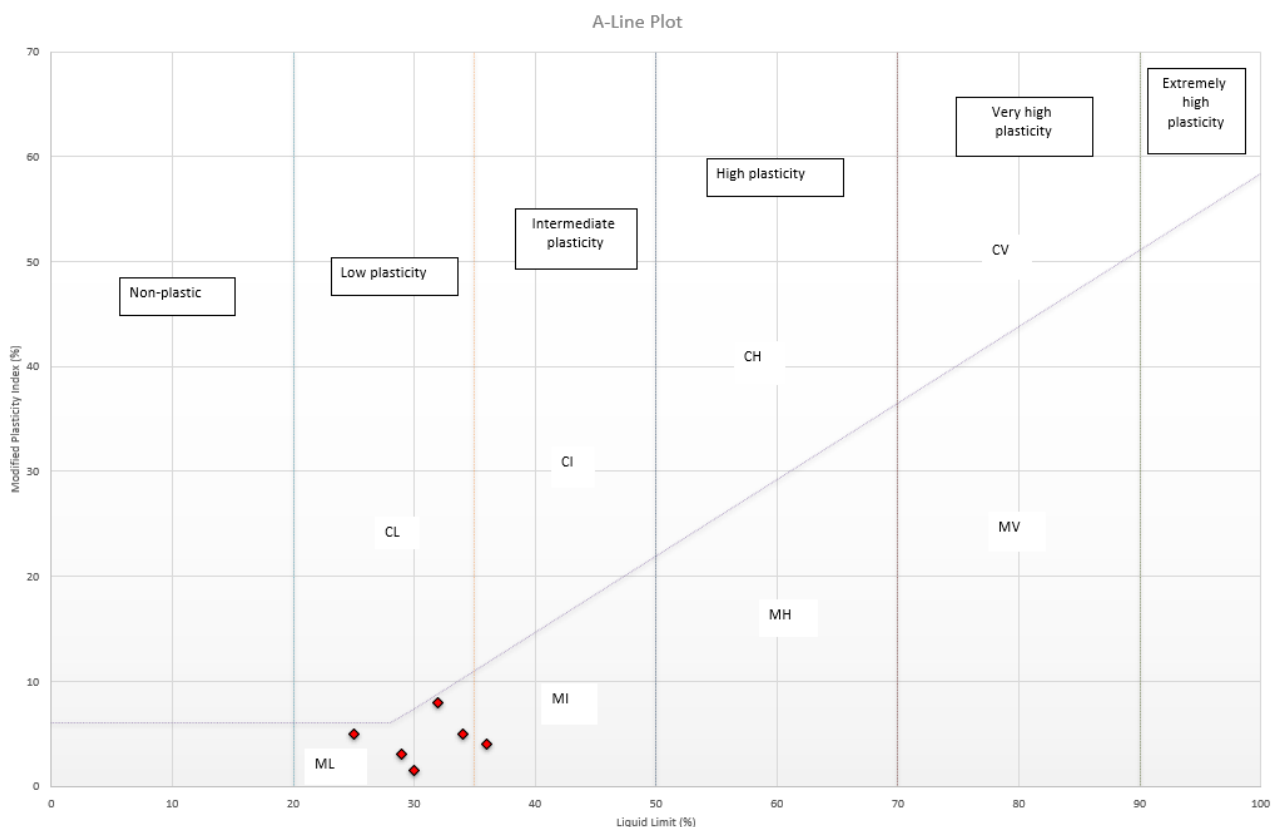


Figure 2: Summary of Plasticity Tests for Pennant Sandstone Formation

Taking into account the portion of the sample passing the 425  $\mu\text{m}$  sieve, the reported plasticity index values can be modified in accordance with NHBC standards Chapter 4.2 'Building Near Trees'. Based on this the samples all have a non-shrinkable potential and so no requirement on a minimum foundation depth when building near trees, when foundations are placed within the shallow cohesive residual soils.

5no. particle size distribution test (PSD) was carried out on the residual soils, the result is summarised below:

| Particle Size | Minimum | Maximum | Average |
|---------------|---------|---------|---------|
| Cobbles       | 0       | 0       | 0       |
| Gravel        | 12      | 79      | 45      |
| Sand          | 11      | 45      | 29      |
| Silt/Clay     | 10      | 43      | 26      |

Table 7: Particle size distribution testing

Based on the single PSD results, the residual soils could be typically classed as clayey/silty sandy gravel. The PSD curves show two sets of different gradings suggesting the residual soils are slightly varied across whole site, but appears to become more granular with depth as shown both below and the exploratory hole logs contained in **Appendix G**.

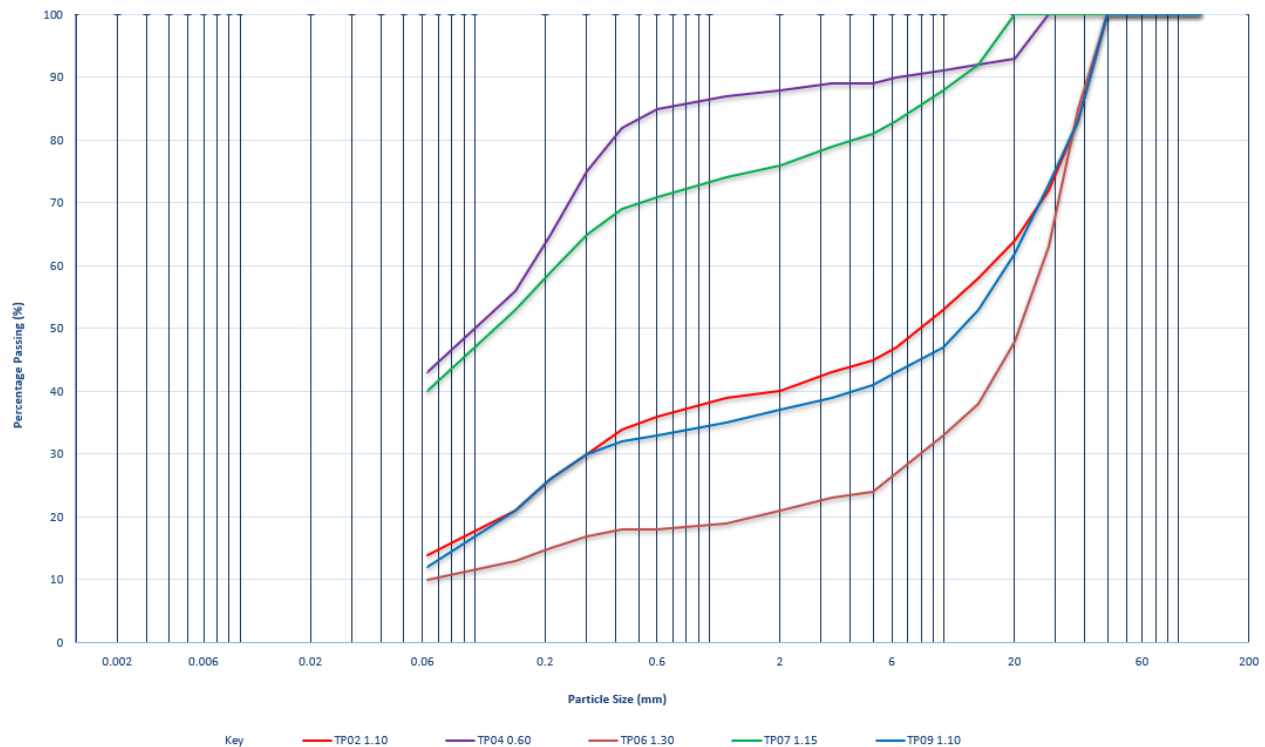


Figure 3: Weathered Pennant Sandstone Formation PSD Curve

## 7 Generic Quantitative Risk Assessment (Contamination) (Area 2 – Visitor Centre & Area 3 – Pond Cottage only)

### 7.1 General

The following comprises a Generic Quantitative Risk Assessment (GQRA) of contamination risk, in accordance with the methodology set out in **Appendix D**.

The following updated conceptual model information has been taken from the information obtained in **section 3.0 - 5.0** and from the site walkover.

**Please note this assessment only covers the proposed developments in Area 2 (Visitors Centre) and Area 3 (Pond Cottage). This section will be updated accordingly once all available information for the other proposed development areas has been obtained.**

### 7.2 Risks to Human Health

#### 7.2.1 Soils

A summary of the chemical test results and a comparison against the relevant assessment criteria used in this case, are given in the tables below.

The generic assessment criteria used in this case are generally the LQM/CIEH Sutable 4 Use Levels (S4ULs), based on minimal or tolerable risk and are intended to be protective of human health. Different criteria are provided for a variety of land use, and the criteria for “Commercial end-use” has been adopted here.

The exception to this is use of the C4SL levels for Lead, as S4UL are not provided for this substance.

Both the C4SL and S4UL are based on current best practice and reflect the most up to date guidance and legislation.

In accordance with best practice, individual exceedances of the relevant assessment criteria have been identified and comment provided where necessary.

##### 7.2.1.1 Metals & Semi-metals

The table below summarises the chemical results for metals and semi-metals on site from Area 2 and Area 3 of the investigation:

*Table 8: Summary of Soil Contamination – Metals and Semi Metals*

| Contaminant      | C4SL/<br>S4UL<br>mg/kg | Source | Measured<br>concentrations<br>mg/kg |         | 95%<br>UCL*** | Number of<br>individual<br>exceedances |
|------------------|------------------------|--------|-------------------------------------|---------|---------------|----------------------------------------|
|                  |                        |        | Minimum                             | Maximum |               |                                        |
| Arsenic (mg/kg)  | 640                    | S4UL   | 12                                  | 33      | -             | 0/3                                    |
| Cadmium (mg/kg)  | 190                    | S4UL   | <0.10                               | 0.17    | -             | 0/3                                    |
| Chromium (mg/kg) | 8600                   | S4UL   | 12                                  | 20      | -             | 0/3                                    |
| Lead (mg/kg)     | 750                    |        | 26                                  | 54      | -             | 0/3                                    |
| Mercury (mg/kg)  | 1100                   | S4UL   | 0.06                                | 0.16    | -             | 0/3                                    |
| Selenium (mg/kg) | 12000                  | S4UL   | 0.63                                | 1.0     | -             | 0/3                                    |

|                       |       |      |       |       |   |     |
|-----------------------|-------|------|-------|-------|---|-----|
| Copper (mg/kg)        | 68000 | S4UL | 29    | 51    | - | 0/3 |
| Nickel (mg/kg)        | 980   | S4UL | 18    | 40    | - | 0/3 |
| Zinc (mg/kg)          | 73000 | CIEH | 71    | 110   | - | 0/3 |
| Total Cyanide (mg/kg) | 480   | CLEA | <0.50 | <0.50 | - | 0/3 |

- C4SL – DEFRA Category 4 Screening Levels (2014);
- S4UL – CIEH/LQM Sutable 4 use levels (2015);
- 95% Upper Confidence Limit (UCL) statistical analysis not undertaken where there are no contaminant exceedances and/or insufficient number of samples.

All samples tested were below the relevant guideline values within Area 2 and Area 3.

#### 7.2.1.2 Polyaromatic Hydrocarbons

The table below summarises the results for speciated PAHs on site for Areas 2 and 3.

Table 9: Summary of Soil Contamination – PAHs

| Contaminant          | SGV/<br>GAC<br>(mg/kg) | Source | Measured<br>concentrations<br>(mg/kg) |         | 95% UCL | Number of<br>individual<br>exceedances |
|----------------------|------------------------|--------|---------------------------------------|---------|---------|----------------------------------------|
|                      |                        |        | Minimum                               | Maximum |         |                                        |
| Acenaphthene         | 84000                  | CIEH   | <0.10                                 | 6.6     | -       | 0/3                                    |
| Acenaphthylene       | 83000                  | CIEH   | <0.10                                 | 43      | -       | 0/3                                    |
| Anthracene           | 520000                 | CIEH   | <0.10                                 | <0.10   | -       | 0/3                                    |
| Benz[a]anthracene    | 170                    | CIEH   | <0.10                                 | 0.79    | -       | 0/3                                    |
| Benzo[a]pyrene       | 35                     | CIEH   | <0.10                                 | <0.10   | -       | 0/3                                    |
| Benzo[b]fluoranthene | 44                     | CIEH   | <0.10                                 | <0.10   | -       | 0/3                                    |
| Benzo[ghi]perylene   | 3900                   | CIEH   | <0.10                                 | 78      | -       | 0/3                                    |
| Benzo[k]fluoranthene | 1200                   | CIEH   | <0.10                                 | <0.10   | -       | 0/3                                    |
| Chrysene             | 350                    | CIEH   | <0.10                                 | 0.36    | -       | 0/3                                    |
| Dibenz[ah]anthracene | 3.5                    | CIEH   | <0.10                                 | 35      | -       | 1/3                                    |
| Fluoranthene         | 23000                  | CIEH   | <0.10                                 | 0.64    | -       | 0/3                                    |
| Fluorene             | 63000                  | CIEH   | <0.10                                 | 29      | -       | 0/3                                    |
| Indeno[123-cd]pyrene | 500                    | CIEH   | <0.10                                 | 84      | -       | 0/3                                    |
| Naphthalene          | 190                    | CIEH   | <0.10                                 | 23      | -       | 0/3                                    |
| Phenanthrene         | 92                     | CIEH   | <0.10                                 | 0.15    | -       | 0/3                                    |
| Pyrene               | 54000                  | CIEH   | <0.10                                 | 0.82    | -       | 0/3                                    |

Notes:

- CIEH – Chartered Institute of Environmental Health Land Quality Management Generic
- Assessment Criteria (based upon worse-case 1% SOM content)
- - 95% Upper Confidence Limit (UCL) statistical analysis not undertaken where there are no contaminant exceedances and/or insufficient number of samples

There was one exceedance of Dibenz[ah]anthracene of 35mg/kg was encountered in TP07 at 1.15m in Area 3 (Pond Cottage) when compared against Commercial GAC's.

The sample from TP07 at 1.15m is logged as natural clay and no inclusions of coal are recorded but given the coal legacy of the area, it is likely associated with an unrecorded coal inclusion. Given the depth of the sample future end-users are unlikely to come into contact with this material, therefore the pathway is severed and the risk to human health is considered low.

There were no exceedances of PAH within the samples tested in Area 2.

#### 7.2.1.3 Total Hydrocarbons

TP07 at 1.15m recorded a total TPH value of 330mg/kg above detection limits. This again as logged as natural will likely be attributed to a coal inclusion as no other source was present. Again, given the depth of the sample future end-users are unlikely to come into contact with this material, therefore the pathway is severed so risk to human health is considered low.

### 7.2.2 Radon

The radon risk is reported on the UK Radon Atlas ([ukradon.org](http://ukradon.org)). The guidance indicates that the site is in a moderate probability radon area (5 – 10% of homes are estimated to be at or above the Action Level) and therefore basic radon protection methods are required for construction of new buildings/dwellings.

A site-specific radon report is recommended to confirm this guidance is correct.

### 7.2.3 Asbestos

Asbestos identification was carried out on 2no. samples taken from TP02 at 0.20m and TP07 at 1.15m. No asbestos was detected in either of the samples screened.

## 7.3 Risk to Controlled Waters

No groundwater was encountered during the investigation. Given the absence of significant contamination within the Made Ground and the underlying natural soils being cohesive, the leaching risk to groundwater is considered very low.

Based on topographic levels and River Neath to the west, the minor elevations encountered in soils around TP07 are likely down gradient from the southwest surface water and underlain by a cohesive layer, therefore, the risk to surface waters is considered low.

## 7.4 Risks to Flora and Fauna

Based on the current design there are small areas of soft landscaping within the development and consequently a plant life risk assessment has been undertaken to assess the suitability of site won soils for re-use in these areas.

Generally copper, nickel, zinc, cadmium and mercury can inhibit plant growth so the results for these have been compared with values given in the Department of Environments, Code of Practice for Agricultural Use of Sewage Sludge, 1996. All values were below these concentrations and therefore no site to flora or fauna has been identified.

## 7.5 Risks to Adjacent Land and Third Parties

No significant risk to neighbouring occupiers has been identified.

## 7.6 Potential Geo-Environmental Liabilities

Potential geo-environmental liabilities under Part 2A of the Environmental Protection Act 1990 (as amended) and the Groundwater Regulations (GWR) 2009, relating to the site in its current condition is not considered likely based on the tests data available.

## 7.7 Off Site Disposal

A waste assessment of the soils in accordance with WM3 has been undertaken, in order to support further decisions regarding material movement and earthworks at the site. All three samples tested were classified as non-hazardous using HazWasteOnline, therefore they can be deposited at a non-hazardous or an inert landfill.

Any samples identified to contain asbestos will also likely require disposing of at a hazardous landfill waste operator.

The waste classification reports for each sample tested, are contained in **Appendix E**.

## 7.8 Updated Conceptual Site Model

Table 11 below shows the updated conceptual site model from Area 2 and Area 3, which has been formulated based on the information obtained in the ground investigation and historic data.

Table 10 - Conceptual Site Model – Areas 2 and 3

| Sources                                                             | Receptor                     | Pathway                                                               | Consequence | Probability    | Risk                   | Recommended Action (to clarify level of risk and assess suitable mitigation measures or to mitigate the risk)                                                                                                                                                                                                                 |
|---------------------------------------------------------------------|------------------------------|-----------------------------------------------------------------------|-------------|----------------|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Metals, metalloids from Made Ground and natural sources             | End Users                    | Ingestion<br>Inhalation<br>Direct Contact                             | Medium      | Unlikely       | Low Risk               | No exceedances in heavy metal concentrations detected.                                                                                                                                                                                                                                                                        |
|                                                                     | Groundwater<br>Surface water | Leaching through unsaturated zone<br>Surface water runoff or drainage | Mild        | Unlikely       | Very Low Risk          |                                                                                                                                                                                                                                                                                                                               |
| Hydrocarbons, PAHs, organics – from Made Ground and natural sources | End Users                    | Ingestion<br>Inhalation<br>Direct Contact                             | Medium      | Low Likelihood | Moderate/Low Risk      | PAH exceedance in one samples. Source of contamination is likely attributed to coal fragments within weathered coal bearing strata. Depth of contamination unlikely to come into contact with future end-users so risk is low.                                                                                                |
|                                                                     | Groundwater<br>Surface water | Leaching through unsaturated zone<br>Surface water runoff or drainage | Medium      | Unlikely       | Low Risk               | Given the underlying natural soils being cohesive and the contaminated soils being down gradient of surface water features, the leaching risk to groundwater and surface water features is considered low, therefore no further action is warranted.                                                                          |
| Asbestos                                                            | End Users                    | Ingestion<br>Inhalation<br>Direct Contact                             | Medium      | Unlikely       | Low Risk               | No Asbestos detected.                                                                                                                                                                                                                                                                                                         |
| Ground gases                                                        | End Users                    | Inhalation                                                            | Medium      | Unlikely       | Very Low Risk/Low risk | No sources of gas were identified within Area 2.<br>In Area 3 a thickness of made ground was encountered although no degradable material encountered, although residual risk from potential nearby coal workings. The fact basic radon protection measures are to be installed, should be enough to reduce any residual risk. |
|                                                                     | Buildings                    | Migration into structure (explosive/fire risk)                        | Medium      | Unlikely       | Very Low Risk/Low risk |                                                                                                                                                                                                                                                                                                                               |

## 7.9 Contamination Risk Summary

In summary the contamination has been encountered:

### Human Health

- Exceedance of Dibenzo[ah]anthracene was encountered in TP07 at 1.15m – *low risk to human health*.
- Total TPH value of 330mg/kg recorded in TP07 1.15m – *low risk to human health*.
- No elevated Metals noted.
- Limited made ground encountered across the site.

### Controlled Waters

- Given there's only one sample with PAH exceedance in natural soils located in TP07 and the underlying soils being cohesive, the risk it could impact the groundwater or offsite controlled waters is considered very low.
- Based on topographic levels and River Neath to the west, the minor elevations encountered in soils around TP07 are likely down gradient from the southwest surface water and underlain by a cohesive layer, therefore, the risk to surface waters is considered low.

### Ground Gas

- No ground gas source encountered therefore very low gas risk in Area 2.
- In Area 3 residual risk of ground gas from any nearby underground workings and made ground, although no degradable material noticed and layer of cohesive deposits, together with radon protection should therefore mitigate any risk as low.

Based on the above, overall contamination risk within Area 2 and Area 3 is considered low. Elevations of PAH was recorded within a localised area of natural soils thought to associated with the presence of coal, although occurs at a depth where end users are unlikely to come into contact therefore no pathway or mitigation likely required.

All samples tested were classified as non-hazardous for waste disposal purposes.

## 7.10 Outstanding Investigation Areas

Section 7.0 will be updated accordingly once all outstanding ground investigation data is obtained.

## 8 GEOTECHNICAL ASSESSMENT (Area 2 – Visitor Centre & Area 3 – Pond Cottage only)

### 8.1 Introduction

It is understood that the existing visitor centre (Area 2) is proposed to be demolished and replaced with 2 storey steep podium with a first-floor timber frame building, with two cascade seating areas on the first floor and external terrace.

The existing cottage (Area 3) is proposed to be refurbished into a café with public toilets and seating areas. The associated gardens will also be outside seating areas with landscape areas. A one storey timber extension with a cantilever viewing platform is also proposed on the southern side of the existing cottage.

No proposed loads have been provided and the below is based on general recommendations of what would be expected from a traditional two/one storey residential development and may need revisiting once final designs are known.

**Please note this assessment only covers the proposed developments in Area 2 (Visitors Centre) and Area 3 (Pond Cottage). This section will be updated accordingly once all available information for the other proposed development areas has been obtained.**

### 8.2 Excavations

Excavation of shallow soils should be readily achievable using conventional plant and equipment. Elsewhere, where excavations extend towards the deeper granular residual soils or where there are more granular layers then some spalling of the excavation sides should be expected, especially around Area 2 of the site where the granular layer appears shallower.

Temporary excavations within the cohesive deposits should be stable in the short term at angles of no greater than 1V:1.5H (33°) but where the excavations extend into the more granular material then these should be reduced to 1V:2H (26°).

A risk assessment of the stability of any open excavation should be undertaken by a competent person and appropriate measures adopted to ensure safe working practise in and around open excavations. Further guidance on responsibilities and requirements for working near, and in, excavations can be obtained from the Construction Design and Management Regulations (2015); Construction Information Sheet 47: Inspections and Reports (2005) and HSG47: Avoiding Danger from Underground Services.

Groundwater was not encountered during the investigation so unlikely to be encountered during site works, although water ingress after prolonged wet periods should be expected in the more granular material. Should any groundwater inflow be encountered, it should be readily controlled by traditional groundwater control methods such as sump and pump techniques in accordance with CIRIA Report C750 Groundwater Control – Design and Practice. Instability of excavation sides should be expected where groundwater ingress occurs, and suitable battering of sides or temporary retention may be required, where excavations are required to extend below these depths.

### 8.3 Foundation Options

#### 8.3.1 Area 2 – Visitor Centre

Traditional strip foundations will likely be suitable within Area 2, extending through any Made Ground and into the granular residual soils of the Pennant Sandstone Formation. Based on a traditional 0.6m wide foundation, founding at a minimum depth 0.45m within the slightly silty angular gravel an allowable bearing pressure in the order 125kPa should be achievable. Note that the hand inspection pit carried out around the existing foundations extended 0.8m and was still within Made Ground, so foundations within the footprint of the existing building will need to extend through any Made Ground and into the underlying natural weathered granular deposits.

### 8.3.2 Area 3 – Pond Cottage

Traditional strip foundations will likely be suitable within Area 3, extending through any Made Ground and the upper dark brown silty material and into the cohesive residual soils of the Pennant Sandstone Formation that are at least firm in strength, encountered from a depth of 1.1m bgl. Based on a low plasticity clay, using a 0.6m wide foundation, within the firm clay with an undrained shear strength of at least 50kPa, would give an allowable bearing pressure in the order 100kPa.

All formations should be inspected by a geotechnical engineer, to confirm founding stratum is of suitable strength for the proposed loads. Any sub formation materials deemed as unsuitable such as soft or loose zones should be excavated and replaced with well compacted suitable granular fill or lean mix concrete. Foundation excavations should be protected from water and inclement weather including frost and any water should be removed by pumping from a sump in the base of the excavation, prior to pouring of concrete.

### 8.4 Floor Slabs

The site is underlain by a mixture of cohesive and granular residual soils. In the area of the proposed visitor centre a ground bearing floor slab should be suitable, but given the cohesive nature of the material around Pond Cottage and that a greater thickness of made ground was encountered in HP04, a suspended floor slab is recommended, as recommended in the National House-Building Council (NHBC) standards.

### 8.5 Protection of Buried Concrete

The site generally classed as greenfield with Area 4 being classed as brownfield. The groundwater is assumed to be mobile. Sulphate testing in accordance with BRE SD1:2005 was carried out on selected samples across all areas of the site, the results of which are summarised in the table below.

| Location                                            | Depth | Total Sulphur (%)  | Total Potential Sulphate (%) | Total Sulphate (%SO <sub>4</sub> ) | 2:1 Water Soluble Sulphate (mg/l) | Oxidisable Sulphides (%) | pH                |
|-----------------------------------------------------|-------|--------------------|------------------------------|------------------------------------|-----------------------------------|--------------------------|-------------------|
| <b>Made Ground</b>                                  |       |                    |                              |                                    |                                   |                          |                   |
| TP06                                                | 0.40  | 0.01               | 0.03                         | 0.03                               | 14                                | 0.06                     | 7.9               |
| TP08                                                | 0.80  | 0.01               | 0.03                         | 0.03                               | 10                                | 0.01                     | 8.1               |
| <b>Residual Soils – Pennant Sandstone Formation</b> |       |                    |                              |                                    |                                   |                          |                   |
| TP02                                                | 0.20  | 0.01               | 0.03                         | 0.03                               | 10                                | 0.02                     | 7.3               |
| TP04                                                | 1.20  | 0.01               | 0.03                         | 0.03                               | 10                                | 0.02                     | 7.7               |
| TP05                                                | 2.10  | 0.01               | 0.03                         | 0.03                               | 10                                | 0.15                     | 8.3               |
| TP10                                                | 2.10  | 0.01               | 0.03                         | 0.03                               | 10                                | 0.01                     | 8.2               |
| <b>Characteristic Value</b>                         |       | <b><u>0.01</u></b> | <b><u>0.03</u></b>           | <b><u>0.03</u></b>                 | <b><u>14</u></b>                  | <b><u>0.15</u></b>       | <b><u>8.3</u></b> |

Table 11: BRE Sulphate Test Results

The characteristic value for each stratum was calculated and used to ascertain the relevant sulphate class for each material. Based on Table C2 of the BRE Special Digest 1:2005, the following concrete classifications for the different stratum have been obtained.

Oxidisable sulphides are all below 0.3% so it is assumed pyrite is not present and the following classification is based on water soluble sulphate results.

Made Ground: **DS-1 AC-1**

Residual Soils: **DS-1 AC-1**

## 8.6 Earthworks

The proposed site levels have not been determined at this stage but given the relative flat nature of Area 2 and 3, these are expected to be similar to existing site levels.

That being said, should the material be used in any earthworks then based on the classification testing of the residual soils of the Pennant Sandstone Formation, the cohesive soils would likely fall into 2C (Stoney Cohesive Material) when used as general fill, and the granular soils would either fall into Class 1A (Well graded granular material) or 2B (Uniformly graded granular material) in accordance with the SHW Series 600 – Manual of Contract Documents for Highway Works.

## 8.7 Pavement Design

No in-situ CBR or laboratory testing was undertaken within Areas 2 and 3 however both areas have proposed pavements. Using typical CBR values from the table contained within the *Highways Agency Advice Note (73/06) Design Guidance for Road Pavement Foundations (linked to HD26/06)* the cohesive soils had a determined modified plasticity index of 12% which corresponds to a conservative CBR value of 5%. Therefore, CBR value of 5% should be adopted for Areas 2 & 3.

The exposed subgrade should be proof rolled prior to placement of any capping material with any soft spots, such as any unexpected made ground and high natural moisture contents, are likely to have lower CBR values so they should be removed and replaced with a suitable engineered fill.

If following a period of disturbance, weathering or significant increase in moisture content, the CBR is found to be less than 2%, the sub-grade may be unsuitable for both the trafficking of site plant and as support for a permanent foundation, without improvement works being undertaken. Improvement works should be carried out in accordance with CD225. In summary, consideration may be given to the following potential remedial techniques:

- excavation and re-engineering or replacement of weaker soils;
- the inclusion of geosynthetic reinforcement within the unbound layers of the capping and sub-grade;
- where cohesive soils are present, and they are deemed suitable for treatment with hydraulic binders;
- to employ modification and/or stabilisation techniques on the formation.

## 8.8 Soakaway Design

The drainage strategy for the site suggests the surface water drainage option as infiltration via soakaways.

Two soakaways were carried out in Area 2 at depths 1.40m below ground level within TP02 and TP03 the base of the trial pits within the residual deposits of the bedrock. Both tests completed three repeat fills for an infiltration rate to be calculated. A design infiltration rate from both tests was determined as  $6.94 \times 10^{-5}$  m/s.

One soakaway test was carried out in Area 3 at a depth of 1.10m within TP07 and the base of the pit within the residual deposits of the bedrock. The test completed three repeat fills for an infiltration rate to be determined as  $4.74 \times 10^{-5}$  m/s, given the cohesive nature of the base of the pit the majority of infiltration was likely through the sides of the pit in the more granular deposit. It should be noted that TP07 was excavated via hand tools, due to site access restrictions an excavator was not able to access the exploratory position, therefore the test within TP07 was only carried out within a limited pit base dimension and may not be representative over a wider base area. Soakaways extending deeper within the clay will unlikely be suitable.

## 8.9 Coal Mining Risk

Area 2 is away from the development high risk area and there are no underground recorded coal workings in this area, therefore there is not considered a risk from any coal mining risk.

Area 3 is in an area that is shown to be close or within the high development risk area, associated with the Swansea Five Feet coal seam which is shown to crop through the area. Although unlikely to have been worked

under Pond Cottage, confirmatory boreholes to investigate the potential of any unrecorded coal workings in the area is recommended.

### **8.10 Outstanding Investigation Areas**

Section 8.0 will be updated accordingly once all outstanding ground investigation data is obtained.

## 9 GEOTECHNICAL RISK REGISTER

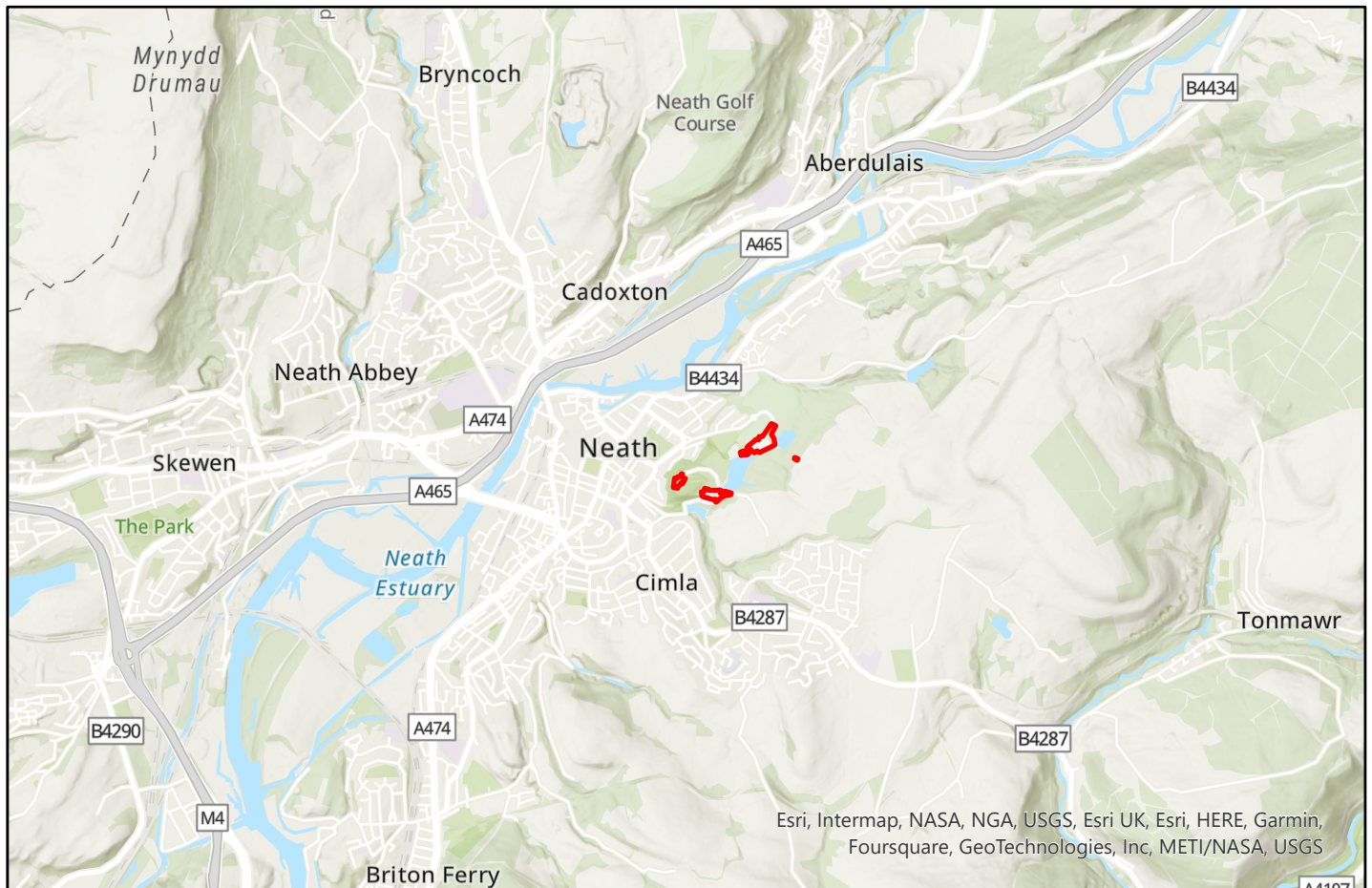
A Geotechnical Risk Register is a method of identifying hazards which may arise during the construction phase of works based on the data currently obtained for the site. The register is a work in progress and as further information arises, it should be updated in order to quantify the risk. At this stage, the aspects covered by the register are attributed to Cost and Health and Safety, although as site works commence, programme may become a prominent factor.

A Ground Risk Register that was started at the commencement of the ground investigation is contained within **Appendix F**.

## 10 References

- [1] The British Standards Institution, BS EN 1997-1:2004+A1:2013 Incorporating corrigendum February 2009 Eurocode 7: Geotechnical design - Part 1: General rules, London: BSI Standards Limited, 2014.
- [2] The British Standards Institution, "BS EN 1997-2:2007 Incorporating corrigendum June 2010 Eurocode 7 - Geotechnical design - Part 2: Ground investigation and testing," BSI Standards Limited, London, 2010.
- [3] The British Standards Institution, NA+A1:2014 to BS EN 1997-1:2004+A1:2013 Incorporating Corregendum No. 1 UK National Annex to Eurocode 7: Geotechnical design - Part 1: General rules, London: BSI Standards Limited, 2014.
- [4] The British Standards Institution, "NA to BS EN 1997-2:2007 UK National Annex to Eurocode 7: Geotechnical design - Part 2: Ground investigation and testing," BSI Standards Limited, London, 2009.
- [5] The British Standards Institution, BS 5930:2015 (+A1:2020) Code of practice for ground investigations, London: BSI Standards Limited, 2015.
- [6] The British Standards Institution, BS 8004:2015 (+A1:2020) Code of Practice for foundations, London: BSI Standards Limited, 2015.
- [7] The British Standards Institution, "BS 10175:2011 + A2:2017 Investigation of potentially contaminated sites - code of practice," BSI Standard Limited, London, 2017.
- [8] Defra/Environment Agency, "CRL 11 (2004) contaminated land research report - Model procedures for the management of land contamination," Environment Agency, Bristol, 2004.
- [9] The British Standards Institution, "BS EN 14688-1:2002 + A1:2013 Geotechnical investigation and testing. Identification and classification of soil. Identification and description," BSI Standards Limited, London, 2013.
- [10] The British Standards Institution, "BS EN 14688-2:2004 + A1:2013 Geotechnical investigation and testing. Identification and classification of soil. Principles for a classification," BSI Standards Limited, London, 2004.
- [11] The British Standards Institution, "BS EN 14689-1:2003 Geotechnical investigation and testing. Identification and classification of rock. Identification and description," BSI Standards Limited, London, 2003.
- [12] Carter, M, and Bentley, S, P. (1991). *Correlations of soil properties*. Michigan: Pentech.

## **APPENDIX A: SITE LOCATION PLAN**

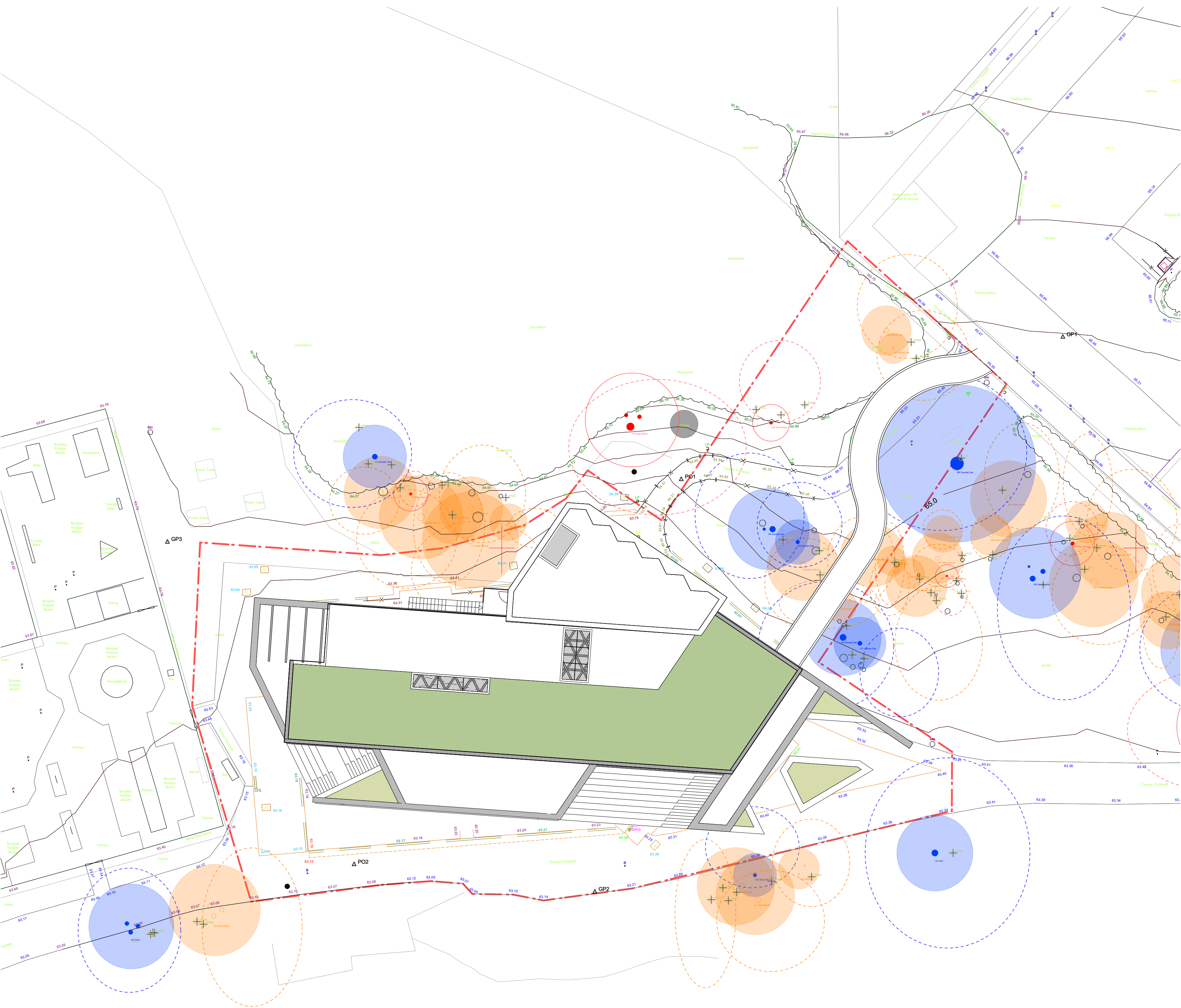


## Appendix A: Site Location Plan

23157 - Gnoll Country Park, Neath

**Jubb**

**APPENDIX B: PROPOSED SITE DEVELOPMENT PLAN**



00201.1 SITE PLAN  
SCALE 1:200 @ A1, 1:400 @ A3

Notes:

Responsibility is not accepted for errors made by others scaling from this drawing.

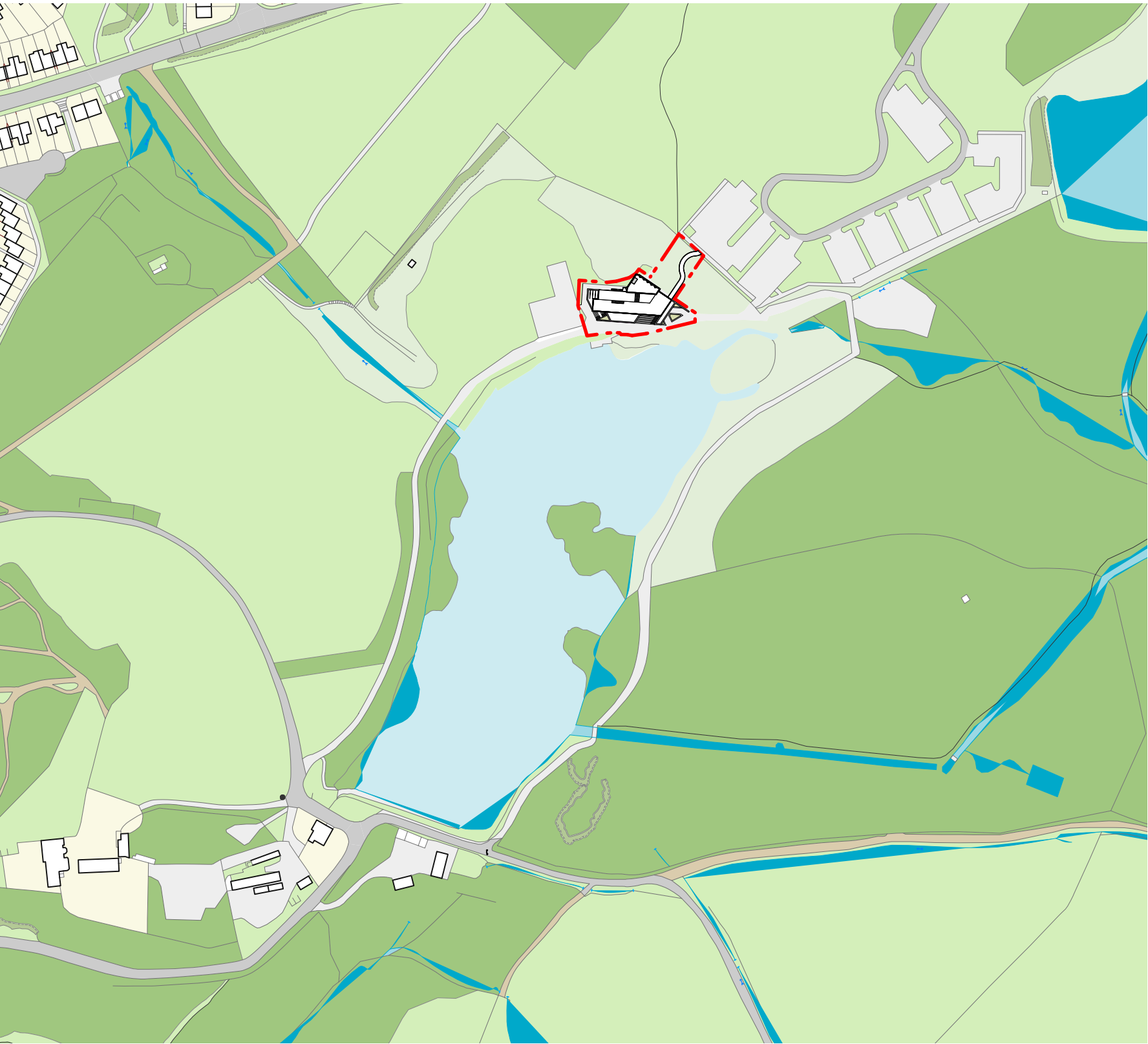
All construction information should be taken from figured dimensions only. Dimensions are in millimetres unless otherwise stated.

All dimensions and conditions are to be checked on site prior to preparing drawings or commencing any work.

Any variations or supplementary drawings are to be approved by The Architect.

All details are to be read in strict accordance with GA drawings and construction notes

All steelwork sizes, padstones, blockwork strengths and associated structural design to be in accordance with structural engineers design and requirements. Hiraeth Architecture accepts no liability to any discrepancies in the structural design indicated on these drawings. Any structural related queries should be directed to the project engineer immediately.



00201.2 SITE LOCATION PLAN  
SCALE 1:2500 @ A1, 1:5000 @ A3

| SERIES      |            | PROPOSED                     |  |
|-------------|------------|------------------------------|--|
| SUITABILITY |            | S1 - ISSUED FOR COORDINATION |  |
| REV         | DATE       | NOTE                         |  |
| P1          | 06/06/2023 | Issued for information       |  |
| P2          | 06/07/2023 | Bridge added                 |  |

Hiraeth.

02920 025814 | office@hiraetharchitecture.co.uk  
The Maltings | East Tyndall St | Cardiff | CF24 5EA

job number

Zone

2325 02

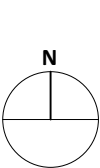
Neath Port Talbot CBC  
GNOLL PARK

Proposed Site Plan

Scale AS NOTEDDate 04/23

UFRNZoneOriginatorRoleTypeSht numberS CodeRev

208002HIRADR00202S1P2



|                    |             |                                    |
|--------------------|-------------|------------------------------------|
| <b>SERIES</b>      |             | <b>PROPOSED</b>                    |
| <b>SUITABILITY</b> |             | <b>S2 - ISSUED FOR INFORMATION</b> |
| <b>REV</b>         | <b>DATE</b> | <b>NOTE</b>                        |
| <b>P2</b>          | 21/06/2023  | Issued for information             |
| <b>P1</b>          | 22/05/2023  |                                    |

| UPRN        | Zone      | Originator | Role     | Type      | Sht number   | S Code    | Rev       |
|-------------|-----------|------------|----------|-----------|--------------|-----------|-----------|
| <b>2080</b> | <b>03</b> | <b>HIR</b> | <b>A</b> | <b>DR</b> | <b>00201</b> | <b>S2</b> | <b>P2</b> |

**APPENDIX C: EXPLORATORY HOLE LOCATION PLAN**



**Legend**

Site Boundary

**Jubb Exploratory Hole Locations**

Type

- DCP
- HP
- TP
- TP + Soakaway

|     |      |                   |    |      |
|-----|------|-------------------|----|------|
| P1  | 001  | Preliminary Issue | JY | IS   |
| Rev | Date | Description       | By | Apvd |

**PROJECT:**

Gnoll Country Park, Neath

**TITLE:**

Exploratory Hole Location Plan

**CLIENT:**

Andrew Scott Ltd

**SCALE@A1:**

1:1,500

**PROJECT REF:**

23157

**DRAWING NO:**

23157-JCE-XX-XX-DR-GE-001

**REV:**

P01

*Revision Referencing*

P = Preliminary A = Approval T = Tender C = Construction



## **APPENDIX D: CONTAMINATION RISK ASSESSMENT METHODOLOGY AND DEFINITIONS**

## CONTAMINATION ASSESSMENT METHODOLOGY

The DEFRA and Environment Agency Contaminated Land Report 11 (CLR11) 'Model Procedures for the Management of Land Contamination' provides a technical framework for structured decision making about land contamination.

### A1. Definition of Risk

CLR11 defines risk as "a combination of probability, or frequency, of occurrence of a defined hazard and the magnitude of the consequences of the occurrence".

### A2. The Concept of the 'Pollutant Linkage'

In the context of contaminated land, there are three essential elements to any risk:

- a **contaminant (or source)** – a substance that is in, on or under land and has the potential to cause harm or cause pollution of controlled waters.
- a **receptor** - humans, ecological system, water body or property.
- a **pathway** – a route or means by which a receptor can be exposed to, or affected by, a contaminant.

Each of these elements can exist separately; however, they create a risk only where they are linked together forming a **pollutant linkage**.

### A3. Conceptual Site Models

A conceptual site model represents the characteristics of the site in diagrammatic or written form that shows the possible relationships between contaminants, pathways and receptors (pollutant linkages).

For all potential pollutant linkages identified, the *consequence* and *probability* of occurrence is qualitatively assessed, and a *risk* assigned.

### A4. The Tiered Risk Assessment Approach

CLR11 presents a tiered approach to risk:

#### **Tier 1** *Preliminary risk assessment (PRA)*

The purpose of the preliminary risk assessment is to develop an initial conceptual model of the site and to establish whether or not there are potentially unacceptable risks. If potential risks are identified the initial conceptual model is developed in subsequent tiers of the risk assessment process.

#### **Tier 2** *Generic quantitative risk assessment (GQRA)*

The purpose of the generic quantitative risk assessment is to establish whether generic assessment criteria and assumptions are appropriate for assessing the risks and, if so, to apply them to establish whether there are actual or potential unacceptable risks. It also determines whether further detailed quantitative risk assessment is required.

#### **Tier 3** *Detailed quantitative risk assessment (DQRA)*

The purpose of the detailed quantitative risk assessment is to establish and use more detailed site-specific information and criteria to decide whether there are unacceptable risks. It may be used as the sole method of quantitative assessments of risks, or it may be used to refine earlier assessments using generic assessment criteria.

## B. RISK ASSESSMENT DEFINITIONS

### B1. General

The following classification and definition of risk assessment has been based on that set out in NHBC and EA Publication R&D 66 – Guidance on the Safe Development of Housing on Land Affected by Contamination (2008).

The key to the classification is that the designation of risk is based upon the consideration of both:

- the magnitude of the potential consequence (i.e., severity)**, which considers both the potential severity of the hazard, and the sensitivity of the receptor.
- the magnitude of probability (i.e., likelihood)**, which considers both the presence of the hazard, the receptor, and the integrity of the pathway.

### B2. Classification of Consequence

| Classification | Definition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Examples                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Severe</b>  | <p>Highly elevated concentrations likely to result in “significant harm” to human health as defined by the EPA 1990, Part 2A, if exposure occurs.</p> <p>Equivalent to EA Category 1 pollution incident including persistent and/or extensive effects on water quality; leading to closure of a potable abstraction point; major impact on amenity value or major damage to agriculture or commerce.</p> <p>Major damage to aquatic or other ecosystems, which is likely to result in a substantial adverse change in its functioning or harm to a species of special interest that endangers the long-term maintenance of the population.</p> <p>Catastrophic damage to crops, buildings or property.</p> | <p>Significant harm to humans is defined in circular 01/2006 as death, disease*, serious injury, genetic mutation, birth defects or the impairment of reproductive functions.</p> <p>Major fish kill in surface water from large spillage of contaminants from site.</p> <p>Highly elevated concentrations of List I and II substances present in groundwater close to small potable abstraction (high sensitivity).</p> <p>Explosion, causing building collapse (can also equate to immediate human health risk if buildings are occupied).</p> |
| <b>Medium</b>  | <p>Elevated concentrations which could result in “significant harm” to human health as defined by the EPA 1990, Part 2A if exposure occurs.</p> <p>Equivalent to EA Category 2 pollution incident including significant effect on water quality; notification required to abstractors; reduction in amenity value or significant damage to agriculture or commerce.</p> <p>Significant damage to aquatic or other ecosystems, which may result in a substantial adverse change in its functioning or harm to a species of special interest that may endanger the long-term maintenance of the population.</p> <p>Significant damage to crops, buildings or property.</p>                                   | <p>Significant harm to humans is defined in circular 01/2006 as death, disease*, serious injury, genetic mutation, birth defects or the impairment of reproductive functions.</p> <p>Damage to building rendering it unsafe to occupy e.g., foundation damage resulting in instability.</p> <p>Ingress of contaminants through plastic potable water pipes.</p>                                                                                                                                                                                  |
| <b>Mild</b>    | <p>Exposure to human health unlikely to lead to “significant harm”.</p> <p>Equivalent to EA Category 3 pollution incident including minimal or short-lived effect on water quality; marginal effect on amenity value, agriculture or commerce.</p> <p>Minor or short-lived damage to aquatic or other ecosystems, which is unlikely to result in a substantial adverse change in its functioning or harm to a species of special interest that would endanger the long-term maintenance of the population.</p> <p>Minor damage to crops, buildings or property.</p>                                                                                                                                        | <p>Exposure could lead to slight short-term effects (e.g., mild skin rash).</p> <p>Surface spalling of concrete.</p>                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Minor</b>   | <p>No measurable effect on humans.</p> <p>Equivalent to insubstantial pollution incident with no observed effect on water quality or ecosystems.</p> <p>Repairable effects of damage to buildings, structures and services.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <p>The loss of plants in a landscaping scheme.</p> <p>Discoloration of concrete.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

\* For these purposes, disease is to be taken to mean an unhealthy condition of the body or a part of it and can include, for example, cancer, liver dysfunction or extensive skin ailments. Mental dysfunction is included only insofar as it is attributable to the effects of a pollutant on the body of the person concerned.

### B3. Classification of Probability

Only applies if there is a possibility of a pollutant linkage being present.

| Classification         | Definition                                                                                                                                                                                                                                                          | Examples                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>High likelihood</b> | There is pollutant linkage, and an event would appear very likely in the short-term and almost inevitable over the long-term, or there is evidence at the receptor of harm or pollution.                                                                            | <p>a) Elevated concentrations of toxic contaminants are present in soils in the top 0.5m in a residential garden.</p> <p>b) Ground/groundwater contamination could be present from chemical works, containing a number of USTs, having been in operation on the same site for over 50</p>                                                                                                                                    |
| <b>Likely</b>          | There is pollutant linkage, and all the elements are present and in the right place which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short-term and likely over the long-term. | <p>a) Elevated concentrations of toxic contaminants are present in soils at depths of 0.5-1.0m in a residential garden, or the top 0.5m in public open space.</p> <p>b) Ground/groundwater contamination could be present from an industrial site containing a UST present between 1970 and 1990. The tank is known to be single skin. There is no evidence of leakage although there are no records of integrity tests.</p> |
| <b>Low likelihood</b>  | There is pollutant linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a long period such an event would take place and is less likely in the shorter term.                                  | <p>a) Elevated concentrations of toxic contaminants are present in soils at depths &gt;1m in a residential garden, or 0.5-1.0m in public open space.</p> <p>b) Ground/groundwater contamination could be present on a light industrial unit constructed in the 1990s containing a UST in operation over the last 10 years – the tank is double skinned but there is no integrity testing or evidence of leakage.</p>         |
| <b>Unlikely</b>        | There is pollutant linkage, but circumstances are such that it is improbable that an event would occur even in the very long-term.                                                                                                                                  | <p>a) Elevated concentrations of toxic contaminants are present below hard standing.</p> <p>b) Light industrial unit &lt;10 yrs. old containing a double-skinned UST with annual integrity testing results available.</p>                                                                                                                                                                                                    |

Note: A pollution linkage must first be established before probability is classified. If there is no pollution linkage, then there is no potential risk. If there is no pollution linkage, then there is no need to apply tests for probability and consequence.

For example, if there is surface contamination and a major aquifer is present at depth, but this major aquifer is overlain by an aquiclude of significant thickness then there is no pollution linkage and the risks to the major aquifer are not assessed. The report should identify both the source and the receptor but state that because there is no linkage there are no potential risks.

#### B4. The Classification of Risk

|             |                 | Consequence       |                   |                   |               |
|-------------|-----------------|-------------------|-------------------|-------------------|---------------|
|             |                 | Severe            | Medium            | Mild              | Minor         |
| Probability | High likelihood | Very high risk    | High risk         | Moderate risk     | Low risk      |
|             | Likely          | High risk         | Moderate risk     | Moderate/low risk | Low risk      |
|             | Low likelihood  | Moderate risk     | Moderate/low risk | Low risk          | Very low risk |
|             | Unlikely        | Moderate/low risk | Low risk          | Very low risk     | Very low risk |

#### B5. Description of the Classified Risks

##### Very high risk

There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the site without remediation action OR there is evidence that severe harm to a designated receptor is already occurring. Realisation of that risk is likely to present a substantial liability to be site owner/or occupier. Investigation is required as a matter of urgency and remediation works likely to follow in the short-term.

#### **High risk**

Harm is likely to arise to a designated receptor from an identified hazard at the site without remediation action. Realisation of the risk is likely to present a substantial liability to the site owner/or occupier. Investigation is required as a matter of urgency to clarify the risk. Remediation works may be necessary in the short-term and are likely over the longer term.

#### **Moderate risk**

It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely, that the harm would be relatively mild. Further investigative work is normally required to clarify the risk and to determine the potential liability to site owner/occupier. Some remediation works may be required in the longer term.

#### **Low risk**

It is possible that harm could arise to a designated receptor from identified hazard, but it is likely at worst, that this harm if realised would normally be mild. It is unlikely that the site owner/or occupier would face substantial liabilities from such a risk. Further investigative work (which is likely to be limited) to clarify the risk may be required. Any subsequent remediation works are likely to be relatively limited.

#### **Very low risk**

It is a low possibility that harm could arise to a designated receptor, but it is likely at worst, that this harm if realised would normally be mild or minor.

#### **No potential risk**

There is no potential risk if no pollution linkage has been established.

### **B6. Definitions**

| <b>Term</b>              | <b>Definition</b>                                                                                                                                                                               |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Hazard</b>            | A property or situation which in certain circumstances could lead to harm. The properties of different hazards must be assessed in relation to their potential to affect the various receptors. |
| <b>Risk</b>              | A combination of the probability or frequency of the occurrences of a defined hazard AND the magnitude of the consequences of that occurrence.                                                  |
| <b>Probability</b>       | The mathematical expression of the chance of a particular event in a given period of time [e.g., probability of 0.2 is equivalent to 20% or a 1 in 5 chance].                                   |
| <b>Impact</b>            | The adverse effects (or harm) arising from a defined hazard which impairs the quality of the environment or human health in the short or longer term.                                           |
| <b>Pollution linkage</b> | An identified pathway is capable of exposing a receptor to a contaminant and that contaminant is capable of harming the receptor.                                                               |

## **APPENDIX E: HAZWASTE ASESMENT**

## Waste Classification Report

HazWasteOnline™ classifies waste as either **hazardous** or **non-hazardous** based on its chemical composition, related legislation and the rules and data defined in the current UK or EU technical guidance (Appendix C) (note that HP 9 Infectious is not assessed). It is the responsibility of the classifier named below to:

- understand the origin of the waste
- select the correct List of Waste code(s)
- confirm that the list of determinands, results and sampling plan are fit for purpose
- select and justify the chosen metal species (Appendix B)
- correctly apply moisture correction and other available corrections
- add the meta data for their user-defined substances (Appendix A)
- check that the classification engine is suitable with respect to the national destination of the waste (Appendix C)



BO3BQ-14NNE-8WW7X

To aid the reviewer, the laboratory results, assumptions and justifications managed by the classifier are highlighted in **pale yellow**.

### Job name

Gnoll Park

### Description/Comments

### Project

### Site

### Classified by

Name: **Ian Squibbs**  
 Date: **17 Aug 2023 13:17 GMT**  
 Telephone: **0) 1179 226266**  
 Company: **Jubb Consulting Engineers Ltd**  
**Suite B, Ground Floor West, St James**  
**Court, St James Parade**  
**Bristol**  
**BS1 3LH**

HazWasteOnline™ provides a two day, hazardous waste classification course that covers the use of the software and both basic and advanced waste classification techniques. Certification has to be renewed every 3 years.

**HazWasteOnline™ Certification:**

-

**Course**

Hazardous Waste Classification

**Date**

-

### Purpose of classification

2 - Material Characterisation

### Address of the waste

Gnoll Park

Post Code **N/A**

### SIC for the process giving rise to the waste

### Description of industry/producer giving rise to the waste

Construction

### Description of the specific process, sub-process and/or activity that created the waste

Excavations

### Description of the waste

made Ground



## Job summary

| # | Sample name | Depth [m] | Classification Result | Hazard properties | Page |
|---|-------------|-----------|-----------------------|-------------------|------|
| 1 | TP02        | 0.2       | Non Hazardous         |                   | 3    |
| 2 | TP03        | 0.2       | Non Hazardous         |                   | 5    |
| 3 | TP07        | 1.15      | Non Hazardous         |                   | 7    |

## Related documents

| # | Name                     | Description                                   |
|---|--------------------------|-----------------------------------------------|
| 1 | General Brownfield Soils | waste stream template used to create this Job |

## Report

Created by: Ian Squibbs

Created date: 17 Aug 2023 13:17 GMT

| Appendices                                                                 | Page |
|----------------------------------------------------------------------------|------|
| <a href="#">Appendix A: Classifier defined and non GB MCL determinands</a> | 9    |
| <a href="#">Appendix B: Rationale for selection of metal species</a>       | 10   |
| <a href="#">Appendix C: Version</a>                                        | 10   |

## Classification of sample: TP02

 **Non Hazardous Waste**  
Classified as **17 05 04**  
in the List of Waste

## Sample details

|                   |           |                                                                                           |
|-------------------|-----------|-------------------------------------------------------------------------------------------|
| Sample name:      | LoW Code: |                                                                                           |
| <b>TP02</b>       | Chapter:  | 17: Construction and Demolition Wastes (including excavated soil from contaminated sites) |
| Sample Depth:     | Entry:    | 17 05 04 (Soil and stones other than those mentioned in 17 05 03)                         |
| <b>0.2 m</b>      |           |                                                                                           |
| Moisture content: |           |                                                                                           |
| <b>12%</b>        |           |                                                                                           |
| (no correction)   |           |                                                                                           |

## Hazard properties

None identified

## Determinands

Moisture content: 12% No Moisture Correction applied (MC)

| #  | Determinand                                                                                                                                                                                                  |                                |                                  | CLP Note | User entered data | Conv. Factor | Compound conc. |       | Classification value | MC Applied | Conc. Not Used |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|----------------------------------|----------|-------------------|--------------|----------------|-------|----------------------|------------|----------------|
|    | EU CLP index number                                                                                                                                                                                          | EC Number                      | CAS Number                       |          |                   |              |                |       |                      |            |                |
| 1  |  arsenic { arsenic trioxide }                                                                                             |                                |                                  |          | 12 mg/kg          | 1.32         | 15.844         | mg/kg | 0.00158 %            |            |                |
|    | 033-003-00-0                                                                                                                                                                                                 | 215-481-4                      | 1327-53-3                        |          |                   |              |                |       |                      |            |                |
| 2  |  cadmium { cadmium sulfide }                                                                                              |                                |                                  | 1        | <0.1 mg/kg        | 1.285        | <0.129         | mg/kg | <0.00001 %           |            | <LOD           |
|    | 048-010-00-4                                                                                                                                                                                                 | 215-147-8                      | 1306-23-6                        |          |                   |              |                |       |                      |            |                |
| 3  |  chromium in chromium(III) compounds { chromium(III) oxide (worst case) }                                                 |                                |                                  |          | 12 mg/kg          | 1.462        | 17.539         | mg/kg | 0.00175 %            |            |                |
|    |                                                                                                                                                                                                              | 215-160-9                      | 1308-38-9                        |          |                   |              |                |       |                      |            |                |
| 4  |  lead { lead chromate }                                                                                                   |                                |                                  | 1        | 25 mg/kg          | 1.56         | 38.995         | mg/kg | 0.0025 %             |            |                |
|    | 082-004-00-2                                                                                                                                                                                                 | 231-846-0                      | 7758-97-6                        |          |                   |              |                |       |                      |            |                |
| 5  |  mercury { mercury dichloride }                                                                                           |                                |                                  |          | 0.06 mg/kg        | 1.353        | 0.0812         | mg/kg | 0.00000812 %         |            |                |
|    | 080-010-00-X                                                                                                                                                                                                 | 231-299-8                      | 7487-94-7                        |          |                   |              |                |       |                      |            |                |
| 6  |  copper { dicopper oxide; copper (I) oxide }                                                                              |                                |                                  |          | 29 mg/kg          | 1.126        | 32.651         | mg/kg | 0.00327 %            |            |                |
|    | 029-002-00-X                                                                                                                                                                                                 | 215-270-7                      | 1317-39-1                        |          |                   |              |                |       |                      |            |                |
| 7  |  nickel { nickel dihydroxide }                                                                                            |                                |                                  |          | 23 mg/kg          | 1.579        | 36.328         | mg/kg | 0.00363 %            |            |                |
|    | 028-008-00-X                                                                                                                                                                                                 | 235-008-5 [1]<br>234-348-1 [2] | 12054-48-7 [1]<br>11113-74-9 [2] |          |                   |              |                |       |                      |            |                |
| 8  |  selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } |                                |                                  |          | 0.63 mg/kg        | 1.405        | 0.885          | mg/kg | 0.0000885 %          |            |                |
|    | 034-002-00-8                                                                                                                                                                                                 |                                |                                  |          |                   |              |                |       |                      |            |                |
| 9  |  zinc { zinc oxide }                                                                                                      |                                |                                  |          | 71 mg/kg          | 1.245        | 88.375         | mg/kg | 0.00884 %            |            |                |
|    | 030-013-00-7                                                                                                                                                                                                 | 215-222-5                      | 1314-13-2                        |          |                   |              |                |       |                      |            |                |
| 10 |  pH                                                                                                                       |                                | PH                               |          | 7.3 pH            |              | 7.3            | pH    | 7.3 pH               |            |                |
|    |                                                                                                                                                                                                              |                                |                                  |          |                   |              |                |       |                      |            |                |
| 11 | naphthalene                                                                                                                                                                                                  |                                |                                  |          | <0.1 mg/kg        |              | <0.1           | mg/kg | <0.00001 %           |            | <LOD           |
|    | 601-052-00-2                                                                                                                                                                                                 | 202-049-5                      | 91-20-3                          |          |                   |              |                |       |                      |            |                |
| 12 | acenaphthylene                                                                                                                                                                                               |                                |                                  |          | <0.1 mg/kg        |              | <0.1           | mg/kg | <0.00001 %           |            | <LOD           |
|    |                                                                                                                                                                                                              | 205-917-1                      | 208-96-8                         |          |                   |              |                |       |                      |            |                |
| 13 | acenaphthene                                                                                                                                                                                                 |                                |                                  |          | <0.1 mg/kg        |              | <0.1           | mg/kg | <0.00001 %           |            | <LOD           |
|    |                                                                                                                                                                                                              | 201-469-6                      | 83-32-9                          |          |                   |              |                |       |                      |            |                |
| 14 | fluorene                                                                                                                                                                                                     |                                |                                  |          | <0.1 mg/kg        |              | <0.1           | mg/kg | <0.00001 %           |            | <LOD           |
|    |                                                                                                                                                                                                              | 201-695-5                      | 86-73-7                          |          |                   |              |                |       |                      |            |                |
| 15 | phenanthrene                                                                                                                                                                                                 |                                |                                  |          | <0.1 mg/kg        |              | <0.1           | mg/kg | <0.00001 %           |            | <LOD           |
|    |                                                                                                                                                                                                              | 201-581-5                      | 85-01-8                          |          |                   |              |                |       |                      |            |                |

| #      | Determinand                        |              |            | CLP Note | User entered data | Conv. Factor | Compound conc. | Classification value | MC Applied | Conc. Not Used |
|--------|------------------------------------|--------------|------------|----------|-------------------|--------------|----------------|----------------------|------------|----------------|
|        | EU CLP index number                | EC Number    | CAS Number |          |                   |              |                |                      |            |                |
| 16     | anthracene                         | 204-371-1    | 120-12-7   |          | <0.1 mg/kg        |              | <0.1 mg/kg     | <0.00001 %           |            | <LOD           |
| 17     | fluoranthene                       | 205-912-4    | 206-44-0   |          | <0.1 mg/kg        |              | <0.1 mg/kg     | <0.00001 %           |            | <LOD           |
| 18     | pyrene                             | 204-927-3    | 129-00-0   |          | <0.1 mg/kg        |              | <0.1 mg/kg     | <0.00001 %           |            | <LOD           |
| 19     | benzo[a]anthracene                 | 601-033-00-9 | 200-280-6  | 56-55-3  | <0.1 mg/kg        |              | <0.1 mg/kg     | <0.00001 %           |            | <LOD           |
| 20     | chrysene                           | 601-048-00-0 | 205-923-4  | 218-01-9 | <0.1 mg/kg        |              | <0.1 mg/kg     | <0.00001 %           |            | <LOD           |
| 21     | benzo[b]fluoranthene               | 601-034-00-4 | 205-911-9  | 205-99-2 | <0.1 mg/kg        |              | <0.1 mg/kg     | <0.00001 %           |            | <LOD           |
| 22     | benzo[k]fluoranthene               | 601-036-00-5 | 205-916-6  | 207-08-9 | <0.1 mg/kg        |              | <0.1 mg/kg     | <0.00001 %           |            | <LOD           |
| 23     | benzo[a]pyrene; benzo[def]chrysene | 601-032-00-3 | 200-028-5  | 50-32-8  | <0.1 mg/kg        |              | <0.1 mg/kg     | <0.00001 %           |            | <LOD           |
| 24     | indeno[123-cd]pyrene               | 205-893-2    | 193-39-5   |          | <0.1 mg/kg        |              | <0.1 mg/kg     | <0.00001 %           |            | <LOD           |
| 25     | dibenz[a,h]anthracene              | 601-041-00-2 | 200-181-8  | 53-70-3  | <0.1 mg/kg        |              | <0.1 mg/kg     | <0.00001 %           |            | <LOD           |
| 26     | benzo[ghi]perylene                 | 205-883-8    | 191-24-2   |          | <0.1 mg/kg        |              | <0.1 mg/kg     | <0.00001 %           |            | <LOD           |
| 27     | TPH (C6 to C40) petroleum group    |              | TPH        |          | <10 mg/kg         |              | <10 mg/kg      | <0.001 %             |            | <LOD           |
| Total: |                                    |              |            |          |                   |              |                | 0.0228 %             |            |                |

#### Key

|             |                                                                                                                                 |
|-------------|---------------------------------------------------------------------------------------------------------------------------------|
|             | User supplied data                                                                                                              |
|             | Determinand values ignored for classification, see column 'Conc. Not Used' for reason                                           |
|             | Determinand defined or amended by HazWasteOnline (see Appendix A)                                                               |
|             | Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| <LOD        | Below limit of detection                                                                                                        |
| CLP: Note 1 | Only the metal concentration has been used for classification                                                                   |

## Classification of sample: TP03

✔ **Non Hazardous Waste**  
Classified as **17 05 04**  
in the List of Waste

## Sample details

|                   |                                                                                           |
|-------------------|-------------------------------------------------------------------------------------------|
| Sample name:      | LoW Code:                                                                                 |
| <b>TP03</b>       | Chapter:                                                                                  |
| Sample Depth:     | 17: Construction and Demolition Wastes (including excavated soil from contaminated sites) |
| <b>0.2 m</b>      | Entry:                                                                                    |
| Moisture content: | 17 05 04 (Soil and stones other than those mentioned in 17 05 03)                         |
| <b>10%</b>        |                                                                                           |
| (no correction)   |                                                                                           |

## Hazard properties

None identified

## Determinands

Moisture content: 10% No Moisture Correction applied (MC)

| #  | Determinand                                                                                                              |                                |                                  | CLP Note | User entered data | Conv. Factor | Compound conc. |  | Classification value | MC Applied | Conc. Not Used |
|----|--------------------------------------------------------------------------------------------------------------------------|--------------------------------|----------------------------------|----------|-------------------|--------------|----------------|--|----------------------|------------|----------------|
|    | EU CLP index number                                                                                                      | EC Number                      | CAS Number                       |          |                   |              |                |  |                      |            |                |
| 1  | arsenic { arsenic trioxide }                                                                                             |                                |                                  |          | 33 mg/kg          | 1.32         | 43.571 mg/kg   |  | 0.00436 %            |            |                |
|    | 033-003-00-0                                                                                                             | 215-481-4                      | 1327-53-3                        |          |                   |              |                |  |                      |            |                |
| 2  | cadmium { cadmium sulfide }                                                                                              |                                |                                  | 1        | 0.6 mg/kg         | 1.285        | 0.771 mg/kg    |  | 0.00006 %            |            |                |
|    | 048-010-00-4                                                                                                             | 215-147-8                      | 1306-23-6                        |          |                   |              |                |  |                      |            |                |
| 3  | chromium in chromium(III) compounds { chromium(III) oxide (worst case) }                                                 |                                |                                  |          | 14 mg/kg          | 1.462        | 20.462 mg/kg   |  | 0.00205 %            |            |                |
|    |                                                                                                                          | 215-160-9                      | 1308-38-9                        |          |                   |              |                |  |                      |            |                |
| 4  | lead { lead chromate }                                                                                                   |                                |                                  | 1        | 54 mg/kg          | 1.56         | 84.23 mg/kg    |  | 0.0054 %             |            |                |
|    | 082-004-00-2                                                                                                             | 231-846-0                      | 7758-97-6                        |          |                   |              |                |  |                      |            |                |
| 5  | mercury { mercury dichloride }                                                                                           |                                |                                  |          | 0.1 mg/kg         | 1.353        | 0.135 mg/kg    |  | 0.0000135 %          |            |                |
|    | 080-010-00-X                                                                                                             | 231-299-8                      | 7487-94-7                        |          |                   |              |                |  |                      |            |                |
| 6  | copper { dicopper oxide; copper (I) oxide }                                                                              |                                |                                  |          | 51 mg/kg          | 1.126        | 57.42 mg/kg    |  | 0.00574 %            |            |                |
|    | 029-002-00-X                                                                                                             | 215-270-7                      | 1317-39-1                        |          |                   |              |                |  |                      |            |                |
| 7  | nickel { nickel dihydroxide }                                                                                            |                                |                                  |          | 18 mg/kg          | 1.579        | 28.431 mg/kg   |  | 0.00284 %            |            |                |
|    | 028-008-00-X                                                                                                             | 235-008-5 [1]<br>234-348-1 [2] | 12054-48-7 [1]<br>11113-74-9 [2] |          |                   |              |                |  |                      |            |                |
| 8  | selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } |                                |                                  |          | 0.97 mg/kg        | 1.405        | 1.363 mg/kg    |  | 0.000136 %           |            |                |
|    | 034-002-00-8                                                                                                             |                                |                                  |          |                   |              |                |  |                      |            |                |
| 9  | zinc { zinc oxide }                                                                                                      |                                |                                  |          | 100 mg/kg         | 1.245        | 124.471 mg/kg  |  | 0.0124 %             |            |                |
|    | 030-013-00-7                                                                                                             | 215-222-5                      | 1314-13-2                        |          |                   |              |                |  |                      |            |                |
| 10 | pH                                                                                                                       |                                | PH                               |          | 6.9 pH            |              | 6.9 pH         |  | 6.9 pH               |            |                |
|    |                                                                                                                          |                                |                                  |          |                   |              |                |  |                      |            |                |
| 11 | naphthalene                                                                                                              |                                |                                  |          | 3.1 mg/kg         |              | 3.1 mg/kg      |  | 0.00031 %            |            |                |
|    | 601-052-00-2                                                                                                             | 202-049-5                      | 91-20-3                          |          |                   |              |                |  |                      |            |                |
| 12 | acenaphthylene                                                                                                           |                                |                                  |          | <0.1 mg/kg        |              | <0.1 mg/kg     |  | <0.00001 %           |            | <LOD           |
|    |                                                                                                                          | 205-917-1                      | 208-96-8                         |          |                   |              |                |  |                      |            |                |
| 13 | acenaphthene                                                                                                             |                                |                                  |          | 0.61 mg/kg        |              | 0.61 mg/kg     |  | 0.000061 %           |            |                |
|    |                                                                                                                          | 201-469-6                      | 83-32-9                          |          |                   |              |                |  |                      |            |                |
| 14 | fluorene                                                                                                                 |                                |                                  |          | 0.14 mg/kg        |              | 0.14 mg/kg     |  | 0.000014 %           |            |                |
|    |                                                                                                                          | 201-695-5                      | 86-73-7                          |          |                   |              |                |  |                      |            |                |
| 15 | phenanthrene                                                                                                             |                                |                                  |          | 0.15 mg/kg        |              | 0.15 mg/kg     |  | 0.000015 %           |            |                |
|    |                                                                                                                          | 201-581-5                      | 85-01-8                          |          |                   |              |                |  |                      |            |                |

| #      | Determinand                        |              |            | CLP Note | User entered data | Conv. Factor | Compound conc. | Classification value | MC Applied | Conc. Not Used |
|--------|------------------------------------|--------------|------------|----------|-------------------|--------------|----------------|----------------------|------------|----------------|
|        | EU CLP index number                | EC Number    | CAS Number |          |                   |              |                |                      |            |                |
| 16     | anthracene                         | 204-371-1    | 120-12-7   |          | <0.1 mg/kg        |              | <0.1 mg/kg     | <0.00001 %           |            | <LOD           |
| 17     | fluoranthene                       | 205-912-4    | 206-44-0   |          | 0.12 mg/kg        |              | 0.12 mg/kg     | 0.000012 %           |            |                |
| 18     | pyrene                             | 204-927-3    | 129-00-0   |          | 0.11 mg/kg        |              | 0.11 mg/kg     | 0.000011 %           |            |                |
| 19     | benzo[a]anthracene                 | 601-033-00-9 | 200-280-6  | 56-55-3  | <0.1 mg/kg        |              | <0.1 mg/kg     | <0.00001 %           |            | <LOD           |
| 20     | chrysene                           | 601-048-00-0 | 205-923-4  | 218-01-9 | <0.1 mg/kg        |              | <0.1 mg/kg     | <0.00001 %           |            | <LOD           |
| 21     | benzo[b]fluoranthene               | 601-034-00-4 | 205-911-9  | 205-99-2 | <0.1 mg/kg        |              | <0.1 mg/kg     | <0.00001 %           |            | <LOD           |
| 22     | benzo[k]fluoranthene               | 601-036-00-5 | 205-916-6  | 207-08-9 | <0.1 mg/kg        |              | <0.1 mg/kg     | <0.00001 %           |            | <LOD           |
| 23     | benzo[a]pyrene; benzo[def]chrysene | 601-032-00-3 | 200-028-5  | 50-32-8  | <0.1 mg/kg        |              | <0.1 mg/kg     | <0.00001 %           |            | <LOD           |
| 24     | indeno[123-cd]pyrene               | 205-893-2    | 193-39-5   |          | <0.1 mg/kg        |              | <0.1 mg/kg     | <0.00001 %           |            | <LOD           |
| 25     | dibenz[a,h]anthracene              | 601-041-00-2 | 200-181-8  | 53-70-3  | <0.1 mg/kg        |              | <0.1 mg/kg     | <0.00001 %           |            | <LOD           |
| 26     | benzo[ghi]perylene                 | 205-883-8    | 191-24-2   |          | <0.1 mg/kg        |              | <0.1 mg/kg     | <0.00001 %           |            | <LOD           |
| Total: |                                    |              |            |          |                   |              |                | 0.0336 %             |            |                |

#### Key

|                                                                                     |                                                                                                                                 |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
|                                                                                     | User supplied data                                                                                                              |
|                                                                                     | Determinand values ignored for classification, see column 'Conc. Not Used' for reason                                           |
| •                                                                                   | Determinand defined or amended by HazWasteOnline (see Appendix A)                                                               |
|  | Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| <LOD                                                                                | Below limit of detection                                                                                                        |
| CLP: Note 1                                                                         | Only the metal concentration has been used for classification                                                                   |

## Classification of sample: TP07

✔ **Non Hazardous Waste**  
Classified as **17 05 04**  
in the List of Waste

## Sample details

|                   |                                                                                           |
|-------------------|-------------------------------------------------------------------------------------------|
| Sample name:      | LoW Code:                                                                                 |
| <b>TP07</b>       | Chapter:                                                                                  |
| Sample Depth:     | 17: Construction and Demolition Wastes (including excavated soil from contaminated sites) |
| <b>1.15 m</b>     | Entry:                                                                                    |
| Moisture content: | 17 05 04 (Soil and stones other than those mentioned in 17 05 03)                         |
| <b>17%</b>        |                                                                                           |
| (no correction)   |                                                                                           |

## Hazard properties

None identified

## Determinands

Moisture content: 17% No Moisture Correction applied (MC)

| #  | Determinand                                                                                                              |                                |                                  | CLP Note | User entered data | Conv. Factor | Compound conc. |  | Classification value | MC Applied | Conc. Not Used |
|----|--------------------------------------------------------------------------------------------------------------------------|--------------------------------|----------------------------------|----------|-------------------|--------------|----------------|--|----------------------|------------|----------------|
|    | EU CLP index number                                                                                                      | EC Number                      | CAS Number                       |          |                   |              |                |  |                      |            |                |
| 1  | arsenic { arsenic trioxide }                                                                                             |                                |                                  |          | 20 mg/kg          | 1.32         | 26.407 mg/kg   |  | 0.00264 %            |            |                |
|    | 033-003-00-0                                                                                                             | 215-481-4                      | 1327-53-3                        |          |                   |              |                |  |                      |            |                |
| 2  | cadmium { cadmium sulfide }                                                                                              |                                |                                  | 1        | 0.17 mg/kg        | 1.285        | 0.218 mg/kg    |  | 0.000017 %           |            |                |
|    | 048-010-00-4                                                                                                             | 215-147-8                      | 1306-23-6                        |          |                   |              |                |  |                      |            |                |
| 3  | chromium in chromium(III) compounds { chromium(III) oxide (worst case) }                                                 |                                |                                  |          | 20 mg/kg          | 1.462        | 29.231 mg/kg   |  | 0.00292 %            |            |                |
|    |                                                                                                                          | 215-160-9                      | 1308-38-9                        |          |                   |              |                |  |                      |            |                |
| 4  | lead { lead chromate }                                                                                                   |                                |                                  | 1        | 38 mg/kg          | 1.56         | 59.273 mg/kg   |  | 0.0038 %             |            |                |
|    | 082-004-00-2                                                                                                             | 231-846-0                      | 7758-97-6                        |          |                   |              |                |  |                      |            |                |
| 5  | mercury { mercury dichloride }                                                                                           |                                |                                  |          | 0.1 mg/kg         | 1.353        | 0.135 mg/kg    |  | 0.0000135 %          |            |                |
|    | 080-010-00-X                                                                                                             | 231-299-8                      | 7487-94-7                        |          |                   |              |                |  |                      |            |                |
| 6  | copper { dicopper oxide; copper (I) oxide }                                                                              |                                |                                  |          | 49 mg/kg          | 1.126        | 55.169 mg/kg   |  | 0.00552 %            |            |                |
|    | 029-002-00-X                                                                                                             | 215-270-7                      | 1317-39-1                        |          |                   |              |                |  |                      |            |                |
| 7  | nickel { nickel dihydroxide }                                                                                            |                                |                                  |          | 40 mg/kg          | 1.579        | 63.18 mg/kg    |  | 0.00632 %            |            |                |
|    | 028-008-00-X                                                                                                             | 235-008-5 [1]<br>234-348-1 [2] | 12054-48-7 [1]<br>11113-74-9 [2] |          |                   |              |                |  |                      |            |                |
| 8  | selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } |                                |                                  |          | 1 mg/kg           | 1.405        | 1.405 mg/kg    |  | 0.000141 %           |            |                |
|    | 034-002-00-8                                                                                                             |                                |                                  |          |                   |              |                |  |                      |            |                |
| 9  | zinc { zinc oxide }                                                                                                      |                                |                                  |          | 110 mg/kg         | 1.245        | 136.919 mg/kg  |  | 0.0137 %             |            |                |
|    | 030-013-00-7                                                                                                             | 215-222-5                      | 1314-13-2                        |          |                   |              |                |  |                      |            |                |
| 10 | pH                                                                                                                       |                                |                                  |          | 5.4 pH            |              | 5.4 pH         |  | 5.4 pH               |            |                |
|    |                                                                                                                          |                                | PH                               |          |                   |              |                |  |                      |            |                |
| 11 | naphthalene                                                                                                              |                                |                                  |          | 23 mg/kg          |              | 23 mg/kg       |  | 0.0023 %             |            |                |
|    | 601-052-00-2                                                                                                             | 202-049-5                      | 91-20-3                          |          |                   |              |                |  |                      |            |                |
| 12 | acenaphthylene                                                                                                           |                                |                                  |          | 43 mg/kg          |              | 43 mg/kg       |  | 0.0043 %             |            |                |
|    |                                                                                                                          | 205-917-1                      | 208-96-8                         |          |                   |              |                |  |                      |            |                |
| 13 | acenaphthene                                                                                                             |                                |                                  |          | 6.6 mg/kg         |              | 6.6 mg/kg      |  | 0.00066 %            |            |                |
|    |                                                                                                                          | 201-469-6                      | 83-32-9                          |          |                   |              |                |  |                      |            |                |
| 14 | fluorene                                                                                                                 |                                |                                  |          | 29 mg/kg          |              | 29 mg/kg       |  | 0.0029 %             |            |                |
|    |                                                                                                                          | 201-695-5                      | 86-73-7                          |          |                   |              |                |  |                      |            |                |
| 15 | phenanthrene                                                                                                             |                                |                                  |          | <0.1 mg/kg        |              | <0.1 mg/kg     |  | <0.00001 %           |            | <LOD           |
|    |                                                                                                                          | 201-581-5                      | 85-01-8                          |          |                   |              |                |  |                      |            |                |

| #      | Determinand                        |              |            | CLP Note | User entered data | Conv. Factor | Compound conc. | Classification value | MC Applied | Conc. Not Used |
|--------|------------------------------------|--------------|------------|----------|-------------------|--------------|----------------|----------------------|------------|----------------|
|        | EU CLP index number                | EC Number    | CAS Number |          |                   |              |                |                      |            |                |
| 16     | anthracene                         | 204-371-1    | 120-12-7   |          | <0.1 mg/kg        |              | <0.1 mg/kg     | <0.00001 %           |            | <LOD           |
| 17     | fluoranthene                       | 205-912-4    | 206-44-0   |          | 0.64 mg/kg        |              | 0.64 mg/kg     | 0.000064 %           |            |                |
| 18     | pyrene                             | 204-927-3    | 129-00-0   |          | 0.82 mg/kg        |              | 0.82 mg/kg     | 0.000082 %           |            |                |
| 19     | benzo[a]anthracene                 | 601-033-00-9 | 200-280-6  |          | 0.79 mg/kg        |              | 0.79 mg/kg     | 0.000079 %           |            |                |
| 20     | chrysene                           | 601-048-00-0 | 205-923-4  |          | 0.36 mg/kg        |              | 0.36 mg/kg     | 0.000036 %           |            |                |
| 21     | benzo[b]fluoranthene               | 601-034-00-4 | 205-911-9  |          | <0.1 mg/kg        |              | <0.1 mg/kg     | <0.00001 %           |            | <LOD           |
| 22     | benzo[k]fluoranthene               | 601-036-00-5 | 205-916-6  |          | <0.1 mg/kg        |              | <0.1 mg/kg     | <0.00001 %           |            | <LOD           |
| 23     | benzo[a]pyrene; benzo[def]chrysene | 601-032-00-3 | 200-028-5  |          | <0.1 mg/kg        |              | <0.1 mg/kg     | <0.00001 %           |            | <LOD           |
| 24     | indeno[123-cd]pyrene               | 205-893-2    | 193-39-5   |          | 84 mg/kg          |              | 84 mg/kg       | 0.0084 %             |            |                |
| 25     | dibenz[a,h]anthracene              | 601-041-00-2 | 200-181-8  |          | 35 mg/kg          |              | 35 mg/kg       | 0.0035 %             |            |                |
| 26     | benzo[ghi]perylene                 | 205-883-8    | 191-24-2   |          | 78 mg/kg          |              | 78 mg/kg       | 0.0078 %             |            |                |
| 27     | TPH (C6 to C40) petroleum group    |              | TPH        |          | 43 mg/kg          |              | 43 mg/kg       | 0.0043 %             |            |                |
| Total: |                                    |              |            |          |                   |              |                | 0.0695 %             |            |                |

#### Key

|             |                                                                                                                                 |
|-------------|---------------------------------------------------------------------------------------------------------------------------------|
|             | User supplied data                                                                                                              |
|             | Determinand values ignored for classification, see column 'Conc. Not Used' for reason                                           |
|             | Determinand defined or amended by HazWasteOnline (see Appendix A)                                                               |
|             | Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration |
| <LOD        | Below limit of detection                                                                                                        |
| CLP: Note 1 | Only the metal concentration has been used for classification                                                                   |

#### Supplementary Hazardous Property Information

**HP 3(i): Flammable** "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and ≤ 75°C"

Force this Hazardous property to non hazardous because Unlikely to be flammable within soil at such low concentrations

Hazard Statements hit:

**Flam. Liq. 3; H226** "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0043%)

## Appendix A: Classifier defined and non GB MCL determinands

### ■ **chromium(III) oxide (worst case)** (EC Number: 215-160-9, CAS Number: 1308-38-9)

Description/Comments: Data from C&L Inventory Database

Data source: <https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/details/33806>

Data source date: 17 Jul 2015

Hazard Statements: Acute Tox. 4; H332 , Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Resp. Sens. 1; H334 , Skin Sens. 1; H317 , Repr. 1B; H360FD , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

### ■ **pH** (CAS Number: PH)

Description/Comments: Appendix C4

Data source: WM3 1st Edition 2015

Data source date: 25 May 2015

Hazard Statements: None.

### ■ **acenaphthylene** (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 17 Jul 2015

Hazard Statements: Acute Tox. 4; H302 , Acute Tox. 1; H330 , Acute Tox. 1; H310 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315

### ■ **acenaphthene** (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 17 Jul 2015

Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Aquatic Chronic 2; H411

### ■ **fluorene** (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 06 Aug 2015

Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

### ■ **phenanthrene** (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 06 Aug 2015

Hazard Statements: Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Carc. 2; H351 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Skin Irrit. 2; H315

### ■ **anthracene** (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 17 Jul 2015

Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

### ■ **fluoranthene** (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 21 Aug 2015

Hazard Statements: Acute Tox. 4; H302 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

### ■ **pyrene** (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 21 Aug 2015

Hazard Statements: Skin Irrit. 2; H315 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

### ■ **indeno[123-cd]pyrene** (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 06 Aug 2015

Hazard Statements: Carc. 2; H351

■ **benzo[ghi]perylene** (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015  
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>  
Data source date: 23 Jul 2015  
Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

■ **TPH (C6 to C40) petroleum group** (CAS Number: TPH)

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013  
Data source: WM3 1st Edition 2015  
Data source date: 25 May 2015  
Hazard Statements: Flam. Liq. 3; H226 , Asp. Tox. 1; H304 , STOT RE 2; H373 , Muta. 1B; H340 , Carc. 1B; H350 , Repr. 2; H361d , Aquatic Chronic 2; H411

## Appendix B: Rationale for selection of metal species

### arsenic {arsenic trioxide}

Worst case species based on hazard statements

### cadmium {cadmium sulfide}

Worst case species based on hazard statements

### chromium in chromium(III) compounds {chromium(III) oxide (worst case)}

Worst case species based on hazard statements

### lead {lead chromate}

Worst case species based on hazard statements

### mercury {mercury dichloride}

Worst case species based on hazard statements

### copper {dicopper oxide; copper (I) oxide}

Most likely common species

### nickel {nickel dihydroxide}

Worst case species based on hazard statements

### selenium {selenium compounds with the exception of cadmium sulposelenide and those specified elsewhere in this Annex}

Worst case species based on hazard statements

### zinc {zinc oxide}

Most likely to occur in oxides form in soils.

## Appendix C: Version

HazWasteOnline Classification Engine: **WM3 1st Edition v1.2.GB - Oct 2021**  
HazWasteOnline Classification Engine Version: 2023.226.5717.10536 (14 Aug 2023)  
HazWasteOnline Database: 2023.226.5717.10536 (14 Aug 2023)



This classification utilises the following guidance and legislation:

**WM3 v1.2.GB - Waste Classification** - 1st Edition v1.2.GB - Oct 2021

**CLP Regulation** - Regulation 1272/2008/EC of 16 December 2008

**1st ATP** - Regulation 790/2009/EC of 10 August 2009

**2nd ATP** - Regulation 286/2011/EC of 10 March 2011

**3rd ATP** - Regulation 618/2012/EU of 10 July 2012

**4th ATP** - Regulation 487/2013/EU of 8 May 2013

**Correction to 1st ATP** - Regulation 758/2013/EU of 7 August 2013

**5th ATP** - Regulation 944/2013/EU of 2 October 2013

**6th ATP** - Regulation 605/2014/EU of 5 June 2014

**WFD Annex III replacement** - Regulation 1357/2014/EU of 18 December 2014

**Revised List of Waste 2014** - Decision 2014/955/EU of 18 December 2014

**7th ATP** - Regulation 2015/1221/EU of 24 July 2015

**8th ATP** - Regulation (EU) 2016/918 of 19 May 2016

**9th ATP** - Regulation (EU) 2016/1179 of 19 July 2016

**10th ATP** - Regulation (EU) 2017/776 of 4 May 2017

**HP14 amendment** - Regulation (EU) 2017/997 of 8 June 2017

**13th ATP** - Regulation (EU) 2018/1480 of 4 October 2018

**14th ATP** - Regulation (EU) 2020/217 of 4 October 2019

**15th ATP** - Regulation (EU) 2020/1182 of 19 May 2020

**The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use)(Amendment etc.) (EU Exit)**

**Regulations 2020** - UK: 2020 No. 1567 of 16th December 2020

**The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020** - UK:

2020 No. 1540 of 16th December 2020

**GB MCL List** - version 1.1 of 09 June 2021

**APPENDIX F: GEOTECHNICAL RISK REGISTER**

GEOTECHNICAL RISK REGISTER  
GNOLL COUNTRY PARK, NEATH

Client: Andrew Scott  
Principal Designer: TBC  
Principal Contractor: TBC



| No. | Hazard                                                       | Cause                                                                                                                              | Potential Impact |               |           |      | Risk Rating Before Control |        |             | Risk Control Measure                                                                                                                                                                                                                                                            | Risk Rating following control |        |             | Method of Communication                                              |
|-----|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------|-----------|------|----------------------------|--------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|--------|-------------|----------------------------------------------------------------------|
|     |                                                              |                                                                                                                                    | Category         |               |           |      | Likelihood                 | Effect | Risk Rating |                                                                                                                                                                                                                                                                                 | Likelihood                    | Effect | Risk Rating |                                                                      |
|     |                                                              |                                                                                                                                    | H&S              | Environmental | Programme | Cost |                            |        |             |                                                                                                                                                                                                                                                                                 |                               |        |             |                                                                      |
| 1   | Excavations - Collapse/Instability                           | Excessive Groundwater/ Rainfall<br>Soft Ground Conditions<br>Cuttings too steep/insufficient support.<br>Granular nature of soils. | x                |               | x         | x    | 2                          | 5      | 10          | Review ground investigation report for specific locality excavated.<br>Provide briefing and method of safe working practice<br>Ensure pumping and side support equipment are readily available<br>Temporary batter slopes at safe angles to be determined by ground conditions. | 1                             | 5      | 5           | Site investigation report<br><br>Ground Conditions Assessment Report |
| 2   | Excavations – Surface water flooding                         | Excessive Rainfall event<br>Prolonged periods of steady rainfall<br>Western boundary in area at risk of surface water flooding     |                  |               |           | x    | 3                          | 3      | 9           | Forecast to be checked a week in advance and changes to works made to suit.<br>Seasonal working.<br>Provision of pumping equipment.<br>Drains around upslope of any excavations.<br>Management of surface water and run off.                                                    | 1                             | 3      | 3           | Ground Conditions Assessment Report.                                 |
| 3   | Contamination – Site Soils                                   | Contamination from made ground on site.                                                                                            |                  | x             |           | x    | 1                          | 4      | 4           | Ground investigation to determine contamination status                                                                                                                                                                                                                          | 1                             | 4      | 4           | Ground Conditions Assessment Report                                  |
| 4   | Aggressive Chemicals (Sulphates)                             | Sulphate Levels                                                                                                                    |                  |               |           | x    | 2                          | 3      | 6           | BRE SD1 testing carried out.<br>DS-1 AC-1 Concrete classification                                                                                                                                                                                                               | 1                             | 3      | 3           | Ground Conditions Assessment Report                                  |
| 5   | Silt Run Off                                                 | Excessive rainfall                                                                                                                 |                  | x             |           |      | 4                          | 2      | 8           | Silt control measures should be in place on site                                                                                                                                                                                                                                | 1                             | 2      | 2           | Construction Management Plan                                         |
| 6   | Foundation - Ultimate limit state failure (Bearing Capacity) | Unknown loadings<br>Degradation of concrete<br>Insufficient depth of foundations                                                   | x                |               |           | x    | 2                          | 5      | 10          | Ground investigation to be carried out to determine suitable foundation depth                                                                                                                                                                                                   | 1                             | 5      | 5           | Ground Conditions Assessment Report foundation section.              |
| 7   | Serviceability limit state failure (settlement)              | Plasticity Clays                                                                                                                   |                  |               |           | x    | 3                          | 3      | 9           | Plasticity testing of clays                                                                                                                                                                                                                                                     | 1                             | 3      | 3           | Ground Conditions Assessment Report. NHBC Guidelines                 |
| 8   | Obstructions in natural soils                                | Cobbles                                                                                                                            |                  |               | x         | x    | 2                          | 3      | 6           | Provision should be made in advance for dealing with cobbles and boulders, and exploratory logs inspected.<br>Large plant with toothed buckets to excavate dense material.                                                                                                      | 1                             | 3      | 3           | Ground Investigation Report.                                         |
| 9   | Buried Services                                              | Exploratory holes located over buried services noticed to run through site                                                         | x                |               |           |      | 1                          | 3      | 3           | No known underground services under site. Obtain underground survey search prior to breaking ground.                                                                                                                                                                            | 1                             | 3      | 3           | Service drawings, constraints plan.                                  |
| 10  | Groundwater                                                  | Shallow groundwater                                                                                                                |                  | x             | x         | x    | 2                          | 3      | 6           | Groundwater not encountered during excavation. Any excavations that encounter groundwater will likely require dewatering.                                                                                                                                                       | 1                             | 3      | 3           | Ground Conditions Assessment Report                                  |
| 11  | Unexploded Ordnance                                          | Striking underground UXO                                                                                                           | x                |               |           |      | 1                          | 4      | 4           | Site in a low bomb risk area.                                                                                                                                                                                                                                                   | 1                             | 4      | 4           | Site in low risk area.                                               |
| 12  | Radon                                                        | Site not in an area requiring radon protection measures                                                                            |                  |               |           | x    | 1                          | 4      | 4           | Basic Protection Measures required although confirmation is required in the form of a site-specific radon report.                                                                                                                                                               | 1                             | 4      | 4           | Ground Investigation Report.                                         |

GEOTECHNICAL RISK REGISTER  
GNOLL COUNTRY PARK, NEATH

Client: Andrew Scott  
Principal Designer: TBC  
Principal Contractor: TBC



| Probability   | (P) |   | Impact    | (I) |   | Risk        | (R)   |
|---------------|-----|---|-----------|-----|---|-------------|-------|
| Very likely   | 5   | x | Very high | 5   | = | Severe      | 20-25 |
| Likely        | 4   |   | High      | 4   |   | Substantial | 15-19 |
| Plausible     | 3   |   | Medium    | 3   |   | Moderate    | 10-14 |
| Unlikely      | 2   |   | Low       | 2   |   | Minor       | 5-9   |
| Very Unlikely | 1   |   | Very low  | 1   |   | Negligible  | 1-4   |

**APPENDIX G: TERRA FIRMA – PRELIMINARY FACTUAL INFORMATION**



Geotechnical &amp; Geoenvironmental Specialists

## Sheet 1 of 1

Logged:

Remarks: Trial pit remained stable during excavation. Upon completion, Trial pit backfilled with arisings.

Trial Pit Log

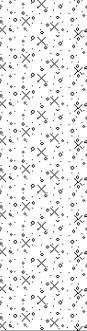
Trial Pit No:  
HP06  
Sheet 1 of 1

|                 |                    |             |       |                                                                                                                                 |  |                                    |  |
|-----------------|--------------------|-------------|-------|---------------------------------------------------------------------------------------------------------------------------------|--|------------------------------------|--|
| Project Name:   | Gnoll Country Park | Project No: | 17887 | Co-ords: -<br>Level:                                                                                                            |  | Date:                              |  |
| Location: Neath |                    |             |       | Dimensions:                                                                                                                     |  | Scale:                             |  |
| Client: Jubb    |                    |             |       | <div> <div>Depth</div> <div>1.00</div> </div> <div> <div>0.50</div> <div></div> </div> <div> <div>0.50</div> <div></div> </div> |  | <div>1:25</div> <div>Logged:</div> |  |

| Water Strike | Samples & In Situ Testing |      |         | Depth (m) | Level (m) | Legend                                                                            | Stratum Description                                                                                                                                                |   |
|--------------|---------------------------|------|---------|-----------|-----------|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|              | Depth                     | Type | Results |           |           |                                                                                   |                                                                                                                                                                    |   |
|              |                           |      |         | 1.00      |           |  | Light brown soft locally firm slightly gravelly slightly sandy silty CLAY. Gravels are angular and subrounded fine to medium sandstone, mudstone, mortar and coal. |   |
|              |                           |      |         | 1.10      |           |  | Dark brown dense angular and subangular fine to coarse silty sandy aggregate GRAVEL.                                                                               | 1 |
|              |                           |      |         |           |           |                                                                                   | End of Pit at 1.000m                                                                                                                                               |   |
|              |                           |      |         |           |           |                                                                                   |                                                                                                                                                                    | 2 |
|              |                           |      |         |           |           |                                                                                   |                                                                                                                                                                    | 3 |
|              |                           |      |         |           |           |                                                                                   |                                                                                                                                                                    | 4 |
|              |                           |      |         |           |           |                                                                                   |                                                                                                                                                                    | 5 |

Stability: Stable

Remarks: Trial pit remained stable during excavation. Upon completion, Trial pit backfilled with arisings.

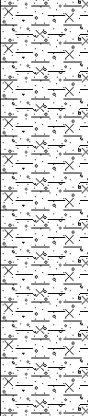
|  <div> Tel: 02920 735354<br/> info@terrafirmawales.co.uk<br/> www.terrafirmawales.co.uk<br/> <small>Geotechnical &amp; Geoenvironmental Specialists</small> </div> |                           |      |         | <h1>Trial Pit Log</h1>                                               |           |                                                                                   | Trial Pit No:<br><b>HP07</b><br>Sheet 1 of 1                                                                                    |       |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|------|---------|----------------------------------------------------------------------|-----------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|-------|--|
| Project Name: <b>Gnoll Country Park</b>                                                                                                                                                                                                            |                           |      |         | Project No:<br><b>17887</b>                                          |           | Co-ords: -<br>Level:                                                              |                                                                                                                                 | Date: |  |
| Location: <b>Neath</b>                                                                                                                                                                                                                             |                           |      |         | Dimensions: <div> <div>0.50</div> <div>0.50</div> <div></div> </div> |           |                                                                                   | Scale:<br><b>1:25</b>                                                                                                           |       |  |
| Client: <b>Jubb</b>                                                                                                                                                                                                                                |                           |      |         | Depth<br><b>1.10</b>                                                 |           |                                                                                   | Logged:                                                                                                                         |       |  |
| Water Strike                                                                                                                                                                                                                                       | Samples & In Situ Testing |      |         | Depth (m)                                                            | Level (m) | Legend                                                                            | Stratum Description                                                                                                             |       |  |
|                                                                                                                                                                                                                                                    | Depth                     | Type | Results |                                                                      |           |                                                                                   |                                                                                                                                 |       |  |
|                                                                                                                                                                                                                                                    |                           |      |         | 1.10                                                                 |           |  | Light brown slightly sandy silty angular to subrounded fine to coarse sandstone GRAVEL becoming increasingly clayey with depth. |       |  |
|                                                                                                                                                                                                                                                    |                           |      |         |                                                                      |           |                                                                                   | End of Pit at 1.100m                                                                                                            |       |  |
|                                                                                                                                                                                                                                                    |                           |      |         |                                                                      |           |                                                                                   | <div> <div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> </div>                                                   |       |  |
| Stability: <b>Stable</b>                                                                                                                                                                                                                           |                           |      |         |                                                                      |           |                                                                                   |                                                                                                                                 |       |  |
| Remarks: Trial pit remained stable during excavation. Upon completion, Trial pit backfilled with arisings.                                                                                                                                         |                           |      |         |                                                                      |           |                                                                                   |                                                                                                                                 |       |  |

Trial Pit Log

Trial Pit No:  
TP01  
Sheet 1 of 1

|                                  |                   |                      |       |
|----------------------------------|-------------------|----------------------|-------|
| Project Name: Gnoll Country Park | Project No: 17887 | Co-ords: -<br>Level: | Date: |
|----------------------------------|-------------------|----------------------|-------|

|                 |                                           |             |
|-----------------|-------------------------------------------|-------------|
| Location: Neath | Dimensions:<br>Depth 2.00<br>1.50<br>0.60 | Scale: 1:25 |
| Client: Jubb    |                                           | Logged:     |

| Water Strike | Samples & In Situ Testing |      |         | Depth (m) | Level (m) | Legend                                                                             | Stratum Description                                                                                                          |   |
|--------------|---------------------------|------|---------|-----------|-----------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|---|
|              | Depth                     | Type | Results |           |           |                                                                                    |                                                                                                                              |   |
|              |                           |      |         | 1.40      |           |   | Grass over firm light brown slightly sandy gravelly silty CLAY. Gravels are angular and subangular fine to coarse sandstone. | 1 |
|              |                           |      |         | 2.00      |           |  | Brown medium dense slightly sandy clayey angular to subrounded fine to coarse sandstone GRAVEL.                              | 2 |
|              |                           |      |         |           |           |                                                                                    | End of Pit at 2.000m                                                                                                         | 3 |
|              |                           |      |         |           |           |                                                                                    |                                                                                                                              | 4 |
|              |                           |      |         |           |           |                                                                                    |                                                                                                                              | 5 |

Stability: Stable

Remarks: Trial pit remained stable during excavation. Upon completion, Trial pit backfilled with arisings.

Trial Pit Log

Trial Pit No:  
TP02  
Sheet 1 of 1

|                                  |                   |                      |       |
|----------------------------------|-------------------|----------------------|-------|
| Project Name: Gnoll Country Park | Project No: 17887 | Co-ords: -<br>Level: | Date: |
|----------------------------------|-------------------|----------------------|-------|

|                 |                  |             |
|-----------------|------------------|-------------|
| Location: Neath | Dimensions: 1.50 | Scale: 1:25 |
| Client: Jubb    | Depth 1.40       | Logged:     |

| Water Strike | Samples & In Situ Testing |      |         | Depth (m) | Level (m) | Legend                                                                            | Stratum Description                                                                                                               |
|--------------|---------------------------|------|---------|-----------|-----------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
|              | Depth                     | Type | Results |           |           |                                                                                   |                                                                                                                                   |
|              |                           |      |         | 0.30      |           |  | Grass over firm light brown slightly sandy gravelly silty CLAY. Gravels are angular and subangular fine to coarse sandstone.      |
|              |                           |      |         | 1.00      |           |  | Brown medium dense tending to dense at base slightly silty sandy angular and subangular fine to coarse tabulate sandstone GRAVEL. |
|              |                           |      |         | 1.40      |           |  | Recovered as very dense sandy angular and subangular tabulate sandstone GRAVEL. Possible bedrock.                                 |
|              |                           |      |         |           |           |                                                                                   | End of Pit at 1.400m                                                                                                              |

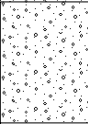
|                                                                                                            |
|------------------------------------------------------------------------------------------------------------|
| Stability: Stable                                                                                          |
| Remarks: Trial pit remained stable during excavation. Upon completion, Trial pit backfilled with arisings. |

Trial Pit Log

Trial Pit No:  
TP03  
Sheet 1 of 1

|                                  |                   |                      |       |
|----------------------------------|-------------------|----------------------|-------|
| Project Name: Gnoll Country Park | Project No: 17887 | Co-ords: -<br>Level: | Date: |
|----------------------------------|-------------------|----------------------|-------|

|                 |                  |             |
|-----------------|------------------|-------------|
| Location: Neath | Dimensions: 1.50 | Scale: 1:25 |
| Client: Jubb    | Depth 1.40       | Logged:     |

| Water Strike | Samples & In Situ Testing |      |         | Depth (m) | Level (m) | Legend                                                                            | Stratum Description                                                                                                                         |   |
|--------------|---------------------------|------|---------|-----------|-----------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|---|
|              | Depth                     | Type | Results |           |           |                                                                                   |                                                                                                                                             |   |
|              |                           |      |         | 0.30      |           |  | Grass over dense reddish brown sandy silty angular and subangular fine to coarse tabulate sandstone GRAVEL.                                 |   |
|              |                           |      |         |           |           |  | Orangeish brown medium dense tending to dense at base slightly silty sandy angular and subangular fine to coarse tabulate sandstone GRAVEL. |   |
|              |                           |      |         | 1.00      |           |  | Recovered as very dense sandy angular and subangular tabulate sandstone GRAVEL. Possible bedrock.                                           | 1 |
|              |                           |      |         | 1.40      |           |                                                                                   | End of Pit at 1.400m                                                                                                                        |   |
|              |                           |      |         |           |           |                                                                                   |                                                                                                                                             | 2 |
|              |                           |      |         |           |           |                                                                                   |                                                                                                                                             | 3 |
|              |                           |      |         |           |           |                                                                                   |                                                                                                                                             | 4 |
|              |                           |      |         |           |           |                                                                                   |                                                                                                                                             | 5 |

Stability: Stable

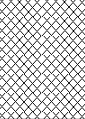
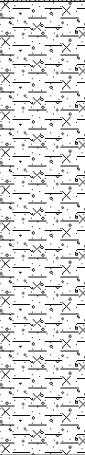
Remarks: Trial pit remained stable during excavation. Upon completion, Trial pit backfilled with arisings.

Trial Pit Log

Trial Pit No:  
TP04  
Sheet 1 of 1

|                                  |                   |                      |       |
|----------------------------------|-------------------|----------------------|-------|
| Project Name: Gnoll Country Park | Project No: 17887 | Co-ords: -<br>Level: | Date: |
|----------------------------------|-------------------|----------------------|-------|

|                 |                  |             |
|-----------------|------------------|-------------|
| Location: Neath | Dimensions: 1.50 | Scale: 1:25 |
| Client: Jubb    | Depth 1.90       | Logged:     |

| Water Strike | Samples & In Situ Testing |      |         | Depth (m) | Level (m) | Legend                                                                             | Stratum Description                                                                                                                                                                                     |
|--------------|---------------------------|------|---------|-----------|-----------|------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              | Depth                     | Type | Results |           |           |                                                                                    |                                                                                                                                                                                                         |
|              |                           |      |         | 0.40      |           |   | Dark grey medium dense to dense very sandy silty angular and subangular fine to coarse brick fragment, concrete, slag, glass and sandstone GRAVEL. Occasional bricks and timber fragments. MADE GROUND. |
|              |                           |      |         | 1.90      |           |  | Orangeish brown firm slightly sandy slightly gravelly silty CLAY. Gravels are subrounded and subangular fine to coarse sandstone.                                                                       |
|              |                           |      |         |           |           |                                                                                    | End of Pit at 1.900m                                                                                                                                                                                    |

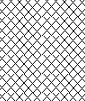
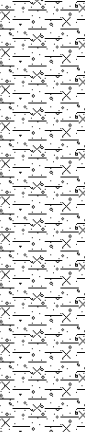
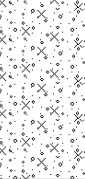
|                                                                                                            |
|------------------------------------------------------------------------------------------------------------|
| Stability: Stable                                                                                          |
| Remarks: Trial pit remained stable during excavation. Upon completion, Trial pit backfilled with arisings. |

Trial Pit Log

Trial Pit No:  
TP05  
Sheet 1 of 1

|                                  |                   |                      |       |
|----------------------------------|-------------------|----------------------|-------|
| Project Name: Gnoll Country Park | Project No: 17887 | Co-ords: -<br>Level: | Date: |
|----------------------------------|-------------------|----------------------|-------|

|                 |                  |             |
|-----------------|------------------|-------------|
| Location: Neath | Dimensions: 2.00 | Scale: 1:25 |
| Client: Jubb    | Depth 2.40       | Logged:     |

| Water Strike | Samples & In Situ Testing |      |         | Depth (m) | Level (m) | Legend                                                                              | Stratum Description                                                                                                                                                                                     |   |
|--------------|---------------------------|------|---------|-----------|-----------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|              | Depth                     | Type | Results |           |           |                                                                                     |                                                                                                                                                                                                         |   |
|              |                           |      |         | 0.35      |           |    | Dark grey medium dense to dense very sandy silty angular and subangular fine to coarse brick fragment, concrete, slag, glass and sandstone GRAVEL. Occasional bricks and timber fragments. MADE GROUND. |   |
|              |                           |      |         |           |           |   | Orangeish brown firm slightly sandy slightly gravelly silty CLAY. Gravels are subrounded and subangular fine to coarse sandstone.                                                                       | 1 |
|              |                           |      |         | 1.80      |           |  | Brown medium dense to dense at base sandy silty angular and subrounded fine to coarse tabulate sandstone GRAVEL. Occasional sandstone cobbles becoming frequent at base.                                | 2 |
|              |                           |      |         | 2.40      |           |                                                                                     | End of Pit at 2.400m                                                                                                                                                                                    | 3 |
|              |                           |      |         |           |           |                                                                                     |                                                                                                                                                                                                         | 4 |
|              |                           |      |         |           |           |                                                                                     |                                                                                                                                                                                                         | 5 |

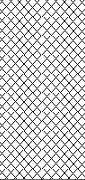
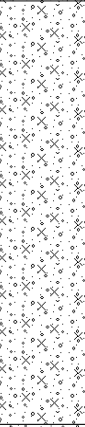
|                                                                                                            |
|------------------------------------------------------------------------------------------------------------|
| Stability: Stable                                                                                          |
| Remarks: Trial pit remained stable during excavation. Upon completion, Trial pit backfilled with arisings. |

Trial Pit Log

Trial Pit No:  
TP06  
Sheet 1 of 1

|                                  |                   |                      |       |
|----------------------------------|-------------------|----------------------|-------|
| Project Name: Gnoll Country Park | Project No: 17887 | Co-ords: -<br>Level: | Date: |
|----------------------------------|-------------------|----------------------|-------|

|                 |                  |             |
|-----------------|------------------|-------------|
| Location: Neath | Dimensions: 2.00 | Scale: 1:25 |
| Client: Jubb    | Depth 2.10       | Logged:     |

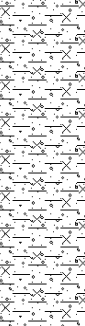
| Water Strike | Samples & In Situ Testing |      |         | Depth (m)    | Level (m) | Legend                                                                              | Stratum Description                                                                                                                                                                                                            |
|--------------|---------------------------|------|---------|--------------|-----------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              | Depth                     | Type | Results |              |           |                                                                                     |                                                                                                                                                                                                                                |
|              |                           |      |         | 0.60         |           |    | Dark grey medium dense to dense very sandy silty angular and subangular fine to coarse brick fragment, concrete, slag, glass, ash and sandstone GRAVEL. Occasional bricks, plastic sheeting and timber fragments. MADE GROUND. |
|              |                           |      |         |              |           |   | Brown medium dense to dense at base sandy silty angular and subrounded fine to coarse tabulate sandstone GRAVEL. Occasional sandstone cobbles becoming frequent at base.                                                       |
|              |                           |      |         | 2.00<br>2.10 |           |  | Recovered as dense to very dense sandy angular and subangular tabulate sandstone GRAVEL. Possible bedrock.                                                                                                                     |
|              |                           |      |         |              |           |                                                                                     | End of Pit at 2.100m                                                                                                                                                                                                           |

|                                                                                                            |
|------------------------------------------------------------------------------------------------------------|
| Stability: Stable                                                                                          |
| Remarks: Trial pit remained stable during excavation. Upon completion, Trial pit backfilled with arisings. |

Trial Pit Log

Trial Pit No:  
 TP07  
 Sheet 1 of 1

|                 |                    |             |       |             |      |         |      |
|-----------------|--------------------|-------------|-------|-------------|------|---------|------|
| Project Name:   | Gnoll Country Park | Project No: | 17887 | Co-ords: -  |      | Date:   |      |
| Location: Neath |                    |             |       | Dimensions: | 0.50 | Scale:  | 1:25 |
| Client: Jubb    |                    |             |       | Depth       | 0.50 | Logged: |      |
|                 |                    |             |       | 1.20        |      |         |      |

| Water Strike | Samples & In Situ Testing |      |         | Depth (m) | Level (m) | Legend                                                                            | Stratum Description                                                                                                                        |   |
|--------------|---------------------------|------|---------|-----------|-----------|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|---|
|              | Depth                     | Type | Results |           |           |                                                                                   |                                                                                                                                            |   |
|              |                           |      |         | 1.10      |           |  | Dark brown soft locally firm slightly gravelly sandy clayey SILT. Gravels are rounded to subangular fine to coarse sandstone and mudstone. | 1 |
|              |                           |      |         | 1.20      |           |  | Orangeish brown firm slightly sandy slightly gravelly silty CLAY. Gravels are subrounded and subangular fine to coarse sandstone.          | 2 |
|              |                           |      |         |           |           |                                                                                   | End of Pit at 1.200m                                                                                                                       | 3 |
|              |                           |      |         |           |           |                                                                                   |                                                                                                                                            | 4 |
|              |                           |      |         |           |           |                                                                                   |                                                                                                                                            | 5 |

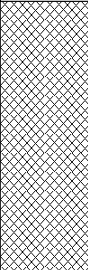
|            |                                                                                                   |
|------------|---------------------------------------------------------------------------------------------------|
| Stability: | Stable                                                                                            |
| Remarks:   | Trial pit remained stable during excavation. Upon completion, Trial pit backfilled with arisings. |

Trial Pit Log

Trial Pit No:  
TP08  
Sheet 1 of 1

|                                  |                   |                      |       |
|----------------------------------|-------------------|----------------------|-------|
| Project Name: Gnoll Country Park | Project No: 17887 | Co-ords: -<br>Level: | Date: |
|----------------------------------|-------------------|----------------------|-------|

|                 |                                |                        |
|-----------------|--------------------------------|------------------------|
| Location: Neath | Dimensions: 1.60<br>Depth 2.00 | Scale: 1:25<br>Logged: |
|-----------------|--------------------------------|------------------------|

| Water Strike | Samples & In Situ Testing |      |         | Depth (m) | Level (m) | Legend                                                                             | Stratum Description                                                                                                                                                      |   |
|--------------|---------------------------|------|---------|-----------|-----------|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|              | Depth                     | Type | Results |           |           |                                                                                    |                                                                                                                                                                          |   |
|              |                           |      |         | 0.90      |           |   | Dark brown slightly sandy gravelly clayey SILT/silty CLAY. Gravels are angular to subrounded sandstone, brick fragments, coal and cinter. MADE GROUND.                   |   |
|              |                           |      |         |           |           |  | Brown medium dense to dense at base sandy silty angular and subrounded fine to coarse tabulate sandstone GRAVEL. Occasional sandstone cobbles becoming frequent at base. | 1 |
|              |                           |      |         | 2.00      |           |                                                                                    | End of Pit at 2.000m                                                                                                                                                     | 2 |
|              |                           |      |         |           |           |                                                                                    |                                                                                                                                                                          | 3 |
|              |                           |      |         |           |           |                                                                                    |                                                                                                                                                                          | 4 |
|              |                           |      |         |           |           |                                                                                    |                                                                                                                                                                          | 5 |

Stability: Stable

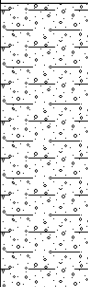
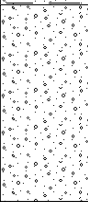
Remarks: Trial pit remained stable during excavation. Upon completion, Trial pit backfilled with arisings.

Trial Pit Log

Trial Pit No:  
TP09  
Sheet 1 of 1

|                                  |                   |                      |       |
|----------------------------------|-------------------|----------------------|-------|
| Project Name: Gnoll Country Park | Project No: 17887 | Co-ords: -<br>Level: | Date: |
|----------------------------------|-------------------|----------------------|-------|

|                 |                  |             |
|-----------------|------------------|-------------|
| Location: Neath | Dimensions: 2.00 | Scale: 1:25 |
| Client: Jubb    | Depth 1.60       | Logged:     |

| Water Strike | Samples & In Situ Testing |      |         | Depth (m) | Level (m) | Legend                                                                            | Stratum Description                                                                                                                           |   |
|--------------|---------------------------|------|---------|-----------|-----------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|---|
|              | Depth                     | Type | Results |           |           |                                                                                   |                                                                                                                                               |   |
|              |                           |      |         | 0.95      |           |  | Greyish brown very dense slightly sandy clayey angular to rounded fine to coarse sandstone and concrete GRAVEL. Occasional sandstone cobbles. |   |
|              |                           |      |         |           |           |  | Recovered as dense to very dense clayey sandy angular and subangular tabulate sandstone GRAVEL. Possible bedrock.                             | 1 |
|              |                           |      |         | 1.60      |           |                                                                                   | End of Pit at 1.600m                                                                                                                          |   |
|              |                           |      |         |           |           |                                                                                   |                                                                                                                                               | 2 |
|              |                           |      |         |           |           |                                                                                   |                                                                                                                                               | 3 |
|              |                           |      |         |           |           |                                                                                   |                                                                                                                                               | 4 |
|              |                           |      |         |           |           |                                                                                   |                                                                                                                                               | 5 |

Stability: Stable

Remarks: Trial pit remained stable during excavation. Upon completion, Trial pit backfilled with arisings.

Trial Pit Log

Trial Pit No:  
TP10  
Sheet 1 of 1

|                                  |                   |                      |       |
|----------------------------------|-------------------|----------------------|-------|
| Project Name: Gnoll Country Park | Project No: 17887 | Co-ords: -<br>Level: | Date: |
|----------------------------------|-------------------|----------------------|-------|

|                 |                  |             |
|-----------------|------------------|-------------|
| Location: Neath | Dimensions: 2.00 | Scale: 1:25 |
| Client: Jubb    | Depth 3.20       | Logged:     |

| Water Strike | Samples & In Situ Testing |      |         | Depth (m) | Level (m) | Legend                                                                             | Stratum Description                                                                                                                                                      |
|--------------|---------------------------|------|---------|-----------|-----------|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              | Depth                     | Type | Results |           |           |                                                                                    |                                                                                                                                                                          |
|              |                           |      |         | 1.40      |           |   | Grass over firm light brown slightly sandy gravelly silty CLAY. Gravels are angular and subangular fine to coarse sandstone and concrete. MADE GROUND.                   |
|              |                           |      |         | 3.20      |           |  | Brown medium dense to dense at base sandy silty angular and subrounded fine to coarse tabulate sandstone GRAVEL. Occasional sandstone cobbles becoming frequent at base. |
|              |                           |      |         |           |           |                                                                                    | End of Pit at 3.200m                                                                                                                                                     |

Stability: Stable

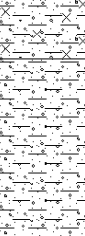
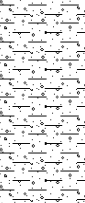
Remarks: Trial pit remained stable during excavation. Upon completion, Trial pit backfilled with arisings.



Trial Pit Log

Trial Pit No:  
TP12  
Sheet 1 of 1

|                                  |                   |                                                |                  |
|----------------------------------|-------------------|------------------------------------------------|------------------|
| Project Name: Gnoll Country Park | Project No: 17887 | Co-ords: 276631.00 - 197719.00<br>Level: 72.00 | Date: 02/08/2023 |
| Location: Neath                  |                   | Dimensions: 2.00                               | Scale: 1:25      |
| Client: Jubb                     |                   | Depth 1.50                                     | Logged: JM       |

| Water Strike | Samples & In Situ Testing |      |         | Depth (m) | Level (m) | Legend                                                                            | Stratum Description                                                                                                                                               |   |
|--------------|---------------------------|------|---------|-----------|-----------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|              | Depth                     | Type | Results |           |           |                                                                                   |                                                                                                                                                                   |   |
|              | 0.20                      |      |         | 0.20      | 71.80     |  | Grass over firm greyish brown sandy gravelly silty CLAY. Gravels are angular and subangular fine to coarse sandstone.                                             |   |
|              | 0.50                      |      |         |           |           |                                                                                   | Firm locally stiff dark brown sandy gravelly CLAY. Gravels are angular to subrounded fine to coarse sandstone. Low cobble content.                                |   |
|              | 0.80                      |      |         | 0.80      | 71.20     |  | Firm light greyish brown very sandy gravelly CLAY. Gravels are angular to subrounded fine to coarse sandstone. Low cobble content tending to high cobble content. | 1 |
|              | 1.00                      |      |         |           |           |                                                                                   |                                                                                                                                                                   |   |
|              | 1.50                      |      |         | 1.50      | 70.50     |                                                                                   | End of Pit at 1.500m                                                                                                                                              |   |
|              |                           |      |         |           |           |                                                                                   |                                                                                                                                                                   | 2 |
|              |                           |      |         |           |           |                                                                                   |                                                                                                                                                                   | 3 |
|              |                           |      |         |           |           |                                                                                   |                                                                                                                                                                   | 4 |
|              |                           |      |         |           |           |                                                                                   |                                                                                                                                                                   | 5 |

|                                                                                                                                                            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Stability: Stable                                                                                                                                          |
| Remarks: Groundwater was not encountered. Trial Pit refused due to achievement of target depth. On Completion, trial pit backfilled with materials arising |

# Trial Pit Log

Trial Pit No:  
**HP01**  
 Sheet 1 of 1

Project Name: **Gnoll Country Park**

Project No:  
**17887**

Co-ords: 276485.00 - 197497.00  
 Level: 65.00

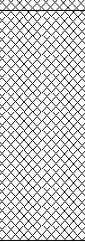
Date:  
**03/08/2023**

Location: Neath

Dimensions: 0.50  
 Depth 0.80

Scale:  
 1:25  
 Logged:  
 JM

Client: Jubb

| Water Strike | Samples & In Situ Testing |      |         | Depth (m) | Level (m) | Legend                                                                            | Stratum Description                                                                                                                                                                                                                                                                      |
|--------------|---------------------------|------|---------|-----------|-----------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              | Depth                     | Type | Results |           |           |                                                                                   |                                                                                                                                                                                                                                                                                          |
|              | 0.50                      |      |         | 0.04      | 64.96     |  | MADE GROUND comprising light greyish brown matrix supported CONCRETE. Aggregate is angular fine and medium gravel.<br>Firm dark brown sandy gravelly ashy CLAY. Gravels are angular and subangular fine to coarse sandstone, cinder, coal, ash, glass and brick fragments. (MADE GROUND) |
|              |                           |      |         | 0.80      | 64.20     |                                                                                   | End of Pit at 0.800m                                                                                                                                                                                                                                                                     |

Stability: Stable

Remarks: Groundwater was not encountered. Trial Pit refused due to achievement of target depth. On Completion, trial pit backfilled with materials arising

Trial Pit Log

Trial Pit No:  
HP02  
Sheet 1 of 1

Project Name: Gnoll Country Park

Project No: 17887

Co-ords: 276050.34 - 197295.30  
Level: 67.00

Date: 03/08/2023

Location: Neath

Client: Jubb

Dimensions: 0.70  
Depth 0.80

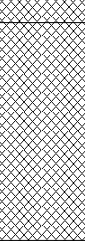
Scale: 1:25  
Logged: JM

| Water Strike | Samples & In Situ Testing |      |         | Depth (m) | Level (m) | Legend                                                                            | Stratum Description                                                                                   |
|--------------|---------------------------|------|---------|-----------|-----------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
|              | Depth                     | Type | Results |           |           |                                                                                   |                                                                                                       |
|              | 0.60                      |      |         | 0.15      | 66.85     |  | Loose red sandy angular and subangular fine to medium aggregate GRAVEL. (MADE GROUND)                 |
|              |                           |      |         | 0.25      | 66.75     |  | Medium dense dark grey angular and subangular medium to coarse aggregate GRAVEL. (MADE GROUND)        |
|              |                           |      |         |           |           |  | Firm light brown sandy gravelly CLAY. Gravels are subangular and subrounded fine to coarse sandstone. |
|              |                           |      |         | 0.80      | 66.20     |                                                                                   | End of Pit at 0.800m                                                                                  |

Stability: Stable

Remarks: Groundwater was not encountered. Trial Pit refused due to achievement of target depth. On Completion, trial pit backfilled with materials arising



|  <div> Tel: 02920 735354<br/> info@terrafirmawales.co.uk<br/> www.terrafirmawales.co.uk </div> |                           |      |         | <h1>Trial Pit Log</h1>      |           |                                                                                   | Trial Pit No:<br><b>HP04</b><br>Sheet 1 of 1                                                                                                                                                                                                                                             |                            |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|------|---------|-----------------------------|-----------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--|
| Project Name: <b>Gnoll Country Park</b>                                                                                                                                        |                           |      |         | Project No:<br><b>17887</b> |           | Co-ords: 276345.00 - 197208.00<br>Level: 63.00                                    |                                                                                                                                                                                                                                                                                          | Date:<br><b>03/08/2023</b> |  |
| Location: <b>Neath</b>                                                                                                                                                         |                           |      |         |                             |           | Dimensions: <div> <div>0.60</div> <div>0.50</div> <div></div> </div>              |                                                                                                                                                                                                                                                                                          | Scale:<br><b>1:25</b>      |  |
| Client: <b>Jubb</b>                                                                                                                                                            |                           |      |         |                             |           | Depth<br>0.80                                                                     |                                                                                                                                                                                                                                                                                          | Logged:<br><b>JM</b>       |  |
| Water Strike                                                                                                                                                                   | Samples & In Situ Testing |      |         | Depth (m)                   | Level (m) | Legend                                                                            | Stratum Description                                                                                                                                                                                                                                                                      |                            |  |
|                                                                                                                                                                                | Depth                     | Type | Results |                             |           |                                                                                   |                                                                                                                                                                                                                                                                                          |                            |  |
|                                                                                                                                                                                | 0.50                      |      |         | 0.08                        | 62.92     |  | MADE GROUND comprising light greyish brown matrix supported CONCRETE. Aggregate is angular fine and medium gravel.<br>Firm dark brown sandy gravelly ashy CLAY. Gravels are angular and subangular fine to coarse sandstone, cinter, coal, ash, glass and brick fragments. (MADE GROUND) |                            |  |
|                                                                                                                                                                                |                           |      |         | 0.80                        | 62.20     |                                                                                   | End of Pit at 0.800m                                                                                                                                                                                                                                                                     |                            |  |
| <div> <div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> </div>                                                                                                  |                           |      |         |                             |           |                                                                                   |                                                                                                                                                                                                                                                                                          |                            |  |
| Stability: <b>Stable</b>                                                                                                                                                       |                           |      |         |                             |           |                                                                                   |                                                                                                                                                                                                                                                                                          |                            |  |
| Remarks: Groundwater was not encountered. Trial Pit refused due to achievement of target depth. On Completion, trial pit backfilled with materials arising                     |                           |      |         |                             |           |                                                                                   |                                                                                                                                                                                                                                                                                          |                            |  |

Trial Pit Log

Trial Pit No:  
HP-A  
Sheet 1 of 1

|                                  |                   |                                                |                  |
|----------------------------------|-------------------|------------------------------------------------|------------------|
| Project Name: Gnoll Country Park | Project No: 17887 | Co-ords: 276051.00 - 197283.00<br>Level: 63.80 | Date: 02/08/2023 |
| Location: Neath                  |                   | Dimensions: 0.50                               | Scale: 1:25      |
| Client: Jubb                     |                   | Depth 1.00                                     | Logged: JM       |

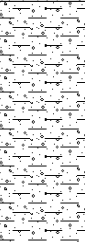
| Water Strike | Samples & In Situ Testing |      |         | Depth (m) | Level (m) | Legend | Stratum Description                                                                                                                                      |   |
|--------------|---------------------------|------|---------|-----------|-----------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|              | Depth                     | Type | Results |           |           |        |                                                                                                                                                          |   |
|              | 0.60                      |      |         |           |           |        | Grass over firm brown sandy gravelly CLAY. Gravels are angular and subangular fine to coarse sandstone, mudstone, slate, mortar and shale. (MADE GROUND) |   |
|              | 1.00                      |      |         | 1.20      | 62.60     |        | End of Pit at 1.000m                                                                                                                                     | 1 |
|              |                           |      |         |           |           |        |                                                                                                                                                          | 2 |
|              |                           |      |         |           |           |        |                                                                                                                                                          | 3 |
|              |                           |      |         |           |           |        |                                                                                                                                                          | 4 |
|              |                           |      |         |           |           |        |                                                                                                                                                          | 5 |

|                                                                                                                                                            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Stability: Stable                                                                                                                                          |
| Remarks: Groundwater was not encountered. Trial Pit refused due to achievement of target depth. On Completion, trial pit backfilled with materials arising |

Trial Pit Log

Trial Pit No:  
HP-B  
Sheet 1 of 1

|                 |                    |             |       |             |                       |         |            |
|-----------------|--------------------|-------------|-------|-------------|-----------------------|---------|------------|
| Project Name:   | Gnoll Country Park | Project No: | 17887 | Co-ords:    | 276019.00 - 197238.00 | Date:   | 02/08/2023 |
| Location: Neath |                    |             |       | Dimensions: | 0.50                  | Scale:  | 1:25       |
| Client: Jubb    |                    |             |       | Depth       | 1.20                  | Logged: | JM         |

| Water Strike | Samples & In Situ Testing |      |         | Depth (m) | Level (m) | Legend                                                                            | Stratum Description                                                                                     |   |
|--------------|---------------------------|------|---------|-----------|-----------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|---|
|              | Depth                     | Type | Results |           |           |                                                                                   |                                                                                                         |   |
|              | 0.30                      |      |         | 0.40      | 63.70     |  | Grass over brown sandy gravelly silty CLAY. Gravels are angular to subrounded fine to coarse sandstone. |   |
|              | 0.80                      |      |         |           |           |  | Firm light brown sandy gravelly CLAY. Gravels are subangular and subrounded fine to coarse sandstone.   | 1 |
|              |                           |      |         | 1.20      | 62.90     |                                                                                   | End of Pit at 1.200m                                                                                    | 2 |
|              |                           |      |         |           |           |                                                                                   |                                                                                                         | 3 |
|              |                           |      |         |           |           |                                                                                   |                                                                                                         | 4 |
|              |                           |      |         |           |           |                                                                                   |                                                                                                         | 5 |

|            |                                                                                                                                                   |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Stability: | Stable                                                                                                                                            |
| Remarks:   | Groundwater was not encountered. Trial Pit refused due to achievement of target depth. On Completion, trial pit backfilled with materials arising |

# SOAKAWAY TEST



Site Name: Gnoll County Park

Project Number: 17887

Date: 07/06/2023

Engineer: JM

Trial Pit:

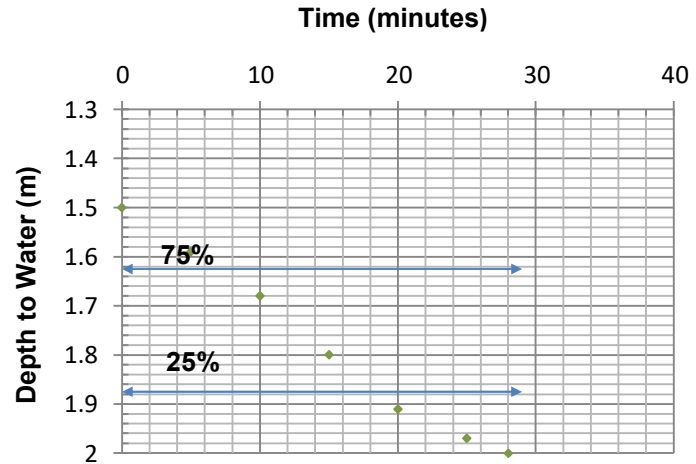
TP01

## TEST 1

Length 1.50 m  
Width 0.60 m  
Depth 2.00 m  
Fill Level 1.50 m

$V_{p75-25}$  0.225 m<sup>3</sup>  
 $a_{p50}$  1.95 m<sup>2</sup>  
 $t_{p75-25}$  9 minutes

Soil Infiltration Rate,  $f$  2.14E-04 ms<sup>-1</sup>

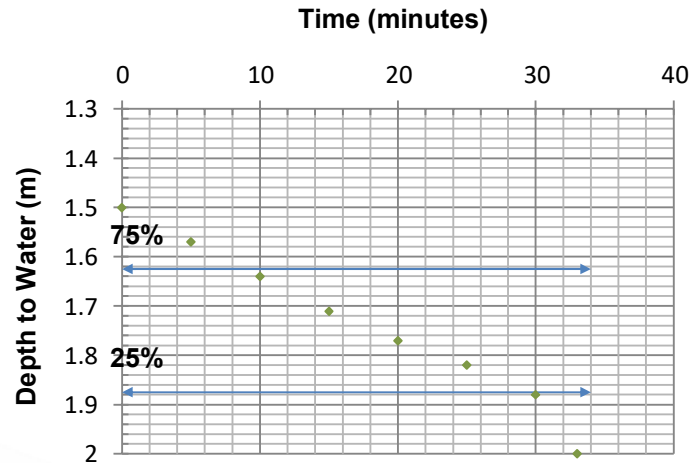


## TEST 2

Length 1.50 m  
Width 0.60 m  
Depth 2.00 m  
Fill Level 1.50 m

$V_{p75-25}$  0.225 m<sup>3</sup>  
 $a_{p50}$  1.95 m<sup>2</sup>  
 $t_{p75-25}$  20 minutes

Soil Infiltration Rate,  $f$  9.62E-05 ms<sup>-1</sup>

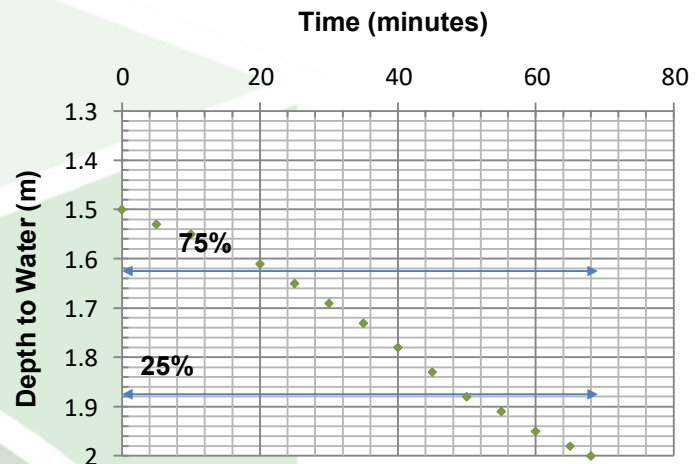


## TEST 3

Length 1.50 m  
Width 0.60 m  
Depth 2.00 m  
Fill Level 1.50 m

$V_{p75-25}$  0.225 m<sup>3</sup>  
 $a_{p50}$  1.95 m<sup>2</sup>  
 $t_{p75-25}$  25 minutes

Soil Infiltration Rate,  $f$  7.69E-05 ms<sup>-1</sup>



## REMARKS:

Test carried out in accordance with BRE Digest 365 (2016)

# SOAKAWAY TEST



Site Name: Groll County Park

Project Number: 17887

Date: 07/06/2023

Engineer: JM

Trial Pit:

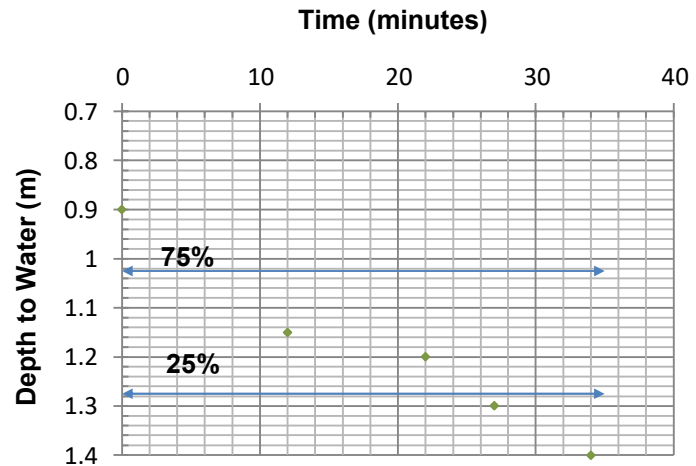
TP02

## TEST 1

Length 1.50 m  
Width 0.60 m  
Depth 1.40 m  
Fill Level 0.90 m

$V_{p75-25}$  0.225 m<sup>3</sup>  
 $a_{p50}$  1.95 m<sup>2</sup>  
 $t_{p75-25}$  0.22 minutes

Soil Infiltration Rate,  $f$  8.74E-03 ms<sup>-1</sup>

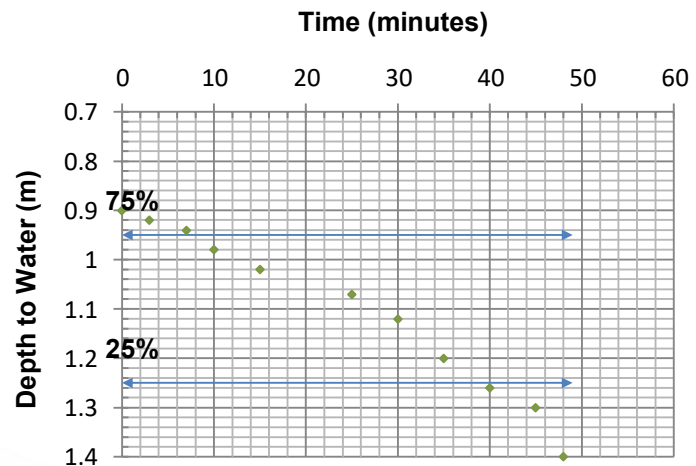


## TEST 2

Length 1.50 m  
Width 0.60 m  
Depth 1.40 m  
Fill Level 0.90 m

$V_{p75-25}$  0.27 m<sup>3</sup>  
 $a_{p50}$  2.16 m<sup>2</sup>  
 $t_{p75-25}$  30 minutes

Soil Infiltration Rate,  $f$  6.94E-05 ms<sup>-1</sup>

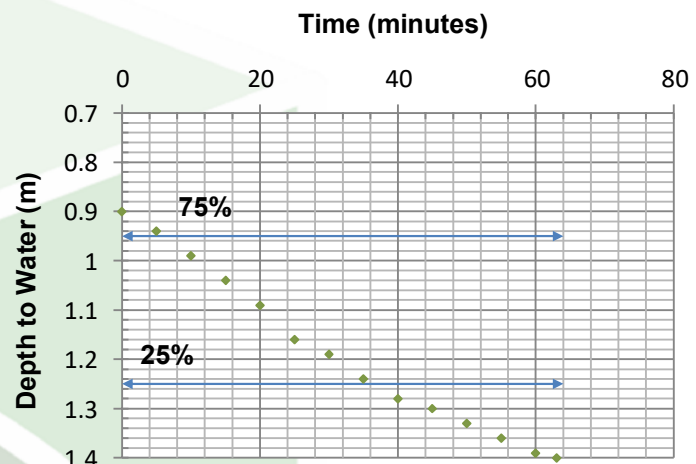


## TEST 3

Length 1.50 m  
Width 0.60 m  
Depth 1.40 m  
Fill Level 0.90 m

$V_{p75-25}$  0.27 m<sup>3</sup>  
 $a_{p50}$  2.16 m<sup>2</sup>  
 $t_{p75-25}$  30 minutes

Soil Infiltration Rate,  $f$  6.94E-05 ms<sup>-1</sup>



## REMARKS:

Test carried out in accordance with BRE Digest 365 (2016)

## SOAKAWAY TEST



Site Name: Gnoll County Park

Project Number: 17887

Date: 07/06/2023

Engineer: JM

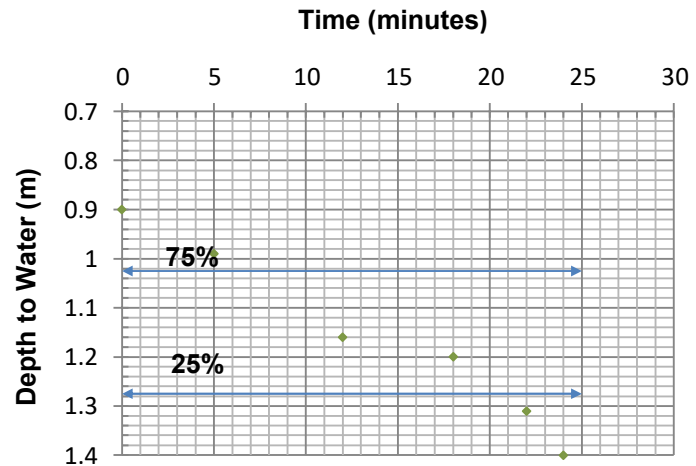
Trial Pit:

TP03

## TEST 1

Length 1.50 m  
 Width 0.60 m  
 Depth 1.40 m  
 Fill Level 0.90 m

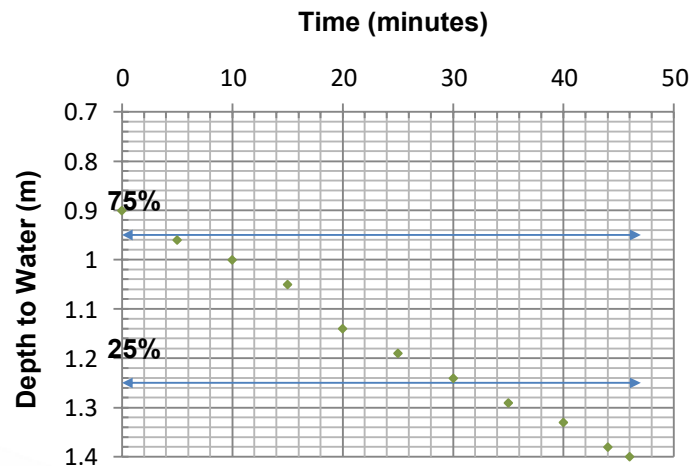
$V_{p75-25}$  0.225 m<sup>3</sup>  
 $a_{p50}$  1.95 m<sup>2</sup>  
 $t_{p75-25}$  12 minutes

Soil Infiltration Rate,  $f$  1.60E-04 ms<sup>-1</sup>

## TEST 2

Length 1.50 m  
 Width 0.60 m  
 Depth 1.40 m  
 Fill Level 0.90 m

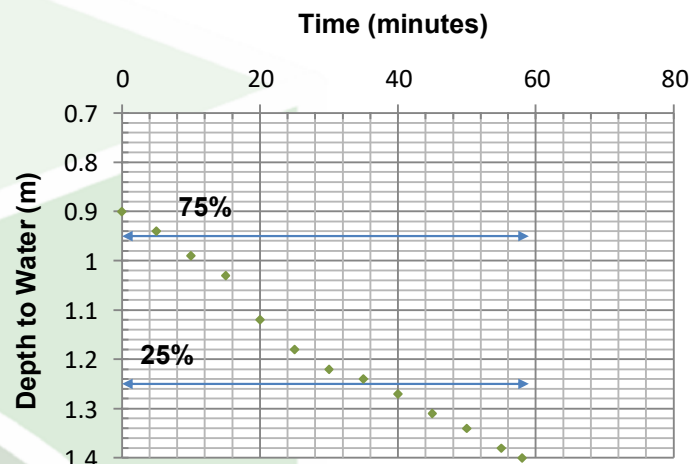
$V_{p75-25}$  0.27 m<sup>3</sup>  
 $a_{p50}$  2.16 m<sup>2</sup>  
 $t_{p75-25}$  27 minutes

Soil Infiltration Rate,  $f$  7.72E-05 ms<sup>-1</sup>

## TEST 3

Length 1.50 m  
 Width 0.60 m  
 Depth 1.40 m  
 Fill Level 0.90 m

$V_{p75-25}$  0.27 m<sup>3</sup>  
 $a_{p50}$  2.16 m<sup>2</sup>  
 $t_{p75-25}$  30 minutes

Soil Infiltration Rate,  $f$  6.94E-05 ms<sup>-1</sup>

## REMARKS:

Test carried out in accordance with BRE Digest 365 (2016)

# SOAKAWAY TEST



Site Name: Gnoll County Park

Project Number: 17887

Date: 05/06/2023

Engineer: JM

Trial Pit:

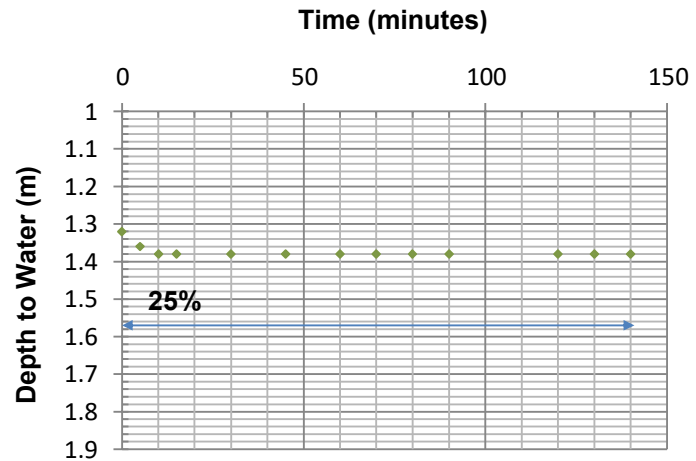
TP04

## TEST 1

Length 1.50 m  
Width 0.60 m  
Depth 1.90 m  
Fill Level 0.58 m

$V_{p75-25}$  0.594 m<sup>3</sup>  
 $a_{p50}$  3.674 m<sup>2</sup>  
 $t_{p75-25}$  minutes

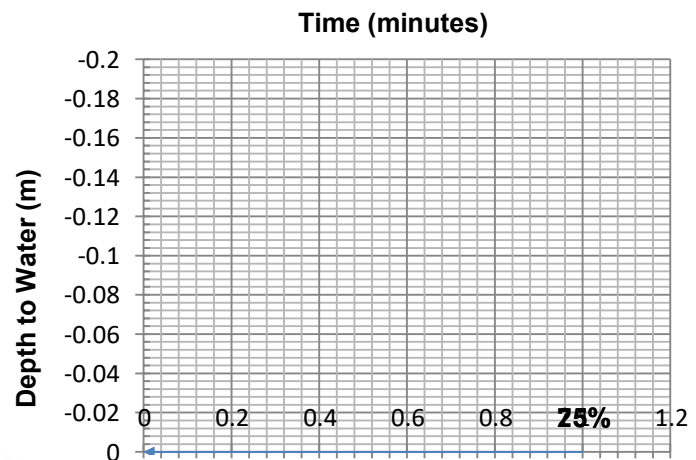
Too Little Intake to calculate Infiltration



## TEST 2

Length m  
Width m  
Depth m  
Fill Level m

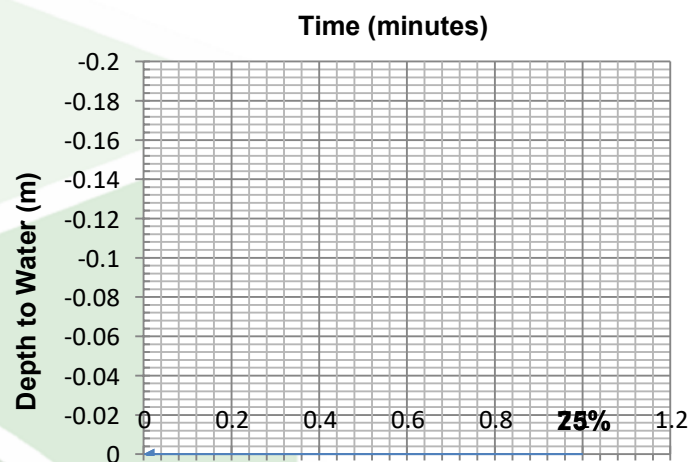
$V_{p75-25}$  0 m<sup>3</sup>  
 $a_{p50}$  0 m<sup>2</sup>  
 $t_{p75-25}$  0 minutes



## TEST 3

Length m  
Width m  
Depth m  
Fill Level m

$V_{p75-25}$  0 m<sup>3</sup>  
 $a_{p50}$  0 m<sup>2</sup>  
 $t_{p75-25}$  0 minutes



## REMARKS:

Test carried out in accordance with BRE Digest 365 (2016)

## SOAKAWAY TEST



Site Name: Gnoll County Park

Project Number: 17887

Date: 06/06/2023

Engineer: JM

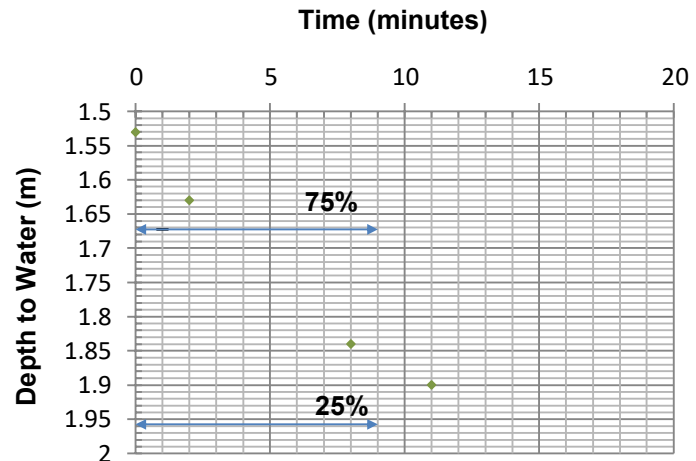
Trial Pit:

TP06

## TEST 1

Length 2.00 m  
 Width 0.60 m  
 Depth 2.10 m  
 Fill Level 0.53 m

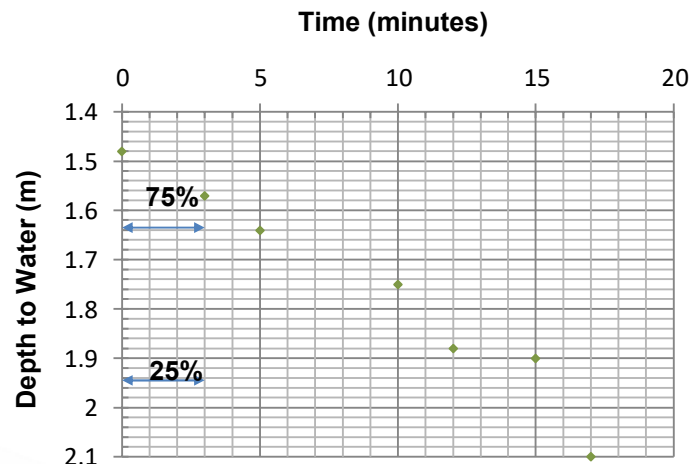
$V_{p75-25}$  0.342 m<sup>3</sup>  
 $a_{p50}$  2.682 m<sup>2</sup>  
 $t_{p75-25}$  8 minutes

Soil Infiltration Rate,  $f$  2.66E-04 ms<sup>-1</sup>

## TEST 2

Length 2.00 m  
 Width 0.60 m  
 Depth 2.10 m  
 Fill Level 1.48 m

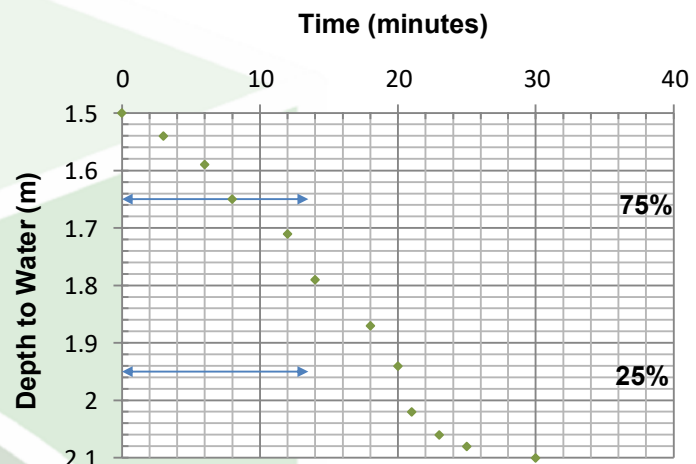
$V_{p75-25}$  0.372 m<sup>3</sup>  
 $a_{p50}$  2.812 m<sup>2</sup>  
 $t_{p75-25}$  2 minutes

Soil Infiltration Rate,  $f$  1.10E-03 ms<sup>-1</sup>

## TEST 3

Length 2.00 m  
 Width 0.60 m  
 Depth 2.10 m  
 Fill Level 0.50 m

$V_{p75-25}$  0.36 m<sup>3</sup>  
 $a_{p50}$  2.76 m<sup>2</sup>  
 $t_{p75-25}$  12.5 minutes

Soil Infiltration Rate,  $f$  1.74E-04 ms<sup>-1</sup>

## REMARKS:

Test carried out in accordance with BRE Digest 365 (2016)

## SOAKAWAY TEST



Site Name: Gnoll County Park

Project Number: 17887

Date: 06/06/2023

Engineer: JM

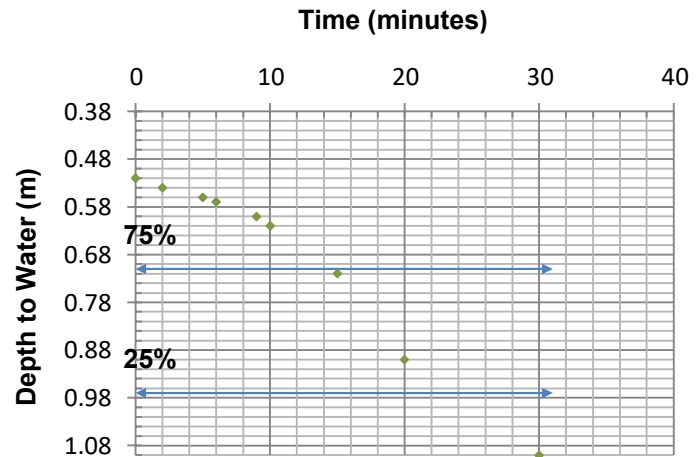
Trial Pit:

TP07

## TEST 1

Length 0.50 m  
 Width 0.50 m  
 Depth 1.10 m  
 Fill Level 0.58 m

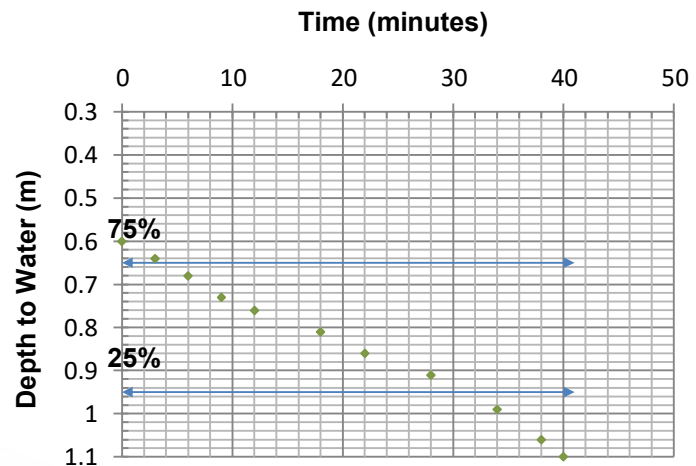
$V_{p75-25}$  0.065 m<sup>3</sup>  
 $a_{p50}$  0.77 m<sup>2</sup>  
 $t_{p75-25}$  0 minutes

Soil Infiltration Rate, f #DIV/0! ms<sup>-1</sup>

## TEST 2

Length 0.50 m  
 Width 0.50 m  
 Depth 1.10 m  
 Fill Level 0.50 m

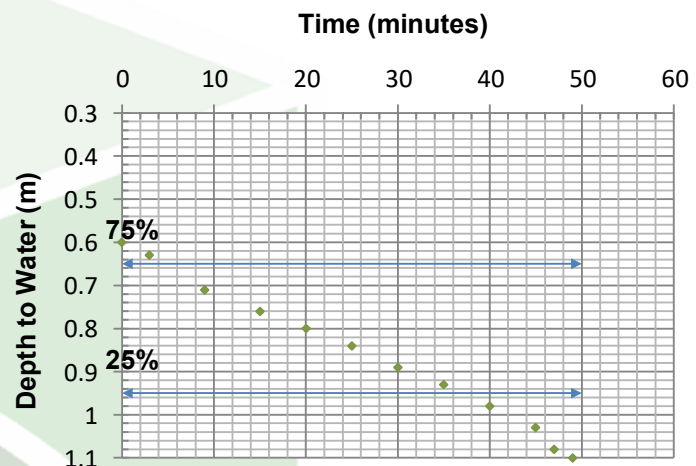
$V_{p75-25}$  0.075 m<sup>3</sup>  
 $a_{p50}$  0.85 m<sup>2</sup>  
 $t_{p75-25}$  27 minutes

Soil Infiltration Rate, f 5.45E-05 ms<sup>-1</sup>

## TEST 3

Length 0.50 m  
 Width 0.50 m  
 Depth 1.10 m  
 Fill Level 0.50 m

$V_{p75-25}$  0.075 m<sup>3</sup>  
 $a_{p50}$  0.85 m<sup>2</sup>  
 $t_{p75-25}$  31 minutes

Soil Infiltration Rate, f 4.74E-05 ms<sup>-1</sup>

## REMARKS:

Test carried out in accordance with BRE Digest 365 (2016)

## SOAKAWAY TEST



Site Name: Groll County Park

Project Number: 17887

Date: 06/06/2023

Engineer: JM

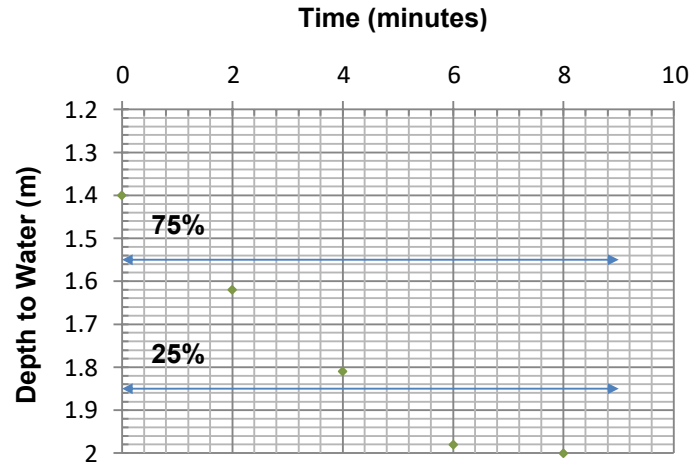
Trial Pit:

TP08

## TEST 1

Length 1.60 m  
 Width 0.60 m  
 Depth 2.00 m  
 Fill Level 1.40 m

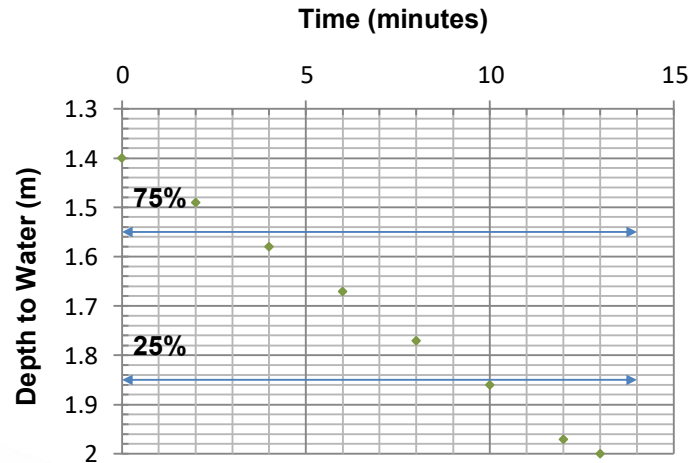
$V_{p75-25}$  0.288 m<sup>3</sup>  
 $a_{p50}$  2.28 m<sup>2</sup>  
 $t_{p75-25}$  2 minutes

Soil Infiltration Rate,  $f$  1.05E-03 ms<sup>-1</sup>

## TEST 2

Length 1.60 m  
 Width 0.60 m  
 Depth 2.00 m  
 Fill Level 1.50 m

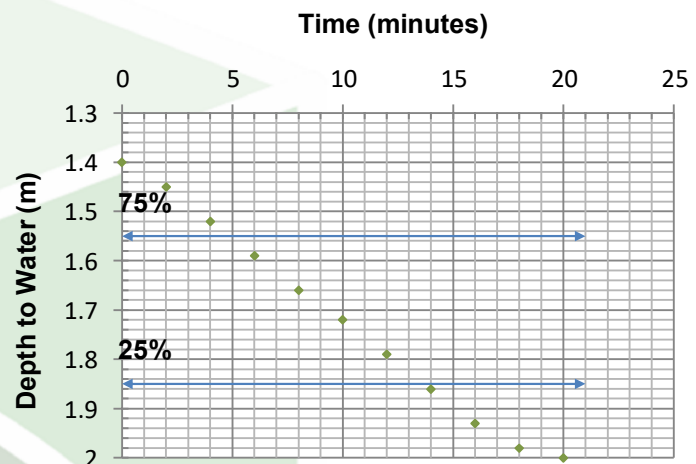
$V_{p75-25}$  0.288 m<sup>3</sup>  
 $a_{p50}$  2.28 m<sup>2</sup>  
 $t_{p75-25}$  6 minutes

Soil Infiltration Rate,  $f$  3.51E-04 ms<sup>-1</sup>

## TEST 3

Length 1.60 m  
 Width 0.60 m  
 Depth 2.00 m  
 Fill Level 1.50 m

$V_{p75-25}$  0.288 m<sup>3</sup>  
 $a_{p50}$  2.28 m<sup>2</sup>  
 $t_{p75-25}$  8 minutes

Soil Infiltration Rate,  $f$  2.63E-04 ms<sup>-1</sup>

## REMARKS:

Test carried out in accordance with BRE Digest 365 (2016)

## SOAKAWAY TEST



Site Name: Gnoll County Park

Project Number: 17887

Date: 06/06/2023

Engineer: JM

Trial Pit:

TP09

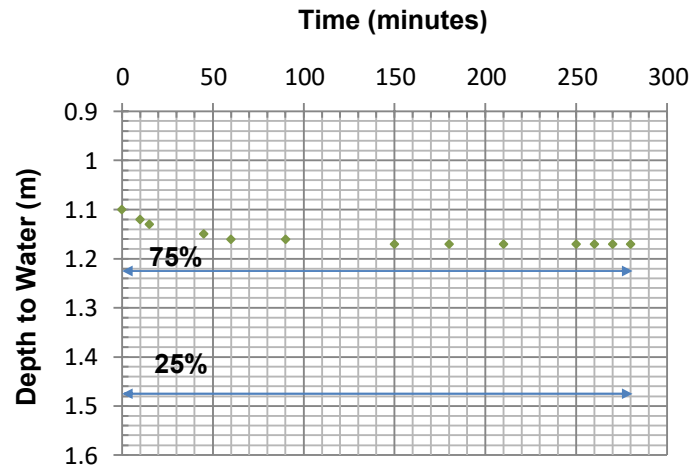
## TEST 1

Length 2.00 m  
 Width 0.60 m  
 Depth 1.60 m  
 Fill Level 1.10 m

$V_{p75-25}$  0.3 m<sup>3</sup>  
 $a_{p50}$  2.5 m<sup>2</sup>  
 $t_{p75-25}$  0.22 minutes

9.09E-03 ms<sup>-1</sup>

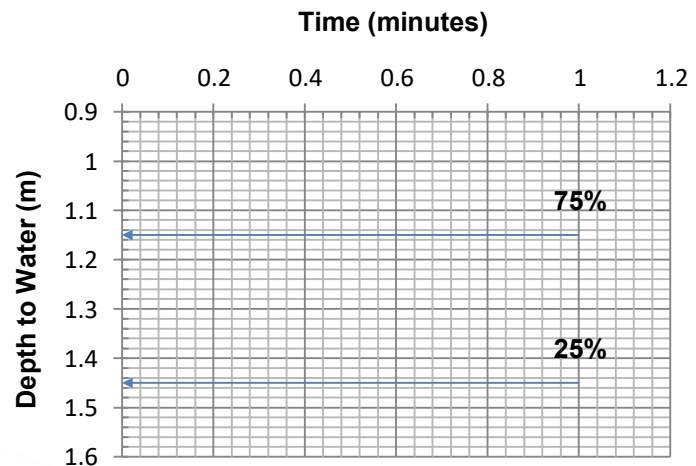
Too Little Infiltration, Did not achieve 75% Drain



## TEST 2

Length 2.00 m  
 Width 0.60 m  
 Depth 1.60 m  
 Fill Level 1.10 m

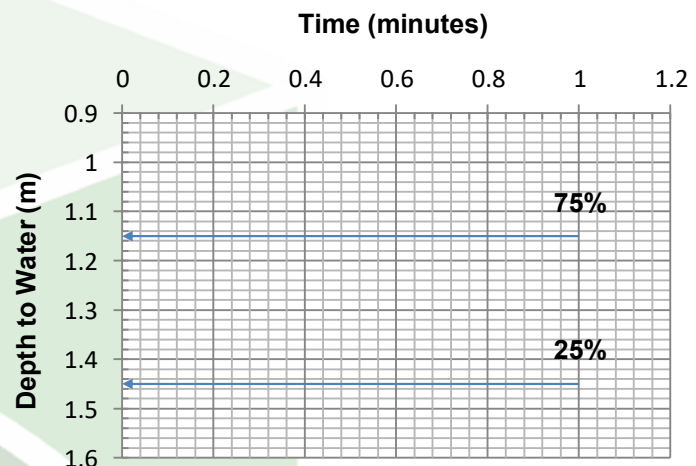
$V_{p75-25}$  0.36 m<sup>3</sup>  
 $a_{p50}$  2.76 m<sup>2</sup>  
 $t_{p75-25}$  0 minutes

Soil Infiltration Rate, f #DIV/0! ms<sup>-1</sup>

## TEST 3

Length 2.00 m  
 Width 0.60 m  
 Depth 1.60 m  
 Fill Level 1.10 m

$V_{p75-25}$  0.36 m<sup>3</sup>  
 $a_{p50}$  2.76 m<sup>2</sup>  
 $t_{p75-25}$  0 minutes

Soil Infiltration Rate, f #DIV/0! ms<sup>-1</sup>

## REMARKS:

Test carried out in accordance with BRE Digest 365 (2016)



## Results Summary

**Apex Testing Solutions Limited**

Sturmi Way  
Village Farm Industrial Estate  
Pyle  
Bridgend  
CF33 6BZ

Telephone: 01656 746762

E-mail: [andrew.grogan@apex-drilling.com](mailto:andrew.grogan@apex-drilling.com)

[laura.davis@apex-drilling.com](mailto:laura.davis@apex-drilling.com)

| <u>Reporting Details</u> |                                                        | <u>Key Information</u>  |            |
|--------------------------|--------------------------------------------------------|-------------------------|------------|
| <b>Company Name:</b>     | TFW Group Ltd                                          | <b>Site Name:</b>       | Gnoll Park |
| <b>Address:</b>          | 5 Deryn Court<br>Wharfdale Road<br>Cardiff<br>CF23 7HA | <b>Job Number:</b>      | D23297     |
| <b>Contact Name:</b>     | <b>Jacob M</b>                                         | <b>Date Received:</b>   | 05/07/2023 |
| <b>Contact Number:</b>   |                                                        | <b>Job Coordinator:</b> | L. Davies  |

| Item No. | Tests Undertaken                                    | Number of Tests |
|----------|-----------------------------------------------------|-----------------|
| 1        | Water Content - ISO 17892 2014+A1:2022              | 6               |
| 2        | Atterburg Limits (4 point) - BS1377-2: 1990         | 6               |
| 3        | Particle Size Distribution - BS1377-2: 1990         | 6               |
| 4        | OMC - BS1377-4: 1990 using 2.5kg Rammer in 1L mould | 1               |

**Results Issued: 10/07/2023**

**Comments**

Results herein relate only to samples received in the laboratory and where not sampled by Apex Testing Solutions personnel relate to the samples as received.

Where tests are UKAS accredited any Opinion and/or Interpretation expressed herein are outside the scope of the UKAS Accreditation. The reports shall not be reproduced in full without the written approval of the laboratory.

Please contact the job coordinator should any further information be required.

## TEST REPORT

### Determination Of Water Content

ISO 17892-1: 2014+A1:2022

**Project No:** D23297

**Project Name:** 17887 - Gnoll Park

**Client:** TFW Group Ltd

**Address:** 5 Deryn Court  
Wharfdale Road  
Cardiff  
CF23 7HA

**ATS Sample No:** 33482

**Site Ref / Hole ID:** TP01

**Sample No:**

**Sampling Certificate  
Received:** No

**Depth (m):** 0.50

**Sample Type:** Disturbed

**Material Description:** Greyish brown sandy  
gravelly CLAY

**Location in Works:** N/a

**Material Source:** Ex-Site

**Date Sampled:** Unknown

**Material Supplier:** Ex-Site

**Sampled By:** Client

**Specification:** BS1377

**Date Received:** 05 July 2023

**Date Tested:** 06 July 2023

#### Test Results

Moisture Content (%)

8.8

**Remarks:**

QA Ref.

EN ISO 17892-  
1:2014 A1:2022



**Apex Testing Solutions**

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7771

Approver

*L Davis*

Date

07/07/2023

L Davis, Quality Manager

Fig

**MC**

**TEST REPORT**  
**LIQUID LIMIT, PLASTIC LIMIT & PLASTICITY INDEX**  
**BS 1377:Part 2:1990. Clause 4.3/5.3/5.4**

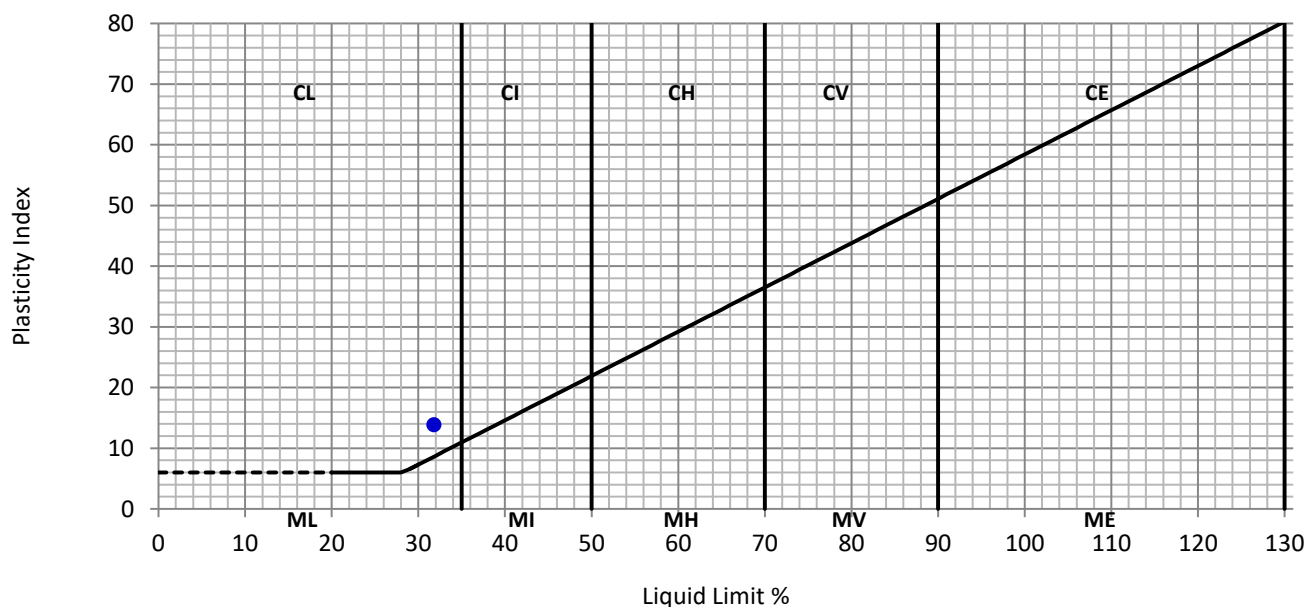
|                       |                    |                 |                                                        |
|-----------------------|--------------------|-----------------|--------------------------------------------------------|
| <b>Project No:</b>    | D23297             | <b>Client:</b>  | TFW Group Ltd                                          |
| <b>Project Name:</b>  | 17887 - Gnoll Park | <b>Address:</b> | 5 Deryn Court<br>Wharfdale Road<br>Cardiff<br>CF23 7HA |
| <b>ATS Sample No:</b> | 33482              |                 |                                                        |

|                                       |              |                              |                                   |
|---------------------------------------|--------------|------------------------------|-----------------------------------|
| <b>Site Ref / Hole ID:</b>            | TP01         | <b>Depth (m):</b>            | 0.50                              |
| <b>Sample No:</b>                     |              | <b>Sample Type:</b>          | Disturbed                         |
| <b>Sampling Certificate Received:</b> | No           | <b>Material Description:</b> | Greyish brown sandy gravelly CLAY |
| <b>Location in Works:</b>             | N/a          | <b>Material Source:</b>      | Ex-Site                           |
| <b>Date Sampled:</b>                  | Unknown      | <b>Material Supplier:</b>    | Ex-Site                           |
| <b>Sampled By:</b>                    | Client       | <b>Specification:</b>        | BS1377                            |
| <b>Date Received:</b>                 | 05 July 2023 | <b>Date Tested:</b>          | 06 July 2023                      |

**Test Results**

|                  |    |   |
|------------------|----|---|
| Liquid Limit     | 32 | % |
| Plastic Limit    | 18 | % |
| Plasticity Index | 14 | % |

|                                     |                       |
|-------------------------------------|-----------------------|
| Preparation:                        | 4.2.4 Sieved Specimen |
| Proportion retained on 425µm sieve: | 57 %                  |



**Remarks:**

QA Ref.

BS1377 - 2  
Rev. 3.0



**Apex Testing Solutions**

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Approver

*L Davis*

L Davis, Quality Manager

Date

07/07/2023

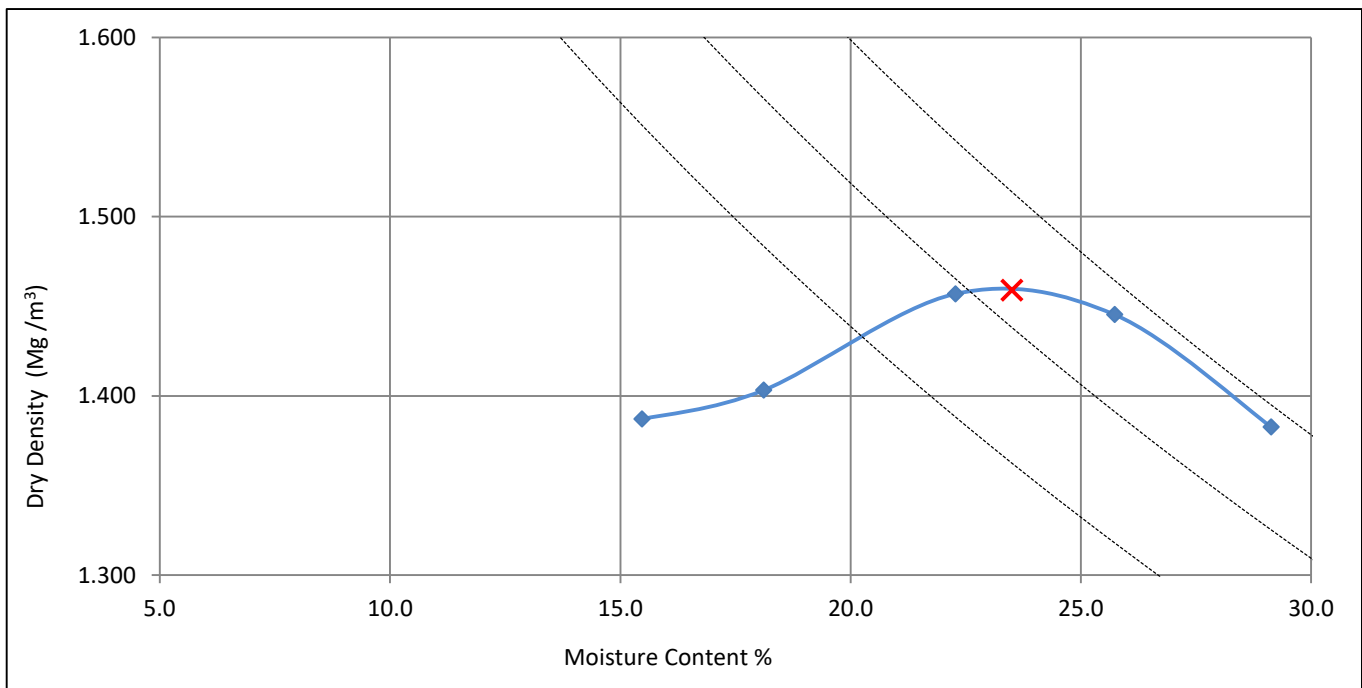
Fig.

**ATT**

**TEST REPORT**  
**DRY DENSITY / MOISTURE CONTENT RELATIONSHIP**  
**BS1377:Part 4:1990**

|                       |                    |                 |                                                        |
|-----------------------|--------------------|-----------------|--------------------------------------------------------|
| <b>Project No:</b>    | D23297             | <b>Client:</b>  | TFW Group Ltd                                          |
| <b>Project Name:</b>  | 17887 - Gnoll Park | <b>Address:</b> | 5 Deryn Court<br>Wharfdale Road<br>Cardiff<br>CF23 7HA |
| <b>ATS Sample No:</b> | 33483              |                 |                                                        |

|                                       |              |                              |                                            |
|---------------------------------------|--------------|------------------------------|--------------------------------------------|
| <b>Site Ref / Hole ID:</b>            | TP01         | <b>Depth (m):</b>            | 1.50                                       |
| <b>Sample No:</b>                     |              | <b>Sample Type:</b>          | Bulk                                       |
| <b>Sampling Certificate Received:</b> | No           | <b>Material Description:</b> | Greyish brown slightly gravelly sandy CLAY |
| <b>Location in Works:</b>             | N/A          | <b>Material Source:</b>      | Site Generated                             |
| <b>Date Sampled:</b>                  | Unknown      | <b>Material Supplier:</b>    | Ex-Site                                    |
| <b>Sampled By:</b>                    | Client       | <b>Specification:</b>        | BS1377                                     |
| <b>Date Received:</b>                 | 05 July 2023 | <b>Date Tested:</b>          | 07 July 2023                               |



|              |                                                                    |
|--------------|--------------------------------------------------------------------|
| Test Method: | BS 1377: part 4: 1990: clause 3.3, 2.5kg rammer in a 1 litre mould |
| Preparation: | Original sample was oven dried @ 105 oC, separate specimens tested |

|                          |      |         |                                                       |
|--------------------------|------|---------|-------------------------------------------------------|
| Particle Density, Mg/m³  | 2.35 | assumed | Derived Parameters <span style="color: red;">✗</span> |
| Material > 37.5mm        | 0    | %       | Maximum Dry Density, Mg/m³                            |
| Material < 37.5mm > 20mm | 1    | %       | Optimum Moisture Content %                            |

|          |           |
|----------|-----------|
| Remarks: | NMC =11 % |
|----------|-----------|

**TEST REPORT**  
**PARTICLE SIZE DISTRIBUTION ANALYSIS**  
**BS1377:Part 2:1990**

**Project No:** D23297  
**Project Name:** 17887 - Gnoll Park  
**ATS Sample No:** 33484

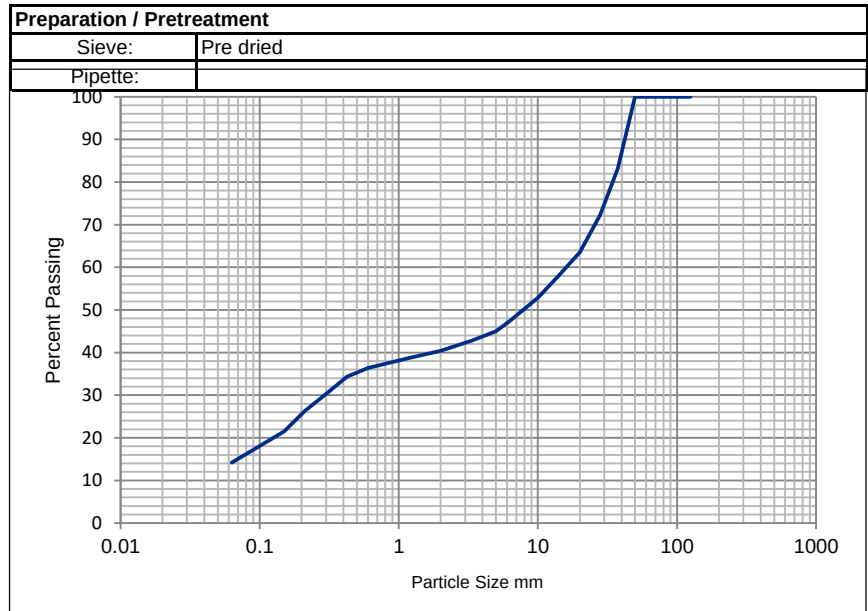
**Client:** TFW Group Ltd  
**Address:** 5 Deryn Court  
 Wharfdale Road  
 Cardiff  
 CF23 7HA

**Site Ref / Hole ID:** TP02  
**Sample No:**  
**Sampling Certificate Received:** No  
**Location in Works:** N/a  
**Date Sampled:** Unknown  
**Sampled By:** Client  
**Date Received:** 05 July 2023

**Depth (m):** 1.10  
**Sample Type:** Bulk  
**Material Description:** Brown clayey sandy GRAVEL  
**Material Source:** Ex-Site  
**Material Supplier:** Ex-Site  
**Specification:** **BS1377**  
**Date Tested:** 07 July 2023

**Test Results**

| Sieving          |           |
|------------------|-----------|
| Particle Size mm | % Passing |
| 125              | 100       |
| 90               | 100       |
| 75               | 100       |
| 63               | 100       |
| 50               | 100       |
| 37.5             | 83        |
| 28               | 72        |
| 20               | 64        |
| 14               | 58        |
| 10               | 53        |
| 6.3              | 47        |
| 5.0              | 45        |
| 3.35             | 43        |
| 2.00             | 40        |
| 1.18             | 39        |
| 0.600            | 36        |
| 0.425            | 34        |
| 0.300            | 30        |
| 0.212            | 26        |
| 0.150            | 21        |
| 0.063            | 14        |



| Sample Portions    |    | Particle Density Mg/m3 | Uniformity Coefficient<br><br>D <sub>60</sub> / D <sub>10</sub> |
|--------------------|----|------------------------|-----------------------------------------------------------------|
| Cobbles / Boulders | 0  | N/A                    |                                                                 |
| Gravel             | 60 |                        |                                                                 |
| Sand               | 26 | Dry mass of sample, kg |                                                                 |
| Silt / Clay        | 14 | 3.2                    | n/a                                                             |

**Remarks:**

QA Ref.

BS1377 - 4

Rev. 2.0



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Approver

*L Davis*

L Davis, Quality Manager

Date

07/07/2023

Fig

**PSD**

## TEST REPORT

### Determination Of Water Content

ISO 17892-1: 2014+A1:2022

**Project No:** D23297

**Project Name:** 17887 - Gnoll Park

**Client:** TFW Group Ltd

**Address:** 5 Deryn Court  
Wharfdale Road  
Cardiff  
CF23 7HA

**ATS Sample No:** 33485

**Site Ref / Hole ID:** TP04

**Sample No:**

**Sampling Certificate  
Received:** No

**Depth (m):** 0.50

**Sample Type:** Disturbed

**Material Description:** Greyish brown silty  
sandy gravelly CLAY

**Location in Works:** N/a

**Material Source:** Ex-Site

**Date Sampled:** Unknown

**Material Supplier:** Ex-Site

**Sampled By:** Client

**Specification:** BS1377

**Date Received:** 05 July 2023

**Date Tested:** 07 July 2023

#### Test Results

Moisture Content (%)

13.3

**Remarks:**

QA Ref.

EN ISO 17892-  
1:2014 A1:2022



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*L Davis*

Date

07/07/2023

L Davis, Quality Manager

Fig

**MC**

**TEST REPORT**  
**LIQUID LIMIT, PLASTIC LIMIT & PLASTICITY INDEX**  
**BS 1377:Part 2:1990. Clause 4.3/5.3/5.4**

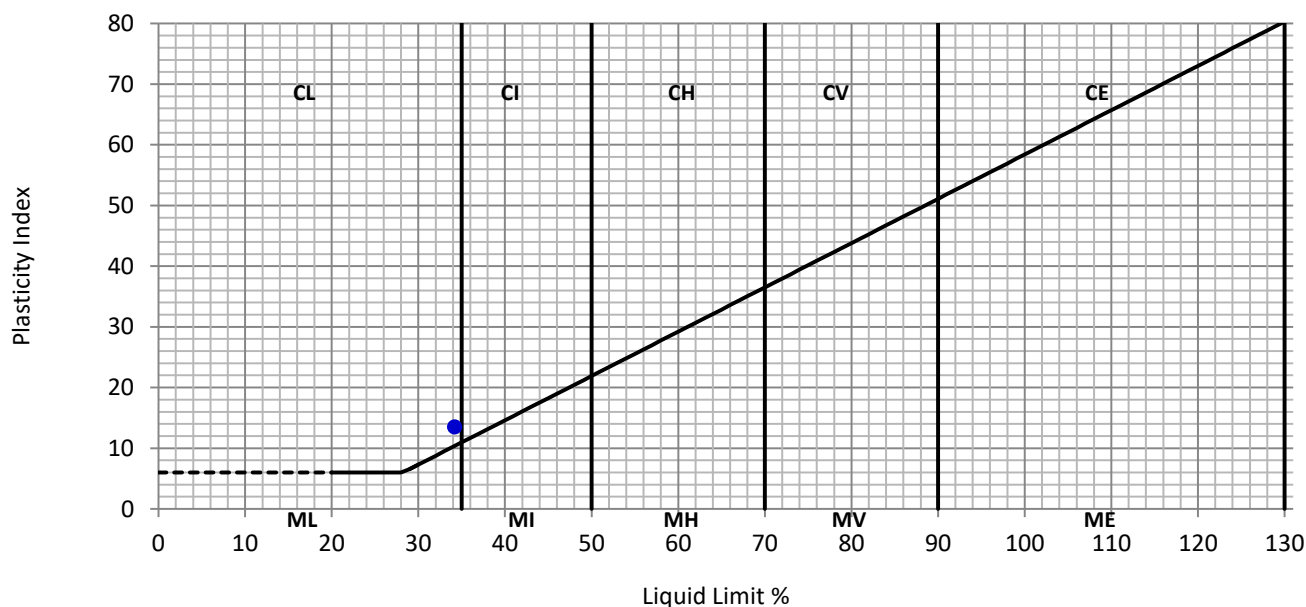
|                       |                    |                 |                                                         |
|-----------------------|--------------------|-----------------|---------------------------------------------------------|
| <b>Project No:</b>    | D23297             | <b>Client:</b>  | TFW Group Ltd                                           |
| <b>Project Name:</b>  | 17887 - Gnoll Park | <b>Address:</b> | 5 Deryn Court<br>Wharfedale Road<br>Cardiff<br>CF23 7HA |
| <b>ATS Sample No:</b> | 33485              |                 |                                                         |

|                                       |              |                              |                                         |
|---------------------------------------|--------------|------------------------------|-----------------------------------------|
| <b>Site Ref / Hole ID:</b>            | TP04         | <b>Depth (m):</b>            | 0.50                                    |
| <b>Sample No:</b>                     |              | <b>Sample Type:</b>          | Disturbed                               |
| <b>Sampling Certificate Received:</b> | No           | <b>Material Description:</b> | Greyish brown silty sandy gravelly CLAY |
| <b>Location in Works:</b>             | N/a          | <b>Material Source:</b>      | Ex-Site                                 |
| <b>Date Sampled:</b>                  | Unknown      | <b>Material Supplier:</b>    | Ex-Site                                 |
| <b>Sampled By:</b>                    | Client       | <b>Specification:</b>        | BS1377                                  |
| <b>Date Received:</b>                 | 05 July 2023 | <b>Date Tested:</b>          | 06 July 2023                            |

**Test Results**

|                  |    |   |
|------------------|----|---|
| Liquid Limit     | 34 | % |
| Plastic Limit    | 21 | % |
| Plasticity Index | 13 | % |

|                                     |                       |
|-------------------------------------|-----------------------|
| Preparation:                        | 4.2.4 Sieved Specimen |
| Proportion retained on 425µm sieve: | 42 %                  |



**Remarks:**

QA Ref.

BS1377 - 2  
Rev. 3.0



**Apex Testing Solutions**

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*L Davis*

L Davis, Quality Manager

Date

07/07/2023

Fig.

**ATT**

**TEST REPORT**  
**PARTICLE SIZE DISTRIBUTION ANALYSIS**  
**BS1377:Part 2:1990**

**Project No:** D23297  
**Project Name:** 17887 - Gnoll Park  
**ATS Sample No:** 33486

**Client:** TFW Group Ltd  
**Address:** 5 Deryn Court  
 Wharfdale Road  
 Cardiff  
 CF23 7HA

**Site Ref / Hole ID:** TP04

**Depth (m):** 1.20

**Sample No:**

**Sample Type:** Bulk

**Sampling Certificate Received:** No

**Material Description:** Brown slightly gravelly sandy CLAY

**Location in Works:** N/a

**Material Source:** Ex-Site

**Date Sampled:** Unknown

**Material Supplier:** Ex-Site

**Sampled By:** Client

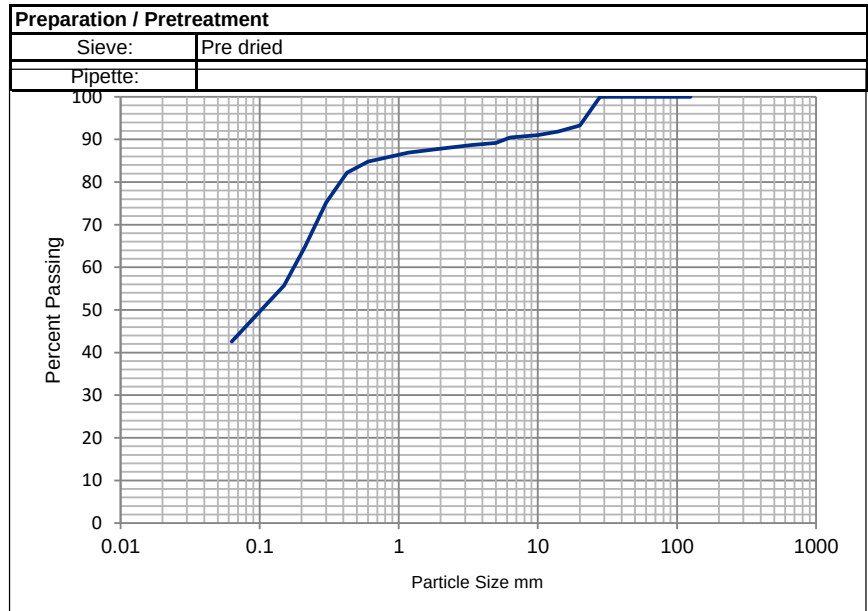
**Specification:** **BS1377**

**Date Received:** 05 July 2023

**Date Tested:** 07 July 2023

**Test Results**

| Sieving          |           |
|------------------|-----------|
| Particle Size mm | % Passing |
| 125              | 100       |
| 90               | 100       |
| 75               | 100       |
| 63               | 100       |
| 50               | 100       |
| 37.5             | 100       |
| 28               | 100       |
| 20               | 93        |
| 14               | 92        |
| 10               | 91        |
| 6.3              | 90        |
| 5.0              | 89        |
| 3.35             | 89        |
| 2.00             | 88        |
| 1.18             | 87        |
| 0.600            | 85        |
| 0.425            | 82        |
| 0.300            | 75        |
| 0.212            | 65        |
| 0.150            | 56        |
| 0.063            | 43        |



| Sample Portions    |    | Particle Density Mg/m3 | Uniformity Coefficient<br><br>D <sub>60</sub> / D <sub>10</sub> |
|--------------------|----|------------------------|-----------------------------------------------------------------|
| Cobbles / Boulders | 0  | N/A                    |                                                                 |
| Gravel             | 12 |                        |                                                                 |
| Sand               | 45 | Dry mass of sample, kg |                                                                 |
| Silt / Clay        | 43 | 0.4                    | n/a                                                             |

**Remarks:**

QA Ref.

BS1377 - 4  
Rev. 2.0



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*L Davis*

L Davis, Quality Manager

Date

07/07/2023

Fig

**PSD**

# TEST REPORT

## Determination Of Water Content

ISO 17892-1: 2014+A1:2022

**Project No:** D23297

**Project Name:** 17887 - Gnoll Park

**Client:** TFW Group Ltd

**Address:** 5 Deryn Court  
Wharfdale Road  
Cardiff  
CF23 7HA

**ATS Sample No:** 33487

**Site Ref / Hole ID:** TP05

**Sample No:**

**Sampling Certificate  
Received:** No

**Depth (m):** 0.60

**Sample Type:** Disturbed

**Material Description:** Dark grey sandy gravelly  
SILT

**Location in Works:** N/a

**Material Source:** Ex-Site

**Date Sampled:** Unknown

**Material Supplier:** Ex-Site

**Sampled By:** Client

**Specification:** BS1377

**Date Received:** 05 July 2023

**Date Tested:** 06 July 2023

### Test Results

Moisture Content (%)

22.1

**Remarks:**

QA Ref.

EN ISO 17892-  
1:2014 A1:2022



**Apex Testing Solutions**

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Approver

*L Davis*

Date

07/07/2023

L Davis, Quality Manager

Fig

**MC**

# TEST REPORT

## LIQUID LIMIT, PLASTIC LIMIT & PLASTICITY INDEX

### BS 1377:Part 2:1990. Clause 4.3/5.3/5.4

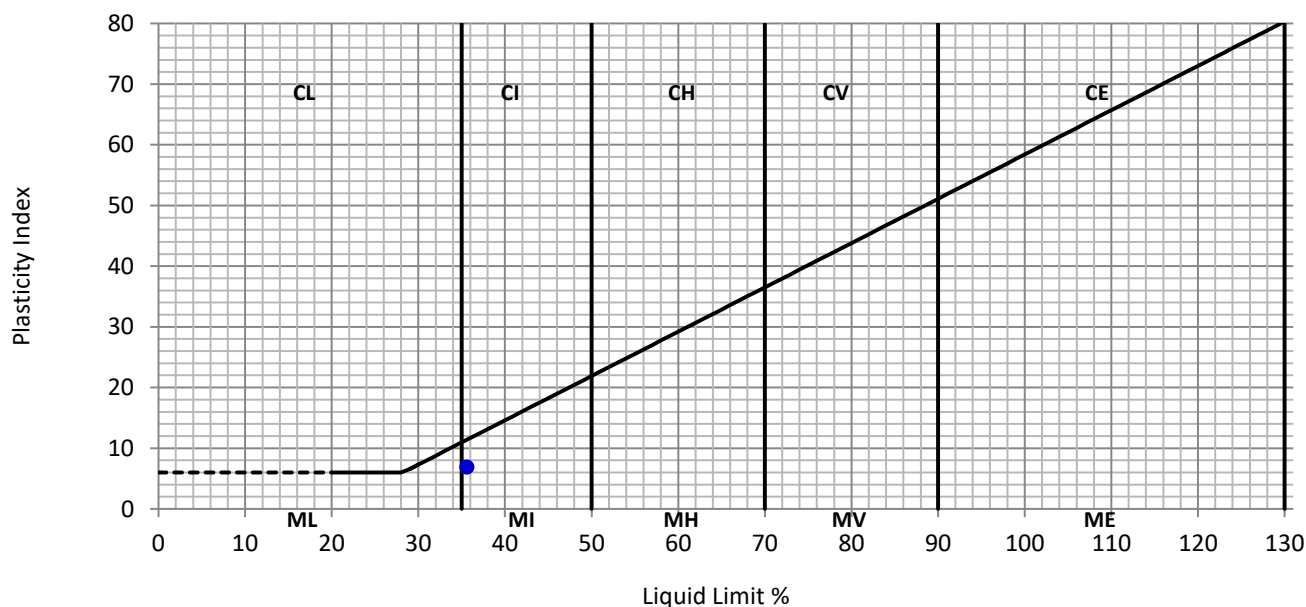
|                       |                    |                 |                |
|-----------------------|--------------------|-----------------|----------------|
| <b>Project No:</b>    | D23297             | <b>Client:</b>  | TFW Group Ltd  |
| <b>Project Name:</b>  | 17887 - Gnoll Park | <b>Address:</b> | 5 Deryn Court  |
|                       |                    |                 | Wharfdale Road |
|                       |                    |                 | Cardiff        |
| <b>ATS Sample No:</b> | 33487              |                 | CF23 7HA       |

|                                       |              |                              |                               |
|---------------------------------------|--------------|------------------------------|-------------------------------|
| <b>Site Ref / Hole ID:</b>            | TP05         | <b>Depth (m):</b>            | 0.60                          |
| <b>Sample No:</b>                     |              | <b>Sample Type:</b>          | Disturbed                     |
| <b>Sampling Certificate Received:</b> | No           | <b>Material Description:</b> | Dark grey sandy gravelly SILT |
| <b>Location in Works:</b>             | N/a          | <b>Material Source:</b>      | Ex-Site                       |
| <b>Date Sampled:</b>                  | Unknown      | <b>Material Supplier:</b>    | Ex-Site                       |
| <b>Sampled By:</b>                    | Client       | <b>Specification:</b>        | BS1377                        |
| <b>Date Received:</b>                 | 05 July 2023 | <b>Date Tested:</b>          | 06 July 2023                  |

#### Test Results

|                  |    |   |
|------------------|----|---|
| Liquid Limit     | 36 | % |
| Plastic Limit    | 29 | % |
| Plasticity Index | 7  | % |

|                                     |                       |
|-------------------------------------|-----------------------|
| Preparation:                        | 4.2.4 Sieved Specimen |
| Proportion retained on 425µm sieve: | 62 %                  |



Remarks:

QA Ref.

BS1377 - 2  
Rev. 3.0



**Apex Testing Solutions**

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Approver

*L Davis*

L Davis, Quality Manager

Date

07/07/2023

Fig.

**ATT**

**TEST REPORT**  
**PARTICLE SIZE DISTRIBUTION ANALYSIS**  
**BS1377:Part 2:1990**

**Project No:** D23297  
**Project Name:** 17887 - Gnoll Park  
**ATS Sample No:** 33488

**Client:** TFW Group Ltd  
**Address:** 5 Deryn Court  
 Wharfdale Road  
 Cardiff  
 CF23 7HA

**Site Ref / Hole ID:** TP06

**Depth (m):** 1.30

**Sample No:**

**Sample Type:** Bulk

**Sampling Certificate Received:** No

**Material Description:** Brown slightly silty slightly sandy GRAVEL

**Location in Works:** N/a

**Material Source:** Ex-Site

**Date Sampled:** Unknown

**Material Supplier:** Ex-Site

**Sampled By:** Client

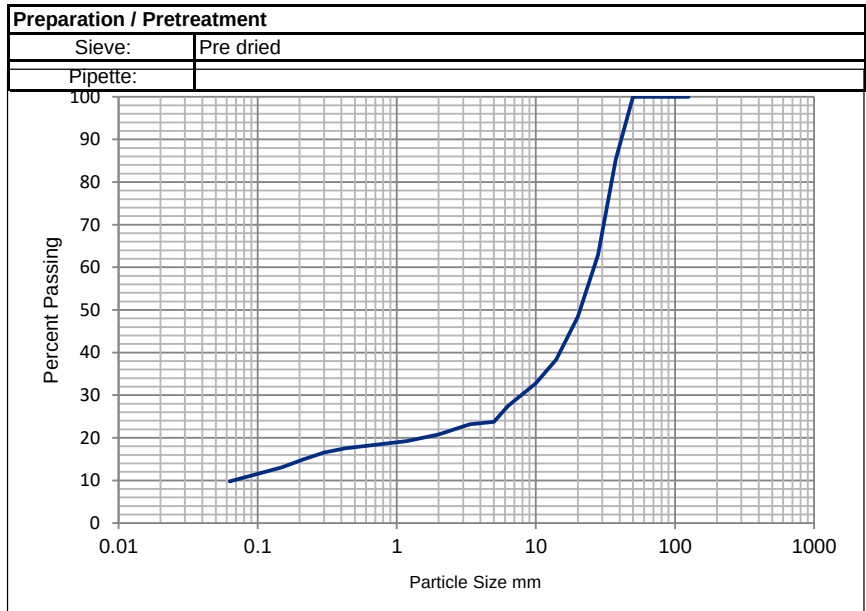
**Specification:** BS1377

**Date Received:** 05 July 2023

**Date Tested:** 10 July 2023

**Test Results**

| Sieving          |           |
|------------------|-----------|
| Particle Size mm | % Passing |
| 125              | 100       |
| 90               | 100       |
| 75               | 100       |
| 63               | 100       |
| 50               | 100       |
| 37.5             | 85        |
| 28               | 63        |
| 20               | 48        |
| 14               | 38        |
| 10               | 33        |
| 6.3              | 27        |
| 5.0              | 24        |
| 3.35             | 23        |
| 2.00             | 21        |
| 1.18             | 19        |
| 0.600            | 18        |
| 0.425            | 18        |
| 0.300            | 17        |
| 0.212            | 15        |
| 0.150            | 13        |
| 0.063            | 10        |



| Sample Portions    |    | Particle Density Mg/m3 | Uniformity Coefficient<br><br>$D_{60} / D_{10}$ |
|--------------------|----|------------------------|-------------------------------------------------|
| Cobbles / Boulders | 0  | N/A                    |                                                 |
| Gravel             | 79 |                        |                                                 |
| Sand               | 11 | Dry mass of sample, kg |                                                 |
| Silt / Clay        | 10 | 4.4                    | n/a                                             |

**Remarks:**

QA Ref.

BS1377 - 4  
Rev. 2.0



**Apex Testing Solutions**

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Approver

*A Grogan*

A Grogan, Laboratory Manager

Date

10/07/2023

Fig

**PSD**

## TEST REPORT

### Determination Of Water Content

ISO 17892-1: 2014+A1:2022

**Project No:** D23297

**Project Name:** 17887 - Gnoll Park

**Client:** TFW Group Ltd

**Address:** 5 Deryn Court  
Wharfdale Road  
Cardiff  
CF23 7HA

**ATS Sample No:** 33489

**Site Ref / Hole ID:** TP07

**Sample No:**

**Sampling Certificate  
Received:** No

**Depth (m):** 0.30

**Sample Type:** Disturbed

**Material Description:** Greyish brown slightly  
sandy slightly gravelly  
CLAY

**Location in Works:** N/a

**Material Source:** Ex-Site

**Date Sampled:** Unknown

**Material Supplier:** Ex-Site

**Sampled By:** Client

**Specification:** BS1377

**Date Received:** 05 July 2023

**Date Tested:** 07 July 2023

#### Test Results

Moisture Content (%)

18.5

**Remarks:**

QA Ref.

EN ISO 17892-  
1:2014 A1:2022



**Apex Testing Solutions**

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Approver

*L Davis*

Date

07/07/2023

L Davis, Quality Manager

Fig

**MC**

**TEST REPORT**  
**LIQUID LIMIT, PLASTIC LIMIT & PLASTICITY INDEX**  
**BS 1377:Part 2:1990. Clause 4.3/5.3/5.4**

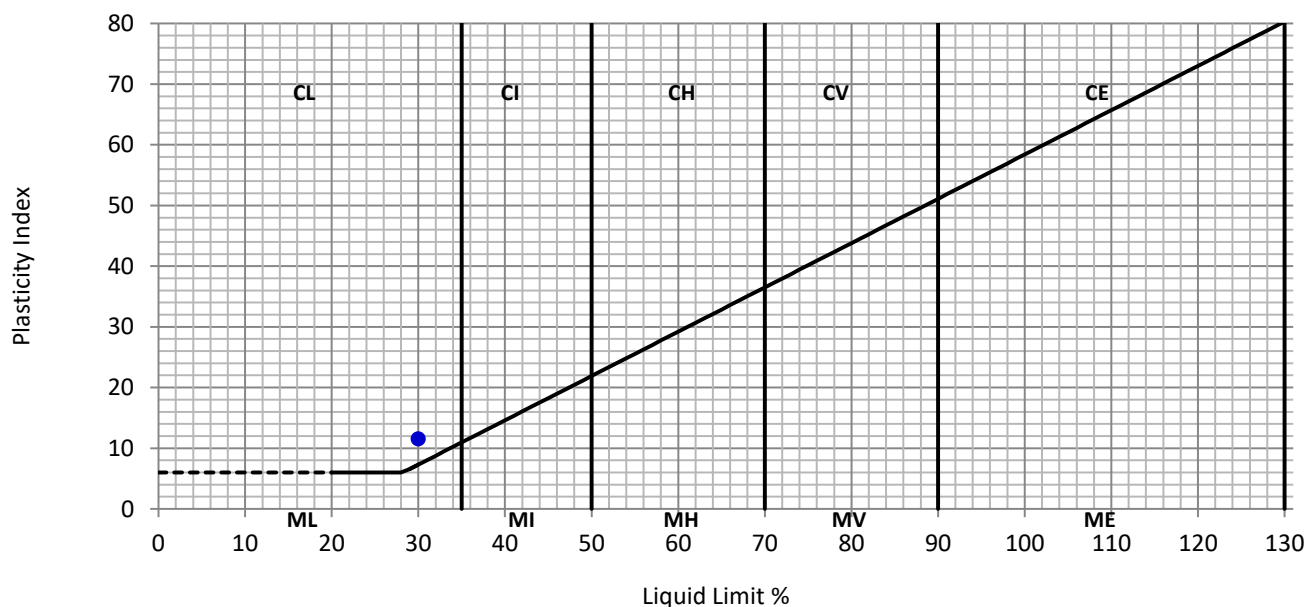
|                       |                    |                 |                                                        |
|-----------------------|--------------------|-----------------|--------------------------------------------------------|
| <b>Project No:</b>    | D23297             | <b>Client:</b>  | TFW Group Ltd                                          |
| <b>Project Name:</b>  | 17887 - Gnoll Park | <b>Address:</b> | 5 Deryn Court<br>Wharfdale Road<br>Cardiff<br>CF23 7HA |
| <b>ATS Sample No:</b> | 33489              |                 |                                                        |

|                                       |              |                              |                                                     |
|---------------------------------------|--------------|------------------------------|-----------------------------------------------------|
| <b>Site Ref / Hole ID:</b>            | TP07         | <b>Depth (m):</b>            | 0.30                                                |
| <b>Sample No:</b>                     |              | <b>Sample Type:</b>          | Disturbed                                           |
| <b>Sampling Certificate Received:</b> | No           | <b>Material Description:</b> | Greyish brown slightly sandy slightly gravelly CLAY |
| <b>Location in Works:</b>             | N/a          | <b>Material Source:</b>      | Ex-Site                                             |
| <b>Date Sampled:</b>                  | Unknown      | <b>Material Supplier:</b>    | Ex-Site                                             |
| <b>Sampled By:</b>                    | Client       | <b>Specification:</b>        | BS1377                                              |
| <b>Date Received:</b>                 | 05 July 2023 | <b>Date Tested:</b>          | 06 July 2023                                        |

**Test Results**

|                  |    |   |
|------------------|----|---|
| Liquid Limit     | 30 | % |
| Plastic Limit    | 18 | % |
| Plasticity Index | 12 | % |

|                                     |                       |
|-------------------------------------|-----------------------|
| Preparation:                        | 4.2.4 Sieved Specimen |
| Proportion retained on 425µm sieve: | 11 %                  |



**Remarks:**

QA Ref.

BS1377 - 2  
Rev. 3.0



**Apex Testing Solutions**

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Approver

*L Davis*

L Davis, Quality Manager

Date

07/07/2023

Fig.

**ATT**

**TEST REPORT**  
**PARTICLE SIZE DISTRIBUTION ANALYSIS**  
**BS1377:Part 2:1990**

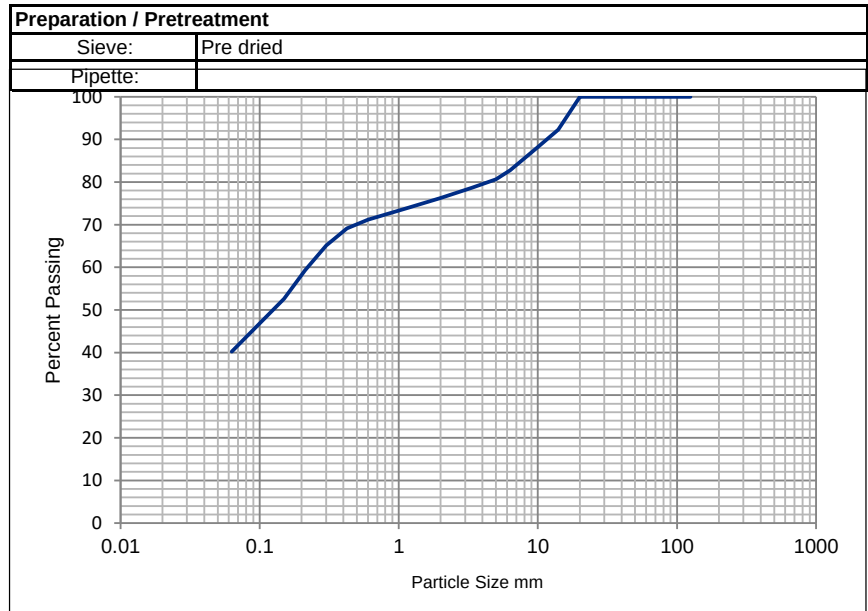
**Project No:** D23297  
**Project Name:** 17887 - Gnoll Park  
  
**ATS Sample No:** 33490

**Client:** TFW Group Ltd  
**Address** 5 Deryn Court  
 Wharfdale Road  
 Cardiff  
 CF23 7HA

**Site Ref / Hole ID:** TP07  
**Depth (m):** 1.15  
**Sample No:**  
**Sample Type:** Bulk  
**Sampling Certificate Received:** No  
**Material Description:** Brown slightly gravelly sandy CLAY  
**Location in Works:** N/a  
**Material Source:** Ex-Site  
**Date Sampled:** Unknown  
**Material Supplier:** Ex-Site  
**Sampled By:** Client  
**Specification:** **BS1377**  
**Date Received:** 05 July 2023  
**Date Tested:** 07 July 2023

**Test Results**

| Sieving          |           |
|------------------|-----------|
| Particle Size mm | % Passing |
| 125              | 100       |
| 90               | 100       |
| 75               | 100       |
| 63               | 100       |
| 50               | 100       |
| 37.5             | 100       |
| 28               | 100       |
| 20               | 100       |
| 14               | 92        |
| 10               | 88        |
| 6.3              | 83        |
| 5.0              | 81        |
| 3.35             | 79        |
| 2.00             | 76        |
| 1.18             | 74        |
| 0.600            | 71        |
| 0.425            | 69        |
| 0.300            | 65        |
| 0.212            | 59        |
| 0.150            | 53        |
| 0.063            | 40        |



| Sample Portions    |    | Particle Density Mg/m3 | Uniformity Coefficient<br><br>D <sub>60</sub> / D <sub>10</sub> |
|--------------------|----|------------------------|-----------------------------------------------------------------|
| Cobbles / Boulders | 0  | N/A                    |                                                                 |
| Gravel             | 24 |                        |                                                                 |
| Sand               | 36 | Dry mass of sample, kg |                                                                 |
| Silt / Clay        | 40 | 0.4                    | n/a                                                             |

**Remarks:**

## TEST REPORT

### Determination Of Water Content

ISO 17892-1: 2014+A1:2022

**Project No:** D23297

**Project Name:** 17887 - Gnoll Park

**Client:** TFW Group Ltd

**Address:** 5 Deryn Court  
Wharfdale Road  
Cardiff  
CF23 7HA

**ATS Sample No:** 33491

**Site Ref / Hole ID:** TP09

**Sample No:**

**Sampling Certificate  
Received:** No

**Depth (m):** 0.50

**Sample Type:** Disturbed

**Material Description:** Greyish brown slightly  
sandy slightly gravelly  
CLAY

**Location in Works:** N/a

**Material Source:** Ex-Site

**Date Sampled:** Unknown

**Material Supplier:** Ex-Site

**Sampled By:** Client

**Specification:** BS1377

**Date Received:** 05 July 2023

**Date Tested:** 07 July 2023

#### Test Results

Moisture Content (%)

9.8

**Remarks:**

QA Ref.

EN ISO 17892-  
1:2014 A1:2022



**Apex Testing Solutions**

Sturmi Way, Village Farm Industrial Est,  
Pyle, Bridgend, CF33 6BZ

Tel: 01656 746762 Fax: 01656 749096



7771

Approver

*L Davis*

Date

07/07/2023

L Davis, Quality Manager

Fig

**MC**

**TEST REPORT**  
**LIQUID LIMIT, PLASTIC LIMIT & PLASTICITY INDEX**  
**BS 1377:Part 2:1990. Clause 4.3/5.3/5.4**

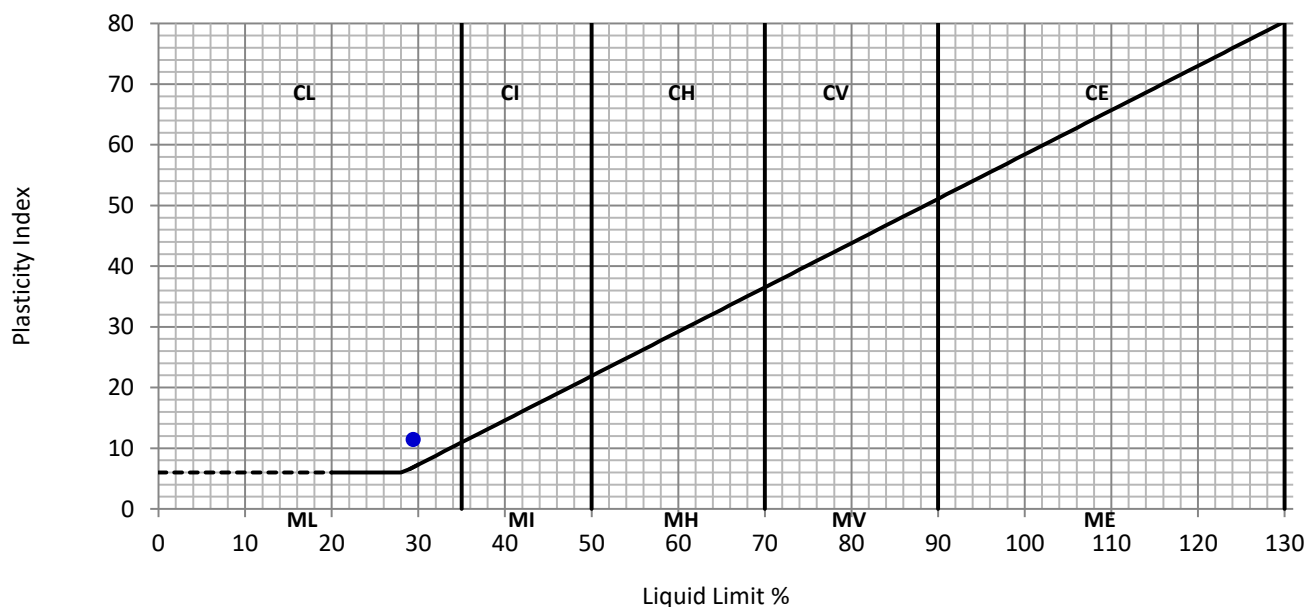
|                       |                    |                 |                                                        |
|-----------------------|--------------------|-----------------|--------------------------------------------------------|
| <b>Project No:</b>    | D23297             | <b>Client:</b>  | TFW Group Ltd                                          |
| <b>Project Name:</b>  | 17887 - Gnoll Park | <b>Address:</b> | 5 Deryn Court<br>Wharfdale Road<br>Cardiff<br>CF23 7HA |
| <b>ATS Sample No:</b> | 33491              |                 |                                                        |

|                                       |              |                              |                                                     |
|---------------------------------------|--------------|------------------------------|-----------------------------------------------------|
| <b>Site Ref / Hole ID:</b>            | TP09         | <b>Depth (m):</b>            | 0.50                                                |
| <b>Sample No:</b>                     |              | <b>Sample Type:</b>          | Disturbed                                           |
| <b>Sampling Certificate Received:</b> | No           | <b>Material Description:</b> | Greyish brown slightly sandy slightly gravelly CLAY |
| <b>Location in Works:</b>             | N/a          | <b>Material Source:</b>      | Ex-Site                                             |
| <b>Date Sampled:</b>                  | Unknown      | <b>Material Supplier:</b>    | Ex-Site                                             |
| <b>Sampled By:</b>                    | Client       | <b>Specification:</b>        | BS1377                                              |
| <b>Date Received:</b>                 | 05 July 2023 | <b>Date Tested:</b>          | 06 July 2023                                        |

**Test Results**

|                  |    |   |
|------------------|----|---|
| Liquid Limit     | 29 | % |
| Plastic Limit    | 18 | % |
| Plasticity Index | 11 | % |

|                                     |                       |
|-------------------------------------|-----------------------|
| Preparation:                        | 4.2.4 Sieved Specimen |
| Proportion retained on 425µm sieve: | 25 %                  |



**Remarks:**

**TEST REPORT**  
**PARTICLE SIZE DISTRIBUTION ANALYSIS**  
**BS1377:Part 2:1990**

**Project No:** D23297  
**Project Name:** 17887 - Gnoll Park  
**ATS Sample No:** 33492

**Client:** TFW Group Ltd  
**Address:** 5 Deryn Court  
 Wharfdale Road  
 Cardiff  
 CF23 7HA

**Site Ref / Hole ID:** TP09

**Depth (m):** 1.10

**Sample No:**

**Sample Type:** Bulk

**Sampling Certificate Received:** No

**Material Description:** Brown gravelly clayey very sandy GRAVEL

**Location in Works:** N/a

**Material Source:** Ex-Site

**Date Sampled:** Unknown

**Material Supplier:** Ex-Site

**Sampled By:** Client

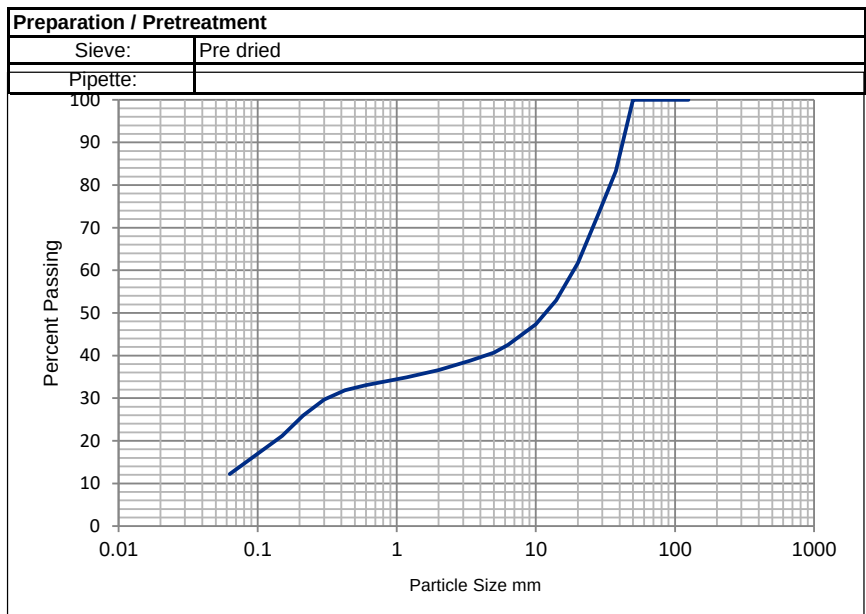
**Specification:** **BS1377**

**Date Received:** 05 July 2023

**Date Tested:** 07 July 2023

**Test Results**

| Sieving          |           |
|------------------|-----------|
| Particle Size mm | % Passing |
| 125              | 100       |
| 90               | 100       |
| 75               | 100       |
| 63               | 100       |
| 50               | 100       |
| 37.5             | 83        |
| 28               | 73        |
| 20               | 62        |
| 14               | 53        |
| 10               | 47        |
| 6.3              | 43        |
| 5.0              | 41        |
| 3.35             | 39        |
| 2.00             | 37        |
| 1.18             | 35        |
| 0.600            | 33        |
| 0.425            | 32        |
| 0.300            | 30        |
| 0.212            | 26        |
| 0.150            | 21        |
| 0.063            | 12        |



| Sample Portions    |    | Particle Density Mg/m3 | Uniformity Coefficient<br><br>D <sub>60</sub> / D <sub>10</sub> |
|--------------------|----|------------------------|-----------------------------------------------------------------|
| Cobbles / Boulders | 0  | N/A                    |                                                                 |
| Gravel             | 63 |                        |                                                                 |
| Sand               | 24 | Dry mass of sample, kg |                                                                 |
| Silt / Clay        | 12 | 4.1                    | n/a                                                             |

**Remarks:**

QA Ref.

BS1377 - 4

Rev. 2.0



**Apex Testing Solutions**

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 CF33 6BZ

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7771

Approver

*L Davis*

L Davis, Quality Manager

Date

07/07/2023

Fig

**PSD**

## TEST REPORT

### Determination Of Water Content

ISO 17892-1: 2014+A1:2022

**Project No:** D23297

**Project Name:** 17887 - Gnoll Park

**Client:** TFW Group Ltd

**Address:** 5 Deryn Court  
Wharfdale Road  
Cardiff  
CF23 7HA

**ATS Sample No:** 33493

**Site Ref / Hole ID:** TP10

**Sample No:**

**Sampling Certificate  
Received:** No

**Depth (m):** 0.60

**Sample Type:** Disturbed

**Material Description:** Greyish brown silty  
sandy gravelly CLAY

**Location in Works:** N/a

**Material Source:** Ex-Site

**Date Sampled:** Unknown

**Material Supplier:** Ex-Site

**Sampled By:** Client

**Specification:** BS1377

**Date Received:** 05 July 2023

**Date Tested:** 07 July 2023

#### Test Results

Moisture Content (%)

9.1

**Remarks:**

QA Ref.

EN ISO 17892-  
1:2014 A1:2022



**Apex Testing Solutions**

Sturmi Way, Village Farm Industrial Est,  
Pyle, Bridgend, CF33 6BZ

Tel: 01656 746762 Fax: 01656 749096



7771

Approver

*L Davis*

Date

07/07/2023

L Davis, Quality Manager

Fig

**MC**

**TEST REPORT**  
**LIQUID LIMIT, PLASTIC LIMIT & PLASTICITY INDEX**  
**BS 1377:Part 2:1990. Clause 4.3/5.3/5.4**

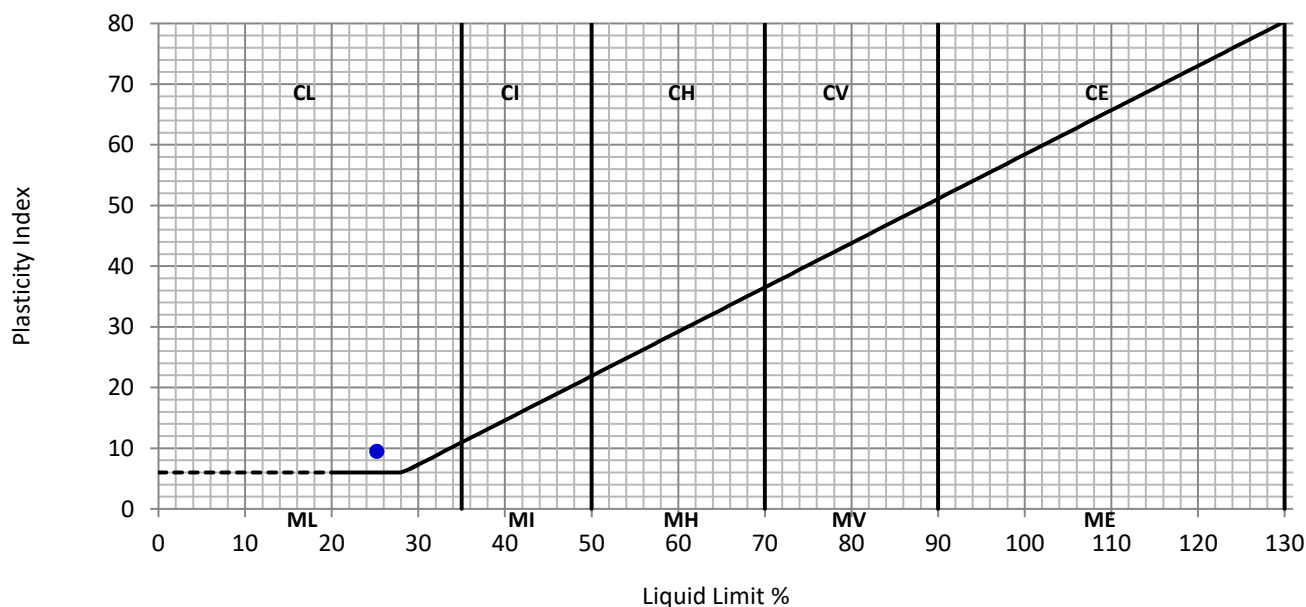
|                       |                    |                 |                                                        |
|-----------------------|--------------------|-----------------|--------------------------------------------------------|
| <b>Project No:</b>    | D23297             | <b>Client:</b>  | TFW Group Ltd                                          |
| <b>Project Name:</b>  | 17887 - Gnoll Park | <b>Address:</b> | 5 Deryn Court<br>Wharfdale Road<br>Cardiff<br>CF23 7HA |
| <b>ATS Sample No:</b> | 33493              |                 |                                                        |

|                                       |              |                              |                                         |
|---------------------------------------|--------------|------------------------------|-----------------------------------------|
| <b>Site Ref / Hole ID:</b>            | TP10         | <b>Depth (m):</b>            | 0.60                                    |
| <b>Sample No:</b>                     |              | <b>Sample Type:</b>          | Disturbed                               |
| <b>Sampling Certificate Received:</b> | No           | <b>Material Description:</b> | Greyish brown silty sandy gravelly CLAY |
| <b>Location in Works:</b>             | N/a          | <b>Material Source:</b>      | Ex-Site                                 |
| <b>Date Sampled:</b>                  | Unknown      | <b>Material Supplier:</b>    | Ex-Site                                 |
| <b>Sampled By:</b>                    | Client       | <b>Specification:</b>        | BS1377                                  |
| <b>Date Received:</b>                 | 05 July 2023 | <b>Date Tested:</b>          | 06 July 2023                            |

**Test Results**

|                  |    |   |
|------------------|----|---|
| Liquid Limit     | 25 | % |
| Plastic Limit    | 16 | % |
| Plasticity Index | 9  | % |

|                                     |                       |
|-------------------------------------|-----------------------|
| Preparation:                        | 4.2.4 Sieved Specimen |
| Proportion retained on 425µm sieve: | 52 %                  |



**Remarks:**

QA Ref.

BS1377 - 2  
Rev. 3.0



**Apex Testing Solutions**

Sturmi Way, Village Farm Industrial Est, Pyle,  
Bridgend, CF33 6BZ  
Tel: 01656 746762 Fax: 01656 749096



7771

Approver

*L Davis*

L Davis, Quality Manager

Date

07/07/2023

Fig.

**ATT**

**TEST REPORT**  
**PARTICLE SIZE DISTRIBUTION ANALYSIS**  
**BS1377:Part 2:1990**

**Project No:** D23297  
**Project Name:** 17887 - Gnoll Park  
  
**ATS Sample No:** 33494

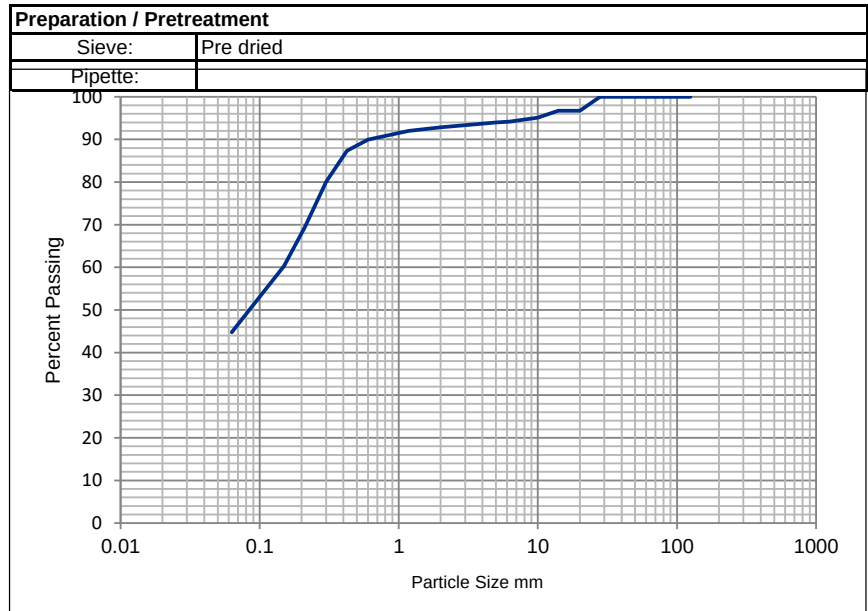
**Client:** TFW Group Ltd  
**Address** 5 Deryn Court  
 Wharfdale Road  
 Cardiff  
 CF23 7HA

**Site Ref / Hole ID:** HP07  
**Sample No:**  
**Sampling Certificate Received:** No  
**Location in Works:** N/a  
  
**Date Sampled:** Unknown  
**Sampled By:** Client  
**Date Received:** 05 July 2023

**Depth (m):** 0.30  
**Sample Type:** Bulk  
**Material Description:** Brown slightly gravelly sandy CLAY  
  
**Material Source:** Ex-Site  
**Material Supplier:** Ex-Site  
**Specification:** **BS1377**  
**Date Tested:** 07 July 2023

**Test Results**

| Sieving          |           |
|------------------|-----------|
| Particle Size mm | % Passing |
| 125              | 100       |
| 90               | 100       |
| 75               | 100       |
| 63               | 100       |
| 50               | 100       |
| 37.5             | 100       |
| 28               | 100       |
| 20               | 97        |
| 14               | 97        |
| 10               | 95        |
| 6.3              | 94        |
| 5.0              | 94        |
| 3.35             | 93        |
| 2.00             | 93        |
| 1.18             | 92        |
| 0.600            | 90        |
| 0.425            | 87        |
| 0.300            | 80        |
| 0.212            | 70        |
| 0.150            | 60        |
| 0.063            | 45        |



| Sample Portions    |    | Particle Density Mg/m3 | Uniformity Coefficient<br><br>D <sub>60</sub> / D <sub>10</sub> |
|--------------------|----|------------------------|-----------------------------------------------------------------|
| Cobbles / Boulders | 0  | N/A                    |                                                                 |
| Gravel             | 7  |                        |                                                                 |
| Sand               | 48 | Dry mass of sample, kg |                                                                 |
| Silt / Clay        | 45 | 0.6                    | n/a                                                             |

**Remarks:**



2183

# Final Report

**Report No.:** 23-22704-1**Initial Date of Issue:** 12-Jul-2023**Re-Issue Details:****Client** Terra Firma (Wales) Ltd**Client Address:** 5 Deryn Court  
Wharfedale Road  
Pentwyn  
Cardiff  
CF23 7HA**Contact(s):** Info**Project** Gnoll Park, Chippneham**Quotation No.:** Q23-31814**Date Received:** 04-Jul-2023**Order No.:****Date Instructed:** 04-Jul-2023**No. of Samples:** 15**Turnaround (Wkdays):** 6**Results Due:** 11-Jul-2023**Date Approved:** 12-Jul-2023**Approved By:****Details:** Stuart Henderson, Technical  
Manager

## Results - Soil

**Project: Gnoll Park, Chippneham**

|                                        |                             |            |              |            |            |                      |            |                      |             |                      |             |                      |                      |
|----------------------------------------|-----------------------------|------------|--------------|------------|------------|----------------------|------------|----------------------|-------------|----------------------|-------------|----------------------|----------------------|
| <b>Client: Terra Firma (Wales) Ltd</b> | <b>Chemtest Job No.:</b>    |            |              |            | 23-22704   | 23-22704             | 23-22704   | 23-22704             | 23-22704    | 23-22704             | 23-22704    | 23-22704             | 23-22704             |
| <b>Quotation No.: Q23-31814</b>        | <b>Chemtest Sample ID.:</b> |            |              |            | 1668800    | 1668801              | 1668802    | 1668803              | 1668804     | 1668805              | 1668806     | 1668807              | 1668808              |
|                                        | Sample Location:            |            |              |            | TP01       | TP02                 | TP03       | TP04                 | TP04        | TP05                 | TP05        | TP06                 | TP07                 |
|                                        | Sample Type:                |            |              |            | SOIL       | SOIL                 | SOIL       | SOIL                 | SOIL        | SOIL                 | SOIL        | SOIL                 | SOIL                 |
|                                        | Top Depth (m):              |            |              |            | 0.50       | 0.20                 | 0.20       | 0.30                 | 1.20        | 0.60                 | 2.10        | 0.40                 | 1.15                 |
|                                        | Asbestos Lab:               |            |              |            |            | DURHAM               |            | DURHAM               |             | DURHAM               |             |                      | DURHAM               |
| <b>Determinand</b>                     | <b>Accred.</b>              | <b>SOP</b> | <b>Units</b> | <b>LOD</b> |            |                      |            |                      |             |                      |             |                      |                      |
| ACM Type                               | U                           | 2192       |              | N/A        |            | -                    |            | -                    |             | -                    |             | -                    | -                    |
| Asbestos Identification                | U                           | 2192       |              | N/A        |            | No Asbestos Detected |            | No Asbestos Detected |             | No Asbestos Detected |             | No Asbestos Detected | No Asbestos Detected |
| Moisture                               | N                           | 2030       | %            | 0.020      | 9.9        | 12                   | 9.7        | 5.6                  | 17          | 15                   | 9.3         | 13                   | 17                   |
| pH                                     | U                           | 2010       |              | 4.0        | [A] 7.9    | [A] 7.3              | [A] 6.9    | [A] 8.4              | [A] 7.7     | [A] 7.9              | [A] 8.3     | [A] 7.9              | [A] 5.4              |
| Sulphate (2:1 Water Soluble) as SO4    | U                           | 2120       | g/l          | 0.010      |            | [A] < 0.010          |            |                      | [A] < 0.010 |                      | [A] < 0.010 | [A] 0.014            |                      |
| Cyanide (Total)                        | U                           | 2300       | mg/kg        | 0.50       | [A] 0.60   | [A] < 0.50           | [A] < 0.50 | [A] < 0.50           |             | [A] < 0.50           |             | [A] < 0.50           | [A] < 0.50           |
| Sulphate (Total)                       | U                           | 2430       | %            | 0.010      | [A] 0.011  | [A] 0.063            | [A] 0.078  | [A] 0.048            | [A] 0.045   | [A] 0.076            | [A] 0.048   | [A] 0.18             | [A] 0.079            |
| Sulphate (Acid Soluble)                | U                           | 2430       | %            | 0.010      |            | [A] 0.11             |            |                      | [A] 0.048   |                      | [A] 0.065   | [A] 0.22             |                      |
| Arsenic                                | U                           | 2455       | mg/kg        | 0.5        | 13         | 12                   | 33         | 30                   |             | 20                   |             | 25                   | 20                   |
| Cadmium                                | U                           | 2455       | mg/kg        | 0.10       | 0.15       | < 0.10               | 0.60       | 0.69                 |             | < 0.10               |             | 0.10                 | 0.17                 |
| Chromium                               | U                           | 2455       | mg/kg        | 0.5        | 26         | 12                   | 14         | 21                   |             | 16                   |             | 14                   | 20                   |
| Copper                                 | U                           | 2455       | mg/kg        | 0.50       | 41         | 29                   | 51         | 55                   |             | 23                   |             | 41                   | 49                   |
| Mercury                                | U                           | 2455       | mg/kg        | 0.05       | 0.06       | 0.06                 | 0.08       | 0.10                 |             | 0.11                 |             | 0.16                 | 0.12                 |
| Nickel                                 | U                           | 2455       | mg/kg        | 0.50       | 49         | 23                   | 18         | 32                   |             | 21                   |             | 21                   | 40                   |
| Lead                                   | U                           | 2455       | mg/kg        | 0.50       | 32         | 26                   | 54         | 55                   |             | 57                   |             | 140                  | 38                   |
| Selenium                               | U                           | 2455       | mg/kg        | 0.25       | 0.94       | 0.63                 | 0.97       | 0.91                 |             | 0.52                 |             | 0.83                 | 1.0                  |
| Zinc                                   | U                           | 2455       | mg/kg        | 0.50       | 120        | 71                   | 100        | 130                  |             | 69                   |             | 73                   | 110                  |
| Chromium (Trivalent)                   | N                           | 2490       | mg/kg        | 1.0        | 26         | 12                   | 14         | 21                   |             | 16                   |             | 14                   | 20                   |
| Chromium (Hexavalent)                  | N                           | 2490       | mg/kg        | 0.50       | < 0.50     | < 0.50               | < 0.50     | < 0.50               |             | < 0.50               |             | < 0.50               | < 0.50               |
| Organic Matter                         | U                           | 2625       | %            | 0.40       | [A] 1.4    | [A] 9.7              | [A] 5.7    | [A] 13               |             | [A] 4.2              |             | [A] 14               | [A] 1.5              |
| Total TPH >C6-C40                      | U                           | 2670       | mg/kg        | 10         |            | [A] < 10             |            | [A] < 10             |             | [A] < 10             |             | [A] 330              | [A] 43               |
| Naphthalene                            | U                           | 2700       | mg/kg        | 0.10       | [A] 4.1    | [A] < 0.10           | [A] 3.1    | [A] < 0.10           |             | [A] < 0.10           |             | [A] 0.33             | [A] 23               |
| Acenaphthylene                         | U                           | 2700       | mg/kg        | 0.10       | [A] 0.34   | [A] < 0.10           | [A] < 0.10 | [A] < 0.10           |             | [A] < 0.10           |             | [A] 1.2              | [A] 43               |
| Acenaphthene                           | U                           | 2700       | mg/kg        | 0.10       | [A] 0.29   | [A] < 0.10           | [A] 0.61   | [A] < 0.10           |             | [A] < 0.10           |             | [A] 0.42             | [A] 6.6              |
| Fluorene                               | U                           | 2700       | mg/kg        | 0.10       | [A] 0.19   | [A] < 0.10           | [A] 0.14   | [A] < 0.10           |             | [A] < 0.10           |             | [A] 0.59             | [A] 29               |
| Phenanthrene                           | U                           | 2700       | mg/kg        | 0.10       | [A] 0.20   | [A] < 0.10           | [A] 0.15   | [A] < 0.10           |             | [A] < 0.10           |             | [A] 4.4              | [A] < 0.10           |
| Anthracene                             | U                           | 2700       | mg/kg        | 0.10       | [A] < 0.10 | [A] < 0.10           | [A] < 0.10 | [A] < 0.10           |             | [A] < 0.10           |             | [A] 2.2              | [A] < 0.10           |
| Fluoranthene                           | U                           | 2700       | mg/kg        | 0.10       | [A] 0.16   | [A] < 0.10           | [A] 0.12   | [A] < 0.10           |             | [A] < 0.10           |             | [A] 16               | [A] 0.64             |
| Pyrene                                 | U                           | 2700       | mg/kg        | 0.10       | [A] 0.15   | [A] < 0.10           | [A] 0.11   | [A] < 0.10           |             | [A] < 0.10           |             | [A] 14               | [A] 0.82             |
| Benzo[a]anthracene                     | U                           | 2700       | mg/kg        | 0.10       | [A] < 0.10 | [A] < 0.10           | [A] < 0.10 | [A] < 0.10           |             | [A] < 0.10           |             | [A] 11               | [A] 0.79             |
| Chrysene                               | U                           | 2700       | mg/kg        | 0.10       | [A] < 0.10 | [A] < 0.10           | [A] < 0.10 | [A] < 0.10           |             | [A] < 0.10           |             | [A] 12               | [A] 0.36             |
| Benzo[b]fluoranthene                   | U                           | 2700       | mg/kg        | 0.10       | [A] < 0.10 | [A] < 0.10           | [A] < 0.10 | [A] < 0.10           |             | [A] < 0.10           |             | [A] 14               | [A] < 0.10           |
| Benzo[k]fluoranthene                   | U                           | 2700       | mg/kg        | 0.10       | [A] < 0.10 | [A] < 0.10           | [A] < 0.10 | [A] < 0.10           |             | [A] < 0.10           |             | [A] 5.3              | [A] < 0.10           |
| Benzo[a]pyrene                         | U                           | 2700       | mg/kg        | 0.10       | [A] < 0.10 | [A] < 0.10           | [A] < 0.10 | [A] < 0.10           |             | [A] < 0.10           |             | [A] 10               | [A] < 0.10           |
| Indeno(1,2,3-c,d)Pyrene                | U                           | 2700       | mg/kg        | 0.10       | [A] < 0.10 | [A] < 0.10           | [A] < 0.10 | [A] < 0.10           |             | [A] < 0.10           |             | [A] 7.4              | [A] 84               |
| Dibenz(a,h)Anthracene                  | U                           | 2700       | mg/kg        | 0.10       | [A] < 0.10 | [A] < 0.10           | [A] < 0.10 | [A] < 0.10           |             | [A] < 0.10           |             | [A] 2.3              | [A] 35               |
| Benzo[g,h,i]perylene                   | U                           | 2700       | mg/kg        | 0.10       | [A] < 0.10 | [A] < 0.10           | [A] < 0.10 | [A] < 0.10           |             | [A] < 0.10           |             | [A] 6.4              | [A] 78               |
| Total Of 16 PAH's                      | U                           | 2700       | mg/kg        | 2.0        | [A] 5.4    | [A] < 2.0            | [A] 4.2    | [A] < 2.0            |             | [A] < 2.0            |             | [A] 110              | [A] 300              |
| Total Phenols                          | U                           | 2920       | mg/kg        | 0.10       | < 0.10     | < 0.10               | < 0.10     | < 0.10               |             | < 0.10               |             | < 0.10               | < 0.10               |

## Results - Soil

### Project: Gnoll Park, Chippneham

|                                        |                             |            |              |            |                      |                      |                      |                      |
|----------------------------------------|-----------------------------|------------|--------------|------------|----------------------|----------------------|----------------------|----------------------|
| <b>Client: Terra Firma (Wales) Ltd</b> | <b>Chemtest Job No.:</b>    |            | 23-22704     | 23-22704   | 23-22704             | 23-22704             | 23-22704             | 23-22704             |
| Quotation No.: Q23-31814               | <b>Chemtest Sample ID.:</b> |            | 1668809      | 1668810    | 1668811              | 1668812              | 1668813              | 1668814              |
|                                        | Sample Location:            |            | TP08         | TP08       | TP09                 | TP10                 | TP10                 | HP06                 |
|                                        | Sample Type:                |            | SOIL         | SOIL       | SOIL                 | SOIL                 | SOIL                 | SOIL                 |
|                                        | Top Depth (m):              |            | 0.50         | 1.50       | 0.50                 | 0.60                 | 2.10                 | 0.10                 |
|                                        | Asbestos Lab:               |            | DURHAM       |            | DURHAM               | DURHAM               |                      | DURHAM               |
| <b>Determinand</b>                     | <b>Accred.</b>              | <b>SOP</b> | <b>Units</b> | <b>LOD</b> |                      |                      |                      |                      |
| ACM Type                               | U                           | 2192       |              | N/A        | -                    | -                    | -                    | -                    |
| Asbestos Identification                | U                           | 2192       |              | N/A        | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected |
| Moisture                               | N                           | 2030       | %            | 0.020      | 3.5                  | 7.3                  | 9.7                  | 9.4                  |
| pH                                     | U                           | 2010       |              | 4.0        | [A] 8.3              | [A] 8.1              | [A] 8.3              | [A] 8.2              |
| Sulphate (2:1 Water Soluble) as SO4    | U                           | 2120       | g/l          | 0.010      |                      | [A] < 0.010          |                      | [A] < 0.010          |
| Cyanide (Total)                        | U                           | 2300       | mg/kg        | 0.50       | [A] < 0.50           | [A] < 0.50           | [A] < 0.50           | [A] < 0.50           |
| Sulphate (Total)                       | U                           | 2430       | %            | 0.010      | [A] 0.036            | [A] 0.090            | [A] 0.074            | [A] 0.033            |
| Sulphate (Acid Soluble)                | U                           | 2430       | %            | 0.010      |                      | [A] 0.080            |                      | [A] 0.040            |
| Arsenic                                | U                           | 2455       | mg/kg        | 0.5        | 35                   | 34                   | 38                   | 16                   |
| Cadmium                                | U                           | 2455       | mg/kg        | 0.10       | 0.75                 | 0.70                 | 0.22                 | 0.10                 |
| Chromium                               | U                           | 2455       | mg/kg        | 0.5        | 21                   | 20                   | 19                   | 20                   |
| Copper                                 | U                           | 2455       | mg/kg        | 0.50       | 90                   | 88                   | 120                  | 23                   |
| Mercury                                | U                           | 2455       | mg/kg        | 0.05       | 0.26                 | 0.25                 | 0.21                 | 0.06                 |
| Nickel                                 | U                           | 2455       | mg/kg        | 0.50       | 27                   | 26                   | 29                   | 36                   |
| Lead                                   | U                           | 2455       | mg/kg        | 0.50       | 120                  | 120                  | 67                   | 23                   |
| Selenium                               | U                           | 2455       | mg/kg        | 0.25       | 1.0                  | 0.91                 | 1.1                  | 0.75                 |
| Zinc                                   | U                           | 2455       | mg/kg        | 0.50       | 180                  | 170                  | 150                  | 83                   |
| Chromium (Trivalent)                   | N                           | 2490       | mg/kg        | 1.0        | 21                   | 20                   | 19                   | 20                   |
| Chromium (Hexavalent)                  | N                           | 2490       | mg/kg        | 0.50       | < 0.50               | < 0.50               | < 0.50               | < 0.50               |
| Organic Matter                         | U                           | 2625       | %            | 0.40       | [A] 12               | [A] 1.1              | [A] 2.6              | [A] 22               |
| Total TPH >C6-C40                      | U                           | 2670       | mg/kg        | 10         | [A] < 10             | [A] < 10             | [A] < 10             | [A] < 10             |
| Naphthalene                            | U                           | 2700       | mg/kg        | 0.10       | [A] < 0.10           | [A] < 0.10           | [A] < 0.10           | [A] < 0.10           |
| Acenaphthylene                         | U                           | 2700       | mg/kg        | 0.10       | [A] < 0.10           | [A] < 0.10           | [A] < 0.10           | [A] < 0.10           |
| Acenaphthene                           | U                           | 2700       | mg/kg        | 0.10       | [A] < 0.10           | [A] < 0.10           | [A] < 0.10           | [A] < 0.10           |
| Fluorene                               | U                           | 2700       | mg/kg        | 0.10       | [A] < 0.10           | [A] < 0.10           | [A] < 0.10           | [A] < 0.10           |
| Phenanthrene                           | U                           | 2700       | mg/kg        | 0.10       | [A] < 0.10           | [A] < 0.10           | [A] < 0.10           | [A] < 0.10           |
| Anthracene                             | U                           | 2700       | mg/kg        | 0.10       | [A] < 0.10           | [A] < 0.10           | [A] < 0.10           | [A] < 0.10           |
| Fluoranthene                           | U                           | 2700       | mg/kg        | 0.10       | [A] 0.18             | [A] < 0.10           | [A] < 0.10           | [A] < 0.10           |
| Pyrene                                 | U                           | 2700       | mg/kg        | 0.10       | [A] 0.20             | [A] < 0.10           | [A] < 0.10           | [A] < 0.10           |
| Benzo[a]anthracene                     | U                           | 2700       | mg/kg        | 0.10       | [A] 0.35             | [A] < 0.10           | [A] < 0.10           | [A] < 0.10           |
| Chrysene                               | U                           | 2700       | mg/kg        | 0.10       | [A] 0.22             | [A] < 0.10           | [A] < 0.10           | [A] < 0.10           |
| Benzo[b]fluoranthene                   | U                           | 2700       | mg/kg        | 0.10       | [A] < 0.10           | [A] < 0.10           | [A] < 0.10           | [A] < 0.10           |
| Benzo[k]fluoranthene                   | U                           | 2700       | mg/kg        | 0.10       | [A] < 0.10           | [A] < 0.10           | [A] < 0.10           | [A] < 0.10           |
| Benzo[a]pyrene                         | U                           | 2700       | mg/kg        | 0.10       | [A] < 0.10           | [A] < 0.10           | [A] < 0.10           | [A] < 0.10           |
| Indeno(1,2,3-c,d)Pyrene                | U                           | 2700       | mg/kg        | 0.10       | [A] < 0.10           | [A] < 0.10           | [A] < 0.10           | [A] < 0.10           |
| Dibenz(a,h)Anthracene                  | U                           | 2700       | mg/kg        | 0.10       | [A] < 0.10           | [A] < 0.10           | [A] < 0.10           | [A] < 0.10           |
| Benzo[g,h,i]perylene                   | U                           | 2700       | mg/kg        | 0.10       | [A] < 0.10           | [A] < 0.10           | [A] < 0.10           | [A] < 0.10           |
| Total Of 16 PAH's                      | U                           | 2700       | mg/kg        | 2.0        | [A] < 2.0            | [A] < 2.0            | [A] < 2.0            | [A] < 2.0            |
| Total Phenols                          | U                           | 2920       | mg/kg        | 0.10       | < 0.10               | < 0.10               | < 0.10               | < 0.10               |

## Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request. The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

| Sample: | Sample Ref: | Sample ID: | Sample Location: | Sampled Date: | Deviation Code(s): | Containers Received: |
|---------|-------------|------------|------------------|---------------|--------------------|----------------------|
| 1668800 |             |            | TP01             |               | A                  | Amber Glass 250ml    |
| 1668800 |             |            | TP01             |               | A                  | Plastic Tub 500g     |
| 1668801 |             |            | TP02             |               | A                  | Amber Glass 250ml    |
| 1668801 |             |            | TP02             |               | A                  | Plastic Tub 500g     |
| 1668802 |             |            | TP03             |               | A                  | Amber Glass 250ml    |
| 1668802 |             |            | TP03             |               | A                  | Plastic Tub 500g     |
| 1668803 |             |            | TP04             |               | A                  | Amber Glass 250ml    |
| 1668803 |             |            | TP04             |               | A                  | Plastic Tub 500g     |
| 1668804 |             |            | TP04             |               | A                  | Amber Glass 250ml    |
| 1668804 |             |            | TP04             |               | A                  | Plastic Tub 500g     |
| 1668805 |             |            | TP05             |               | A                  | Amber Glass 250ml    |
| 1668805 |             |            | TP05             |               | A                  | Plastic Tub 500g     |
| 1668806 |             |            | TP05             |               | A                  | Amber Glass 250ml    |
| 1668806 |             |            | TP05             |               | A                  | Plastic Tub 500g     |
| 1668807 |             |            | TP06             |               | A                  | Amber Glass 250ml    |
| 1668807 |             |            | TP06             |               | A                  | Plastic Tub 500g     |
| 1668808 |             |            | TP07             |               | A                  | Amber Glass 250ml    |
| 1668808 |             |            | TP07             |               | A                  | Plastic Tub 500g     |
| 1668809 |             |            | TP08             |               | A                  | Amber Glass 250ml    |
| 1668809 |             |            | TP08             |               | A                  | Plastic Tub 500g     |
| 1668810 |             |            | TP08             |               | A                  | Amber Glass 250ml    |
| 1668810 |             |            | TP08             |               | A                  | Plastic Tub 500g     |

## Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request. The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

| Sample: | Sample Ref: | Sample ID: | Sample Location: | Sampled Date: | Deviation Code(s): | Containers Received: |
|---------|-------------|------------|------------------|---------------|--------------------|----------------------|
| 1668811 |             |            | TP09             |               | A                  | Amber Glass 250ml    |
| 1668811 |             |            | TP09             |               | A                  | Plastic Tub 500g     |
| 1668812 |             |            | TP10             |               | A                  | Amber Glass 250ml    |
| 1668812 |             |            | TP10             |               | A                  | Plastic Tub 500g     |
| 1668813 |             |            | TP10             |               | A                  | Amber Glass 250ml    |
| 1668813 |             |            | TP10             |               | A                  | Plastic Tub 500g     |
| 1668814 |             |            | HP06             |               | A                  | Amber Glass 250ml    |
| 1668814 |             |            | HP06             |               | A                  | Plastic Tub 500g     |

## Test Methods

| SOP  | Title                                                               | Parameters included                                                                                                                                                                                                                                           | Method summary                                                                                                                                                                         |
|------|---------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2010 | pH Value of Soils                                                   | pH                                                                                                                                                                                                                                                            | pH Meter                                                                                                                                                                               |
| 2030 | Moisture and Stone Content of Soils(Requirement of MCERTS)          | Moisture content                                                                                                                                                                                                                                              | Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.                                                                                   |
| 2040 | Soil Description(Requirement of MCERTS)                             | Soil description                                                                                                                                                                                                                                              | As received soil is described based upon BS5930                                                                                                                                        |
| 2120 | Water Soluble Boron, Sulphate, Magnesium & Chromium                 | Boron; Sulphate; Magnesium; Chromium                                                                                                                                                                                                                          | Aqueous extraction / ICP-OES                                                                                                                                                           |
| 2192 | Asbestos                                                            | Asbestos                                                                                                                                                                                                                                                      | Polarised light microscopy / Gravimetry                                                                                                                                                |
| 2300 | Cyanides & Thiocyanate in Soils                                     | Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate                                                                                                                                                                               | Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.                                                                                    |
| 2430 | Total Sulphate in soils                                             | Total Sulphate                                                                                                                                                                                                                                                | Acid digestion followed by determination of sulphate in extract by ICP-OES.                                                                                                            |
| 2455 | Acid Soluble Metals in Soils                                        | Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc                                                                                                      | Acid digestion followed by determination of metals in extract by ICP-MS.                                                                                                               |
| 2490 | Hexavalent Chromium in Soils                                        | Chromium [VI]                                                                                                                                                                                                                                                 | Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazine. |
| 2625 | Total Organic Carbon in Soils                                       | Total organic Carbon (TOC)                                                                                                                                                                                                                                    | Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.                                                                                             |
| 2670 | Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID               | TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40                                                                                                                                                                                | Dichloromethane extraction / GC-FID                                                                                                                                                    |
| 2700 | Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID | Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenzo[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene | Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)                                                   |
| 2920 | Phenols in Soils by HPLC                                            | Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.                                                                                                             | 60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.                                                                               |

## **Report Information**

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### **Key**

|     |                                                                                                               |
|-----|---------------------------------------------------------------------------------------------------------------|
| U   | UKAS accredited                                                                                               |
| M   | MCERTS and UKAS accredited                                                                                    |
| N   | Unaccredited                                                                                                  |
| S   | This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis     |
| SN  | This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis |
| T   | This analysis has been subcontracted to an unaccredited laboratory                                            |
| I/S | Insufficient Sample                                                                                           |
| U/S | Unsuitable Sample                                                                                             |
| N/E | not evaluated                                                                                                 |
| <   | "less than"                                                                                                   |
| >   | "greater than"                                                                                                |
| SOP | Standard operating procedure                                                                                  |
| LOD | Limit of detection                                                                                            |

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

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### **Sample Deviation Codes**

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

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### **Sample Retention and Disposal**

All soil samples will be retained for a period of 30 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

[customerservices@chemtest.com](mailto:customerservices@chemtest.com)

## **APPENDIX H: LIMITATIONS AND EXCEPTIONS**

## Limitations and Exceptions

1. The advice given in this report is based on the guidelines available at the time of writing.
2. This investigation was conducted so as to generally comply with the relevant principles and requirements of BS10175: 2011 "Investigation of potentially contaminated sites - Code of Practice" and BS 5930:2015 "Code of Practice for Site Investigations".
3. The Client is advised that the conditions observed on site by Jubb Consulting Engineers Ltd (JCE) at the time of the investigation or assessment are subject to change. Certain indicators of the presence of hazardous substances may have been latent at the time of the most recent site reconnaissance or investigation and they may subsequently have become observable. Ground conditions, including geotechnical properties may vary between points of observation, sampling and testing.
4. Certain areas of site had restricted access or were inaccessible due to the presence of in-use buildings, facilities and live services, as identified in this report. These may require further investigation outside the scope of this present investigation.
5. Comments made relating to land gas or groundwater conditions are based on observations made at the time of an investigation unless otherwise stated. Land gas and groundwater conditions may vary as a result of seasonal or other effects.
6. Ground contamination often exists as small discrete areas of contamination and there can be no certainty that any or all such areas have been located, sampled and/or identified.
7. The findings and opinions conveyed in this report are based on information obtained from a variety of sources, including that from previous site investigations and chemical and geotechnical testing laboratories, and which JCE has assumed are correct. Nevertheless, JCE cannot and does not guarantee the authenticity or reliability of the information it has used or cited. JCE can accept no responsibility for inaccuracies within the data supplied by other parties.
8. This report is written in the context of an agreed scope of work between JCE and the Client and should not be used in a different context. In the light of additional information becoming available, improved practices and changes in legislation, amendment or re-interpretation of the assessment or report in whole or part may be necessary after its original submission.
9. This report is provided for sole use by the Client and is confidential to them. No responsibility whatsoever for the contents of the report will be accepted to anyone other than the Client.
10. This report is not a specification for works.
11. JCE believes that providing information about limitations is essential to help the Client identify and thereby manage risks.
12. JCE does not provide legal advice and the advice of the Clients' legal advisors may also be required.
13. JCE retain the copyright in this report and all drawings reproduced in it.