



Former X-Ray Site, Port Talbot

Interpretive Ground Investigation Report

A111150-7-1

Neath Port Talbot Borough Council

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Prepared by WYG Environment Planning Transport Limited.

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EXECUTIVE SUMMARY

The Site	The site is located on Cefn Gwrgan Road, Margam, Port Talbot and is adjacent to Harbour Way (A4241). The site is approximately 0.57 hectares (ha) in area and is centred on National Grid Reference (NGR) 278422, 186995. The site comprises of a disused singly storey brick building within the southern area of the site, an access road along the eastern boundary and an open area of demolition debris covering the surface surrounding a concrete foundation of a building and a gated sub-station. There are several concrete pathways and vegetation surrounding the edges of the site with a bund along the northern edge
Site History	The earliest mapping shows the site to be undeveloped fields with a track running along the eastern boundary to the centre of the boundary and two drainage streams running through the centre and southern end of the site between c.1877 and c.1940. In c.1950, a road is shown in the northern area of the site. In c.1960 the site covers part of a development which consists of rows of sheds; approximately 8 of these sheds are within the site boundaries. In c.1964 the sheds have been replaced by an E-shaped building with 5 No. perpendicular rows and standalone building: only a small section of this building is within the site boundary. The site remains relatively unchanged until c.2010. 2019 mapping shows that the E-shaped building is no longer present, leaving only the stand-alone building in the southern area of the site.
Geology	The British Geological Survey maps show the site is overlain with 'Landscaped Ground which is detailed as 'Artificially Modified Ground'. Superficial Geology comprises Tidal Flat Deposits (comprising mainly clay, silt and sand) underlain by the South Wales Middle Coal Measures Formation (coal bearing- mudstones/siltstones with seatearths and minor sandstone).
Hydrogeology and Hydrology	The South Wales Middle Coal Measure Formation is designated a Secondary A Aquifer. These are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers. The Tidal Flat deposits are classified as a Secondary Undifferentiated Aquifer. This has been assigned in cases where it has not been possible to attribute either a Secondary A or B aquifer to the soil type due to the variable characteristics. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type. The nearest surface water feature is a drainage ditch located 1m east of the site running parallel to the eastern boundary of the site. The Upper Mother Ditch river is located approximately 150m south of the site.
Radon	The site is located within an area where no radon protection measures are required for new developments.

Unexploded Ordnance	The site is located within a Low Risk Area with regards to Unexploded Ordnance (UXO).
Ground contamination assessment	A total of 12 soil samples collect from across the site were submitted for chemical laboratory analysis. Comparison of the chemical analysis results with the generic assessment criteria for a commercial/industrial end use has not identified any exceedances expect for elevated pH readings in two samples. The laboratory results indicated the presence of asbestos fibres in 1no. sample namely HP2 at 0.20-0.30m sampled from shallow Made Ground. The sample was further scheduled for quantification using a combination of gravimetric and phase contract optical microscopy (PCOM) methods. The results of the quantification indicated that the concentration of asbestos within the sample was 3.07%. The controlled waters assessment indicated exceedances of the metal's arsenic, copper and zinc. Concentrations of copper and zinc were further screened using the Metal Bioavailability Assessment Tool (M-BAT) and all values were below the relevant EQS values and returned a low risk characterisation ratio.
Ground Gas Assessment	The site has been classified as Character Situation 1 (Very Low Risk) based on consistently low concentrations of carbon dioxide and methane, coupled with low borehole flow rates. Site classification of a Characteristic Situation 1 indicates no requirement for special protection measures for new developments.
Report Recommendations	Based on the findings of this report, the following recommendations are outlined: - Asbestos was encountered in one sample obtained from HP2 at 0.20m bgl. The presence of coarse gravel and areas of concrete hardstanding which breaks the pollutant linkage between site users and the risk from ingestion, inhalation and dermal contact with asbestos impacted soils. No redevelopment or excavation works are proposed at the site. Should future works be proposed which involve construction/excavation works into the Made Ground soils, the area of asbestos impacted soils require some form of remediation or additional testing to fully assess the risks associated. - Maintenance workers should be made aware of the presence of asbestos in HP2 Made Ground soils. Should any maintenance works involve excavation works, it is recommended that a reactive strategy be put in place prior to undertaking works. Given the risk of asbestos in shallow Made Ground soils appropriate PPE should be made available to workers and works to be undertaken in conjunction with safe systems of work. - The confirmation of asbestos in Made Ground soils at HP2 should be documented within the sites asbestos register. - The radiological survey report recommends removing and destroying the radiation warning signs on the door of the radiography bay to prevent any misinterpretation that a radiation hazard is present.

1.0 INTRODUCTION

1.1 Instruction

WYG Environment Planning Transport Ltd (WYG) was commissioned by Neath Port Talbot Borough Council to undertake a Ground Investigation and Interpretive Report for a site known as the Former X-Ray, Port Talbot (known hereafter as "the site"). This report should be read in conjunction with the following Desk Top Study (DTS) completed by WYG in June 2019 for the same site WYG, June 2019 Former X-Ray Site, Port Talbot. Phase 1 Geo-Environment Assessment Desk Top Study. A111150-7. Neath Port Talbot Borough Council.

The location of the site is shown on Figure 1.

1.2 Brief

The brief was to undertake an intrusive ground investigation to provide information on the ground conditions and to address the pollutant linkages identified in the WYG Desk Study Report (June 2019) and relevant planning conditions set by Neath Port Talbot County Borough Council (P2019/0159) dated 19 February 2019 to support proposals for the change of use into a heavy goods lorry storage yard with ancillary office accommodation within the existing building.

The investigation was designed to comprise the following elements:

- 1 No. days hand pitting to recover soil samples;
- 1 No. days window sampling to a maximum depth of 3.00m bgl or refusal;
- Installation of shallow ground gas monitoring standpipes;
- On-site inspection and logging of samples;
- Chemical sampling in exploratory holes; and
- Laboratory chemical testing of soils.
- 6 No. return visit to monitor ground gas and groundwater levels.

In addition to the above ground investigation works, a radiological survey of the site was carried out by Radman Associated Limited on 24th September 2019 to confirm the presence or otherwise of radiological contamination owing to the sites former use as an X-Ray Facility.

1.3 Report Scope

This report summarises the work undertaken and includes the following key elements:

- Summary of the previous Desk Top Study undertaken by WYG in June 2019;
- Full factual records of the site works carried out;
- Summary of the ground conditions encountered;
- *In-situ* testing results;
- Environmental laboratory testing results;
- Interpretation of Environmental laboratory data, including a ground contamination risk assessment; and
- An executive summary of the report to allow a rapid, layman's overview.

1.4 Limitations

This report has been prepared in accordance with the requirements of Neath Port Talbot Borough Council. It is subject to the report conditions contained in Appendix A.

The information contained in this report is intended for the use of Neath Port Talbot Borough Council. WYG can take no responsibility for the use of this information by any third party or for uses other than that described in this report or detailed within the terms of our engagement.

2.0 SITE INFORMATION

2.1 Location

The site is located on Cefn Gwrgan Road, Margam, Port Talbot and is adjacent to Harbour Way (A4241). The site is approximately 0.57 hectares (ha) in area and is centred on National Grid Reference (NGR) 278422, 186995.

A site location plan is presented in Figure 1.

2.2 Site description

The site comprises of a disused singly storey brick building within the southern area of the site, an access road along the eastern boundary and an open area of demolition debris covering the surface surrounding a concrete foundation of a building and a gated sub-station. There are several concrete pathways and vegetation surrounding the edges of the site with a bund along the northern edge. A detailed description of the site and surrounding area is presented in the Phase 1 Geo-environmental Desk Top Study (DTS) prepared by WYG for the site.

3.0 SITE SETTING

3.1 Introduction

A Phase 1 Geo-environmental Desk Top Study (DTS) report has previously been prepared by WYG in June 2019. A summary of the key site information gathered as part of the DTS is presented in the following sections, however, the reader should refer to the report for full details including supporting/ referenced information.

3.2 Geology, Hydrogeology and Hydrology

3.2.1 Geology

The DTS reviewed the anticipated geology underlying the site, based on information collated from the British Geological Survey (BGS) Sheet No. 247 (Swansea) Solid and Drift (1:50,000), BGS website, Environmental database (Envirocheck™) and Coal Authority Interactive Mapper.

The geological maps show the site is overlain with 'Landscaped Ground which is detailed as 'Artificially Modified Ground'. Superficial Geology comprises Tidal Flat Deposits (comprising mainly clay, silt and sand) underlain by the South Wales Middle Coal Measures Formation (coal bearing- mudstones/siltstones with seatearths and minor sandstone).

3.2.2 Hydrogeology

The South Wales Middle Coal Measure Formation is designated a Secondary A Aquifer. These are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

The Tidal Flat deposits are classified as a Secondary Undifferentiated Aquifer. This has been assigned in cases where it has not been possible to attribute either a Secondary A or B aquifer to the soil type due to the variable characteristics. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

3.2.3 Hydrology

The nearest surface water feature is a drainage ditch located 1m east of the site running parallel to the eastern boundary of the site. The Upper Mother Ditch river is located approximately 150m south of the site.

3.3 Historical Mining

According to the Coal Authority Interactive Viewer (The Coal Authority, 2019) the site is located within a Coal Mining Reporting Area, however it is not located within a Development High Risk Area.

3.4 Radon

The BRE document 211 (Scivvyer, 2015) mapping coverage for the site area was consulted and indicated that the site is located within an area where no radon protection measures are required for new developments.

3.5 Unexploded Ordnance

Based on freely available mapping data from Zetica UXO (Zetica UXO, 2008), the site is located within a Low Risk Area with regards to Unexploded Ordnance (UXO).

3.6 Site History

The earliest mapping shows the site to be undeveloped fields with a track running along the eastern boundary to the centre of the boundary and two drainage streams running through the centre and southern end of the site between c.1877 and c.1940. In c.1950, a road is shown in the northern area of the site. In c.1960 the site covers part of a development which consists of rows of sheds; approximately 8 of these sheds are within the site boundaries. In c.1964 the sheds have been replaced by an E-shaped building with 5 No. perpendicular rows and standalone building: only a small section of this building is within the site boundary. The site remains relatively unchanged until c.2010. 2019 mapping shows that the E-shaped building is no longer present, leaving only the stand-alone building in the southern area of the site.

3.7 Preliminary Ground Contamination Risk Assessment

The information in the DTS report was collated and evaluated to establish an initial qualitative risk assessment for the site. A conceptual model of the site was generated based on information derived from the Phase 1 Geo-environmental Assessment, supplemented by information attained during the WYG site walkover. The following potential pollutant linkages were identified:

- General contamination associated with Made Ground materials including debris and

demolition stockpiles on site with the potential to impact human health and environmental receptors;

- Potential for ACMs in surface soils associated with Made Ground deposits, demolished building materials, within the existing building and floor slabs;
- Ground gas generation from on-site Made Ground, previous developments, embankments associated with Harbour Way (A4241) and putrescible waste;
- Contamination associated with radioactive material and decay products deposited in former service pit underground indicated on historic plans;
- Potential release of hydrocarbon contaminants to the subsurface from the former fuel storage area; and
- Potential PAH contamination noted from two areas of burnt ground.

3.8 DTS Recommendations

Based on the information within the DTS, the following was recommended to support the planning application and meet the requirements of pre-commencement Planning Condition 3 for the proposed site use:

- This Phase 1 Desk Based Study report should be issued to the Council to discharge pre-commencement condition 3(i);
- The exact location and current status of the cobalt nitrate material buried in a former service duct is not fully understood. Further consultation is required with NRW and subject to the outcome of this stage, investigation by a specialist radiological consultant who will also be able to advise on potential disposal requirements, may also be required;
- Ground investigation of potential sources identified at the site is required to meet the requirements of pre-commencement conditions 3 (ii) & 3 (iii) and should comprise the following:
 - Targeted and non-targeted site investigation to assess identified sources of potential contamination, logging and sampling to assess the variability of soils and assess the depth to bedrock, and assess the nature and extent of potentially contaminated soils;
 - Installation of ground gas and groundwater monitoring wells;
 - Chemical laboratory testing of soils, soil derived leachate for a range of contaminants including heavy metals, polycyclic aromatic hydrocarbons (PAHs), speciated hydrocarbons, VOCs, SVOCs and PCBs;

- Assessment of the likely waste classification of surplus soils with regard to off-site disposal;
- Return visits to monitor ground gas (in line with CIRIA 665 guidance) and groundwater (if encountered);
- An interpretive land quality assessment including development of refined conceptual site model (based on site specific data) and a qualitative risk assessment (compliant with UK CLR guidance and CIRIA 55 methodology) within the context of a commercial land use scenario;
- Subject to the findings of the above ground investigation, there may be a requirement to prepare a Remediation/Reactive Strategy to meet the requirements of pre-commencement conditions 3 (iv) and 4;
- A specialist asbestos consultant should be contacted to undertake a survey of the building before any modifications commence. A survey should also be conducted on the remaining hardstanding cover as well as soft landscape areas where the demolition and debris piles were located; and,
- A second site walkover is recommended to assess the extent of removal of sources of contamination, which may reduce the risks in the risk assessment. However, an asbestos survey will also be required to collect samples and monitor potential loose asbestos remaining on site.

4.0 SITE INVESTIGATION

The site investigation was undertaken on the 23rd and 24th September 2019. Six ground gas monitoring visits were undertaken between 4th October and 8th November 2019.

Details of the fieldwork methods are given in the notes section at the end of this report.

4.1 Scope

The scope of the site investigation initially included the following:

- Second site walkover to confirm that all demolition rubble had been removed and scope out exploratory locations at the site;
- 1 No. day's hand pitting within areas of previous demolition waste and exposed Made Ground to recover soil samples for subsequent laboratory analysis;
- 1 No. day's window sampling (up to 4 no. positions) to a maximum depth of 3.00 metres or refusal within the Made Ground to recover soil samples for analysis and installation of shallow ground gas monitoring installations;
- Logging of exploratory positions by a suitably qualified geo-environmental engineer to BS5930: 2015. Representative soil samples will be taken of each identified soil unit, including Made Ground, at regular intervals;
- 8 No. soil samples and 4 No. leachate samples will be submitted and tested for a general suite of common contaminants including Asbestos Containing Materials (ACMs) and fibres.
- 6 No. return visits to establish baseline ground gas conditions in the Made Ground and to record ground gas levels;
- Accurate surveying of all exploratory positions; and,
- Non-intrusive radiological survey of the disused building and remaining site area.

Figure 2 depicts the layout of the exploratory holes advanced during the site investigation. Exploratory hole logs including photographic plates are presented in Appendix B.



4.2 Variation from original scope

- 5 window sampling positions were undertaken to obtain the third shallow installation. Shallow refusal was noted in all exploratory positions due to obstructions within the Made Ground;
- HP07 could not be completed due to difficult ground conditions (obstructions from ground level); and,
- 3 shallow hand pit samples were obtained from ground level to 0.10m bgl within soils surrounding the building and on the bund at the northern edge of the site to obtain surface soil samples for subsequent laboratory analysis.

5.0 GROUND CONDITIONS ENCOUNTERED

5.1 Strata encountered

Made Ground soils were encountered in all exploratory positions. No natural soils were encountered.

A summary of the depths reached in each of the exploratory positions is presented below in Table 5-1 below, with descriptions of each stratum detailed in the subsequent sections. Exploratory hole logs including photographic plates can also be seen in Appendix B.

Table 5-1 - Summary of strata depths (m bgl) for hand pits and windowless sample boreholes

Location	Depth to base of strata (m bgl)
	Made Ground
HP1	GL – 0.20*
HP2	GL – 0.80*
HP3	GL – 0.80*
HP4	GL – 0.80*
HP5	GL – 0.60*
HP6	GL – 0.30*
HP8	GL – 0.40*
WS01	GL – 1.20*
WS02	GL – 0.50*
WS03	GL – 0.90*
WS04	GL – 0.70*
WS05	GL – 0.90*

*Base of stratum not proven

It should be noted that all exploratory locations terminated on obstructions at depths ranging from 0.20m and 0.90m bgl.

5.1.1 Made Ground

Made Ground was encountered in all locations to a maximum depth of 1.20m bgl and could be split into four distinct layers.

Surface Made Ground comprised of black limestone, tarmacadam and slag gravel, apart from HP8 and WS03 where there was grass growth over the surface layer.

Fill was encountered below surface. This material ranged in composition from silty/clayey gravelly sands with sandstone, concrete, slag, clinker, brick, quartz, limestone, tile and metal fragments; gravelly silty clays with sandstone, quartzite and brick fragments and sandy gravels.

WS05 was the only exception as the stratum was described as sandy ashy gravel of concrete.

Please see exploratory hole logs in Appendix B for full descriptions of each position.

5.2 Groundwater

No groundwater was encountered during the site investigation in any of the exploratory holes.

5.3 Visual or Olfactory Evidence of Contamination

During the site investigation no significant visual or olfactory signs of contamination were identified apart from ACMs found in HP2.

5.4 Radiological Survey

A non-intrusive radiological survey was completed by Radman Associated Limited (Radman) within the existing building and wider site area on 24th September 2019. The full report is attached in Appendix F and a brief summary is provided below.

Cobalt-60 waste was understood to have been buried within a former service pit near to the existing building in c.1990's. The half-life for cobalt-60 is 5.26 years and as a result, the material would have degraded to a point that it would likely to be out of scope of the Environmental Permitting (England and Wales) Regulations 2016 as amended. The radiological survey did not detect the presence of cobalt-60.

Although the absence of any radiologically significant contamination across the entire site cannot be guaranteed the results of the non-intrusive survey, indicate a low risk of such contamination being present on site. However, should construction works be planned in the future, it is recommended that a watching brief be maintained for any signs of radiological contamination.

6.0 LABORATORY TESTING

6.1 Environmental Testing

Environmental chemistry was investigated by specialist chemical analysis of selected soil samples carried out by ALS Environmental Laboratories, an approved supplier in accordance with the requirements of WYG's quality system and UKAS and MCERTS accredited for a range of chemical analyses. The testing was scheduled by WYG and is summarised in Table 6-1 for soil samples. The test results are included in Appendix C.

Table 6-1- Summary of Environmental Testing (Soil)

Test suite	No.
Soil Analysis	
- Metals and Metalloids – including Chromium (Hexavalent), Boron (water soluble), Arsenic, Barium, Beryllium, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Vanadium and Zinc; - Inorganics – including pH, Sulphate (total), Cyanide (free); - Total Petroleum Hydrocarbons (TPH CWG) including MTBE and BTEX; - Speciated Polyaromatic Hydrocarbons (USEPA 16); - Asbestos screen; and, - Phenol.	12
Leachate Analysis	
- Dissolved Metals – including Mercury, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Copper, Lead, Nickel, Selenium, Vanadium and Zinc; - Inorganics – including pH, Sulphate, Cyanide (total) and Thiocyanate; - Total Petroleum Hydrocarbons (TPH CWG); - Speciated Poly Aromatic Hydrocarbons (PAHs); - Organic Carbon; and, - Phenol.	4

7.0 GROUDWATER & GAS MONITORING

7.1 Groundwater Monitoring

Groundwater levels were monitored on 6 no. occasions between 4th October and 8th November 2019.

Each shallow installation was dipped using an electronic product dip meter to determine the depth to groundwater and presence of any light non-aqueous phase liquids (LNAPL) or dense non-aqueous phase liquids (DNAPL) in all monitoring boreholes. The depth to the base of each installation was also measured during each visit.

The monitoring data is presented in Appendix D and summarised in Table 7-1 below.

Table 7-1- Summary of groundwater levels monitoring

Location	Base of borehole (m bgl)	Date					
		4 th October	11 th October	18 th October	25 th October	1 st November	8 th November
WS01	1.20	DRY	DRY	DRY	DRY	DRY	DRY
WS03	0.81	0.48*	0.47	0.46	0.50	0.55	0.1
WS05	0.86	DRY	DRY	DRY	DRY	DRY	DRY

*Groundwater level initially measured at 0.13m bgl causing water ingress into gas meter during first visit. Water purged from borehole before gas monitoring was undertaken.

As show above in Table 7-1, shallow groundwater was recorded to be present in WS03 and absent in the other two installations over the monitoring rounds. Water present in this installation is considered to be perched groundwater level in the Made Ground soils rather than an indication of the underlying groundwater table.

7.2 Ground Gas Monitoring

Ground gas monitoring was undertaken between 4th October and 8th November over 6 No. separate monitoring visits. Gas monitoring has been undertaken within the shallower, window sample holes which are screened within the underlying Made Ground deposits.

Groundwater was purged from WS03 on each of the visits with the exception of Round no. 4 (25th October 2019) prior to recording gas concentrations. As a result, these concentrations are unlikely to be fully representative of the gas concentrations in the Made Ground.

The monitoring data is summaries in Table 7-2 and presented in full in Appendix D.

Table 7-2 – Summary of Ground Gas monitoring

Location	Max. Methane (peak) (% vol)	Max. Carbon Dioxide (peak) (% vol)	Min. Oxygen (steady) (% vol)	Max. Carbon Monoxide (steady) (ppm)	Max. Hydrogen Sulphide (steady) (ppm)	Max. Borehole flow (peak) (l/h)
WS01	0.1	1.0	18.6	<1	<1	0.1
WS03	0.1	0.8	21.6	<1	<1	0.1
WS05	0.1	0.1	21.4	<1	<1	0.2

The results indicate measurable low concentrations of carbon dioxide (maximum of 1.0%/vol) and methane (maximum 0.1%/vol).

Concentrations of carbon monoxide and hydrogen sulphide were recorded below the limit of detection (<1.0 ppm) in all exploratory holes on all occasions. The maximum recorded gas flow recorded across the monitoring rounds was a flow of 0.2l/hr, recorded in WS05 during monitoring round 6.

The monitoring rounds were undertaken during atmospheric pressure conditions ranging from 997mb to 1011mb. The monitoring visits on the 1st November (997mb) was undertaken during the lowest pressure reading. A review of atmospheric pressure graphs on weatheronline.co.uk [accessed 11 November 2019] indicates that the monitoring rounds were undertaken during a period of generally falling pressure regimes. This gives us a worst-case ground gas scenario.

8.0 GROUND CONTAMINATION ASSESSMENT- HUMAN HEALTH

8.1 Introduction

The UK Contaminated Land Regime (CLR) allows for a tiered approach to the assessment of ground contamination which is designed to allow increasingly site-specific assessment. In order to assess the potential risk posed by contaminants contained within the soils at the study area a generic quantitative risk assessment (gQRA) has been undertaken by comparing recorded concentrations of chemical constituents in soil with Generic Assessment Criteria (GAC) to identify whether, at the concentrations recorded, the presence of the constituent has the potential to adversely affect the health of site users (a Tier 1 assessment). GAC are set at levels where potential exposure is deemed to be within acceptable limits.

If the recorded concentrations of a particular constituent are below the GAC then the risk is generally considered to be acceptable and further assessment / or mitigation measures are not required. Where a substance is recorded at concentrations higher than GAC this does not necessarily indicate that a particular risk is present, however, it does typically signify the requirement to undertake further assessment in line with the UK tiered risk assessment framework.

8.2 Assessment Criteria

8.2.1 Generic Assessment Criteria

The following GAC for soils have been utilised for the screening process, in order of preference:

- CL:AIRE published C4SL (DEFRA, 2014);
- CIEH/LQM published S4UL (LQM/CIEH, 2015);
- WYG internal Tier 1 Screening Criteria (issue 15) derived using the derivation tool CLEA version 1.06, in line with the current UK Contaminated Land Regime.

C4SL are currently available for arsenic, benzene, benzo(a)pyrene, cadmium, chromium VI and lead¹. The C4SL were originally developed to support the categorisation of sites in accordance with Part 2A are also, based on DEFRA guidance, considered suitable for use during the assessment of sites as part of the planning process.

¹ Arsenic, benzene, benzo(a)pyrene, cadmium, chromium VI, lead assuming 6% SOM (1% SOM C4SL also published for benzene).

Where C4SLs are not available, 'Suitable for Use Levels' (S4UL) developed by CIEH/LQM have been used. The S4UL provide GAC based on minimal or tolerable risk intended to be protective of human health for individual or mixtures of substances. It is considered conservative and appropriate to use these values for contaminants for which C4SL are unavailable. GAC for volatile and semi-volatile organic compounds (VOC and SVOC) not presented in the S4UL document are sourced from CL:AIRE (CL:AIRE, January 2010).

Where no published screening values are available WYG have derived their own values (easily liberatable cyanide).

The CLEA model states that "For most exposure pathways, the contamination is assumed to be at or within one metre of the surface" (Environment Agency, 2009). It is considered that at depths greater than 1.0m, the probability of human exposure via the direct contact pathways are significantly reduced, leaving inhalation of volatile compounds as the dominant pathway with regard to human health risks. Typically, volatile compounds only significantly affect the indoor inhalation pathway. The same screening concentrations have been used for all depths at this stage, though it is noted that these are highly conservative for depths below 1.00m bgl.

8.2.2 Proposed End Use

Screening criteria have been developed for the following land use scenarios:

- Residential with plant uptake;
- Residential without plant uptake;
- Allotments;
- Public open space (park and residential);
- Commercial / Industrial.

The proposed development on site will be utilised for the purposes of a goods lorry storage yard with ancillary office accommodation within the existing building in the southern area of the site, with no major redevelopment or construction works. As such, the assessment has been undertaken with respect to a commercial/industrial end use scenario.

8.2.3 Soil Organic Matter

For organic contaminants, the generic soil screening values have been derived for a range of concentrations of soil organic matter (1%, 2.5%, 6%). In order to provide a conservative assessment, the GAC derived for a 1% SOM have been adopted.

8.3 Tier 1 – Soil Screening

A total of 12 soil samples collect from across the site were submitted for chemical laboratory analysis. Full copies of laboratory certificates of all soil analysis are included as Appendix C.

Comparison of the chemical analysis results with the generic assessment criteria for a commercial/industrial end use has identified 3no. exceedances with respect to the relevant screening criteria, as summarised in Table 8-1.

Table 8-1 - Summary of potential contaminants of concern for commercial/industrial end use

Determinant	Max	Min	Screening Value (residential with plant uptake)	No. of Exceedances
pH	12.70	7.97	<5, >9	1: HP3 0.60-0.70m 2: WS05 0.20-0.30m 3: WS05 0.60-0.70m

The exceedances were recorded within samples obtained at HP3 and WS05. The elevated (alkaline) pH readings are likely to be associated with limestone fragments noted to be present in the Made Ground deposits across the site. HP3 and WS05 are located within areas of previous demolition surrounding the southern edge of the building foundation towards the centre of the site.

8.4 Tier 1- Asbestos Screening

A total of 12no. soil samples were submitted to the laboratory for analysis of asbestos identification. The laboratory results indicated the presence of asbestos fibres in HP2 at 0.20-0.30m sampled from shallow Made Ground. The sample was further scheduled for quantification using a combination of gravimetric and phase contract optical microscopy (PCOM) methods. The results of the quantification indicated that the concentration of asbestos within the sample was 3.07%.

9.0 GROUND CONTAMINATION ASSESSMENT – WIDER ENVIRONMENT

9.1 Introduction

The potential for contaminated groundwater on site to adversely affect controlled water receptors (groundwater and surface water bodies) has been assessed at this stage by direct comparison of analytical data from the WYG ground investigation with relevant Water Quality Standards (WQS).

Similarly, the potential for soil contamination to impact controlled waters has been assessed by comparing analytical data from soil derived leachate tests directly against WQS.

9.2 Assessment Criteria

A drainage ditch is located along the eastern boundary of the site. In light of the environmental setting of the site under consideration, the following water quality standards have been adopted, in order of preference:

- Environmental Quality Standards (EQS);²
- WHO 2008 - Petroleum Products in Drinking Water (WHO 2008); and,
- UK Drinking Water Standards³.

9.3 Tier 1 Screening Assessment – Soil Derived Leachate

Soil derived leachate samples can be used to identify potentially mobile contamination within soil samples collected from the site. It should be noted that the laboratory preparation of leachate samples is likely to produce higher concentrations of leachable components than conditions encountered on site, as such the following assessment is considered to be inherently conservative in nature.

² Where WFD 2015 are not presented revoked WFD 2010 standards are used instead.

³ WHO 2005; WHO 2008; UK Water Supply Regulations 2010 and 1989 Regulations. Priority given to UK drinking water standards – The Water Supply (Water Quality) Regulations 2016.

Four soil derived leachate samples were screened against a suite of determinants outlined in Section 9.2. The results have been screened against the assessment criteria outline in Section 9.2. Full copies of laboratory certificates for all leachate analysis are included as Appendix C.

Table 3 – Summary of Exceedances within Soil Derived Leachate Samples

Determinant	Units	Maximum	Minimum	Screening Value	Exceedances	
					No.	Location
Arsenic	µg/l	1.06	0.127	1.0	1	HP5
Copper	µg/l	0.53	0.299	0.1	4	HP3, HP5, SHP3, WS02
Zinc	µg/l	1.25	<0.1	1.09	1	WS02

The table above indicates there are a limited number of contaminants which exceed the assessment criteria. Exceedances of the metals copper and zinc were further screened using the Metal Bioavailability Assessment Tool (M-BAT). All values returned a low bioavailable concentration (µg/l) (maximum 0.05 for Copper and maximum 0.45 for Zinc) and therefore were below the relevant EQS values. The recorded calcium carbonate (CaCO₃) concentration from the leachate analysis was assumed to be the calcium concentration for the purposes of the M-BAT assessment.

The elevated concentrations in the soil derived leachate samples are generally considered to be marginal to the relevant screening criteria and given the conservative nature of the laboratory testing, M-BAT assessment and nature of the surrounding area, they are not considered to reflect a significant source of contamination. A table showing the results of the M-BAT assessment tool is shown in Appendix C.

9.4 Tier 1 Screening Assessment – Groundwater

No groundwater samples were obtained from the site.

10.0 GROUND GAS ASSESSMENT

10.1 Introduction

Six return ground gas monitoring visits were undertaken between the 4th October and 8th November 2019. Full factual site records of the gas monitoring results are presented in D and presented in Section 7.2.

10.2 Land Gas Risk Assessment Methodology

The key reference document which has been used to undertake the semi-quantitative land gas assessment presented in this report is CIRIA C665⁴. This provides a framework for assessment of land gas risk to buildings/structures with foundations (i.e. houses and/or commercial properties).

The collected data has been used for the purposes of undertaking a semi-quantitative assessment in accordance with the CIRIA 665 methodology. The calculation used to calculate the gas screening value (GSV) for the site, together with the relevant definition of units, is as follows:

$$\text{GSV (litres of gas/hr)} = \text{borehole flow rate (l/hr)} \times \text{gas concentration (volume/100)}$$

10.3 Preliminary Ground Gas Risk Assessment

10.3.1 Source potential

The site is underlain by Made Ground soils to an unknown depth (up to 1.2m recorded, no natural soil were encountered) across all exploratory hole locations. Made Ground soils are considered to represent a potential source of ground gas generation. It is not known whether ground gas protection measures are installed within the existing site building. Therefore, ground gas monitoring has been undertaken in 3 shallow ground gas monitoring installation to confirm requirement for ground gas protection measures within the building.

10.3.2 Risk Assessment

In order to assess the significance of ground gases at the site, measured concentrations and flow rates have been used to derive Gas Screening Values (GSVs). GSVs are the product of gas concentration and gas flow measured in a borehole and provide an indication of the flow of the

⁴ CIRIA C665, Assessing Risks Posed by Hazardous Ground Gases to Buildings. 2007

particular gas in question out of the ground.

Based on a maximum flow recorded of 0.2l/hr and the maximum recorded concentration of carbon dioxide (CO₂) and methane (CH₄) during the six monitoring visits, the GSVs have been calculated as presented in Table 10-1.

Table 10-1 – Initial GSV Calculations

	Maximum Concentration (%)	Maximum Flow Rate (l/hr)	GSV (l/hr)	Characteristic Situation (Wilson and Card)
Carbon Dioxide	1.0	0.2	0.04	1 (Very Low Risk)
Methane	0.1	0.2	0.0002	1 (Very Low Risk)

These values have been compared with the Revised Wilson and Card Classification presented within the CIRIA C665 (2007) report, specifically Table 8.5. The Characteristic values presented above reflect a risk assessment designed for the majority of building types with the exception of low-rise residential buildings which are covered by the NHBC Traffic light system which is specifically designed for residential properties.

10.4 Summary and Discussion

The site has been classified as Character Situation 1 (Very Low Risk) based on consistently low concentrations of carbon dioxide and methane, coupled with low borehole flow rates. Site classification of a Characteristic Situation 1 indicates no requirement for special protection measures for new developments.

Based on the above assessment, there are no ground gas protection measures required. Furthermore, the site is also located within a low risk area with respect to radon.

11.0 SITE CONCEPTUAL MODEL AND GROUND CONTAMINATION RISK ASSESSMENT

11.1 Introduction

In general, ground contamination can occur through several causes, particularly from historical operations and activities. Contamination can result from either on-site sources or from on-site migration from off-site sources, leading to long term liabilities under recent legislation for any site owner.

The Environmental Protection Act 1990 (Part IIA) makes provisions for a risk-based framework for the identification, assessment, management and redevelopment of contaminated land within the UK. The provisions of the Act came into effect in England and Wales in July 2001 and are aimed at ensuring that actions taken with respect to contaminated land are directed by a technically well-founded assessment of risk.

The process of risk assessment is an evaluation of the probability of harm, and comprises the identification of sources of contamination, receptors that may be affected by the contamination and pathways by which the receptors may be harmed forming a pollution linkage. The site conceptual model (presented below) forms the basis for the qualitative assessment of ground contamination risks associated with the site.

11.2 Site Conceptual Model

The conceptual model for the site reflects the findings and observations during the site investigation. The key source, pathway, receptor model is outlined below within the context of the anticipated future development on the site.

11.2.1 Sources

The following sources of potential contamination have been considered in the risk assessment below:

- General contamination associated with Made Ground soils on site;
- Potentially mobile contamination within Made Ground soils;
- Presence of ACM within HP2 at 0.20m bgl;
- Ground gas sources within Made Ground; and,

- Radiological contamination associated with historic use of site.

11.2.2 Pathways

The primary pathways by which sensitive receptors may come into contact with ground contamination are considered to be the following:

- Direct dermal contact or ingestion of soils, or inhalation of dust (i.e. human interaction with surface and sub-surface materials);
- Disturbance of potential asbestos impacted soils and subsequent inhalation of asbestos fibres;
- Leaching and horizontal or vertical migration through the unsaturated ground, whether through permeable sub-surface materials and/or preferential pathways;
- Lateral and vertical migration of groundwater through permeable sub-surface materials and/or preferential pathways;
- The migration and accumulation of ground gases or vapours through permeable sub-surface materials and/or preferential pathways.

11.2.3 Receptors

The following are considered to be sensitive receptors:

- Maintenance workers;
- Future Site Users;
- Groundwater within underlying Secondary A Aquifer;
- Surface waters of the drainage feature along the eastern boundary.

11.3 Ground Contamination Risk Assessment Table

The pollution linkages and a qualitative risk assessment are presented in the table below. The risk assessment considers the site within an area context and assesses potential risks to identified receptors in relation to the existing site setting and the proposed development. CIRIA C552 has been used to define the risk rating presented in the Qualitative Risk Assessment matrix, methodology for which is presented in Appendix F.



Table 11-1 - Ground Contamination Assessment Risk Table

Source	Pathway	Receptor	Consequence of risk being realised	Probability of risk being realised	Risk Classification	Potential risk management requirements
General contamination associated with Made Ground on site	Direct dermal contact or ingestion	Future site users	Medium	Unlikely	Low Risk	The soil laboratory results have not indicated the presence of contaminants of concern in excess of their GAC with the exception of alkaline pH>9 in HP3 and WS05. This can be attributed to the limestone gravel content within the samples. Therefore, the risk to human health is considered to be low.
		Maintenance workers		Unlikely	Low Risk	
	Leaching and horizontal or vertical migration	Groundwater (Secondary A Aquifer)	Medium	Unlikely	Low Risk	The laboratory results of the soil derived leachate testing have indicated only a limited number of exceedances of PAH compounds. Given the conservative nature of the assessment and further M-BAT assessment on the metals, the risk to groundwater and surface waters is considered to be low.
		Surface waters (drainage feature)		Unlikely	Low Risk	



Source	Pathway	Receptor	Consequence of risk being realised	Probability of risk being realised	Risk Classification	Potential risk management requirements
ACM within shallow Made Ground on site.	Inhalation of fibres	Future site users	Medium	Low	Moderate / Low Risk	Loose fibres of chrysotile asbestos have been identified in HP02 at 3.07% below 0.20m bgl. Potential for further ACMs to be present within Made Ground soils at this locality. The site is to be used for the commercial end use involving storage for lorry vehicles. No redevelopment / construction works are planned at this stage. The asbestos fragment identified in the pit was located beneath a layer of coarse gravel (0.20m thickness). This coarse gravel layer breaks the exposure pathway to future site users as long as this layer remains in place. This risk assessment should be updated prior to the start of any future works which involve excavation works or removal of this coarse gravel layer.



Source	Pathway	Receptor	Consequence of risk being realised	Probability of risk being realised	Risk Classification	Potential risk management requirements
		Maintenance workers	Medium	Low	Moderate / Low Risk	No redevelopment / construction works are proposed for the site at this stage. Potential for exposure to maintenance workers should works involve excavation into Made Ground soils in vicinity of HP2. A record should be kept indicating presence of asbestos in shallow soils in vicinity of HP2 and potential for further asbestos in shallow Made Ground soils. Given the potential for asbestos to be present in Made Ground soils, appropriate PPE should be made available should works involve excavation of soils. This should be undertaken in conjunction with safe systems of work. This risk assessment should be updated prior to the start of any future works which involve redevelopment or excavation works.
Ground gas generation associated with Made Ground	Inhalation of gases	Future site users	Medium	Unlikely	Low Risk	The results of the ground gas monitoring undertaken across the site indicates that the site is categorised as Characteristic Situation 1 under the Wilson and Card classification presented in CIRIA 665. This does not require the installation of gas protection measures for new developments.
		Site construction workers	Medium	Unlikely	Low Risk	

Former X-Ray Site, Port Talbot- Interpretive Ground Investigation Report



Source	Pathway	Receptor	Consequence of risk being realised	Probability of risk being realised	Risk Classification	Potential risk management requirements
Radiological contamination associated with buried Cobalt Nitrate	Direct dermal contact, ingestion of soils and inhalation of dusts or vapours	Future site users	Medium	Low likelihood	Moderate/ Low Risk	The radiological survey report indicates there is a low risk of any radiologically significant contamination across the entire site. Given the plans to refurbish the existing building and not develop the entire site, the risk to construction workers and future occupiers is deemed to be negligible. A watching brief during groundworks for any signs of potential radiological contamination is recommended.
		Maintenance workers	Medium	Low likelihood	Moderate/ Low Risk	
	Contaminant leaching and lateral/ vertical migration	Secondary A Aquifer	Medium	Unlikely	Low Risk	

12.0 CONCLUSIONS AND RECOMMENDATIONS

12.1 Ground Contamination

12.1.1 Ground Contamination

The site is underlain by Made Ground to a maximum proven depth of 1.20m, consisting of a mixture of lithologies including tarmacadam, concrete, ash and brick. Laboratory testing has not indicated any potential contaminants of concerns (except pH in two samples) at concentrations in excess of the relevant screening criteria for a commercial end use.

Asbestos (chrysotile) fibres were identified within one sample from the Made Ground (HP2 below 0.20m bgl). Asbestos was not identified to be present in the other eleven samples submitted for laboratory analysis.

A limited number of potential contaminants of concern have been identified with soil derived leachate samples. However, given the conservative nature of the laboratory testing procedures and the further screening using the M-BAT tool for the metal exceedances, the exceedances are not considered to pose a significant risk to the wider environment.

12.1.2 Radiological Contamination

The radiological survey report indicates there is a low risk of any radiologically significant contamination across the entire site. Given the plans to refurbish the existing building and not develop the entire site, the risk to construction workers and future occupiers is deemed to be negligible. A watching brief during groundworks for any signs of potential radiological contamination is recommended.

12.1.3 Ground Gas

Ground gas monitoring from six visits has recorded low concentrations of carbon dioxide and methane coupled with low flow rates. Monitoring was undertaken during periods of both low and falling atmospheric pressures and monitoring data is therefore considered to have been undertaken during worst case conditions.

The site is therefore classified as Characteristic Situation 1 whereby gas protection measures are not considered necessary in new developments.

Radon protection measures are not considered necessary.

12.2 Recommendations

Based on the findings of this report, the following recommendations are outlined:

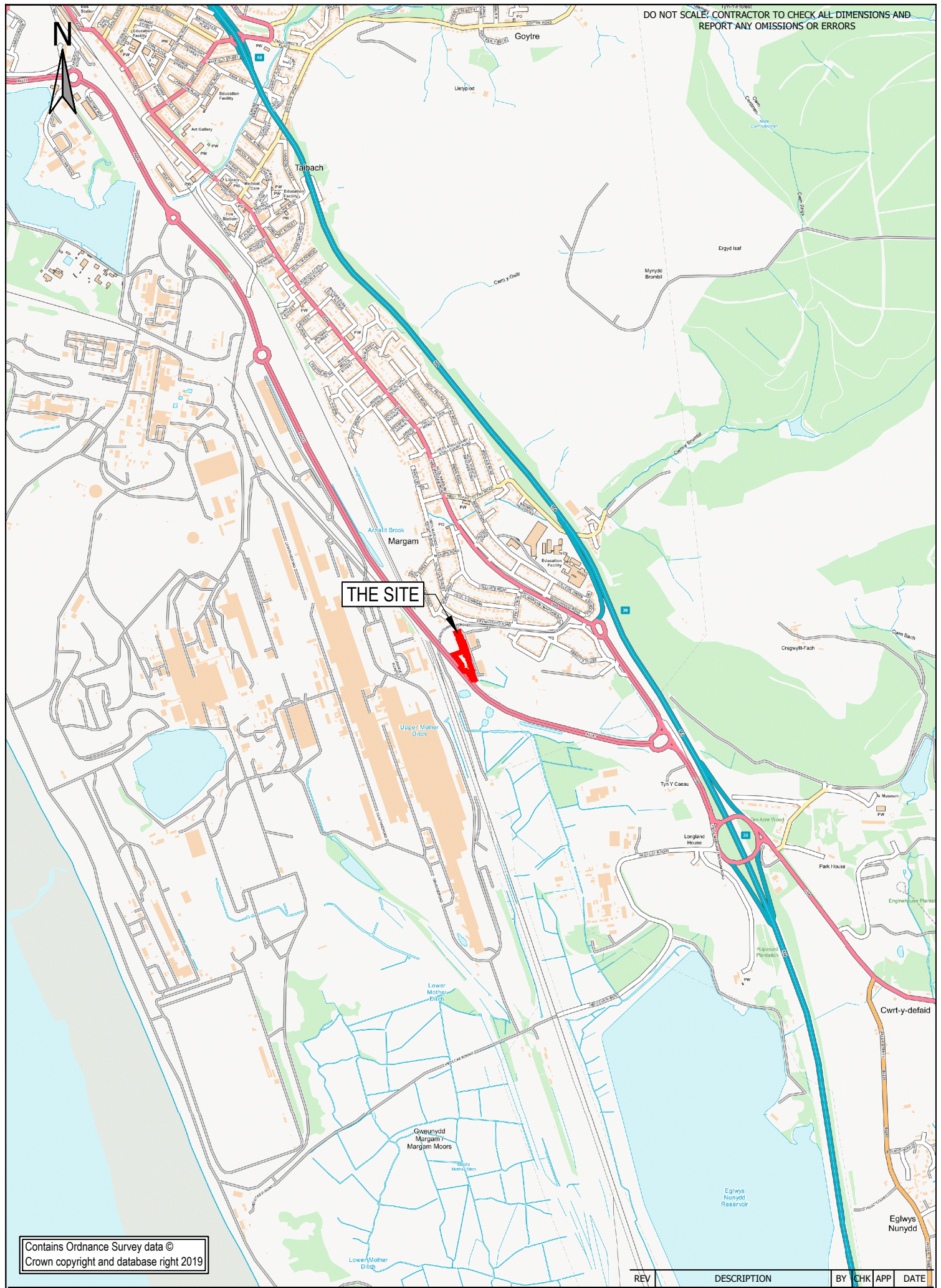
- Asbestos was encountered in one sample obtained from HP2 at 0.20m bgl. The presence of coarse gravel and areas of concrete hardstanding which breaks the pollutant linkage between site users and the risk from ingestion, inhalation and dermal contact with asbestos impacted soils. No redevelopment or excavation works are proposed at the site. Should future works be proposed which involve construction/excavation works into the Made Ground soils, the area of asbestos impacted soils require some form of remediation or additional testing to fully assess the risks associated.
- Maintenance workers should be made aware of the presence of asbestos in HP2 Made Ground soils. Should any future maintenance works involve excavation works, it is recommended that a reactive strategy be put in place prior to undertaking works. Given the risk of asbestos in shallow Made Ground soils appropriate PPE should also be made available to workers and works to be undertaken in conjunction with safe systems of work.
- The confirmation of asbestos in Made Ground soils at HP2 should be documented within the sites asbestos register.
- The radiological survey report recommends removing and destroying the radiation warning signs on the door of the radiography bay to prevent any misinterpretation that a radiation hazard is present.



FIGURES



FIGURE 1 – SITE LOCATION PLAN



DO NOT SCALE: CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ANY OMISSIONS OR ERRORS

THE SITE

Contains Ordnance Survey data ©
Crown copyright and database right 2019

5th FLOOR
LONGCROSS COURT
47 NEWPORT ROAD
CARDIFF
CF24 0AD
TEL: +44 (0)29 2082 9200
e-mail: cardiff@wyg.com



Client:
**NEATH PORT TALBOT
BOROUGH COUNCIL**

Project: A111150-7
**FORMER X-RAY SITE
PORT TALBOT**

Drawing Title:
SITE LOCATION PLAN

Scale @	A4	Drawn	Date	Checked	Date	Approved	Date
1:20,000	CM	24.05.19					
Project No.	Office	Type	Drawing No.	Revision			
A111150-7	CDP	N	01				

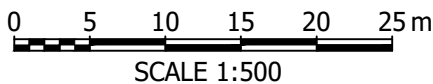


FIGURE 2 – EXPLORATORY LOCATION PLAN



KEY

-  HAND DUG PIT
-  SHALLOW HAND PIT
-  WINDOW SAMPLE
-  INSTALLATION



REV	DESCRIPTION	BY	CHK	APP	DATE
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Client:
NEATH PORT TALBOT CBC

5th FLOOR
LONGCROSS COURT
47 NEWPORT ROAD
CARDIFF
CF24 0AD

TEL: +44 (0)29 2082 9200
e-mail: cardiff@wyg.com



Project: A11115-7-1
FORMER X-RAY SITE

Drawing Title:
EXPLORATORY HOLE LOCATION PLAN

Scale @ A3 1:500	Drawn CM	Date 25.10.19	Checked	Date	Approved	Date
Project No. A111150-7-1	Office CDF	Type N	Drawing No. 02		Revision	



APPENDICES



APPENDIX A – REPORT CONDITIONS



APPENDIX A - REPORT CONDITIONS GEO-ENVIRONMENTAL DESK TOP REVIEW

This report is produced solely for the benefit of Neath Port Talbot Borough Council and no liability is accepted for any reliance placed on it by any other party unless specifically agreed in writing otherwise.

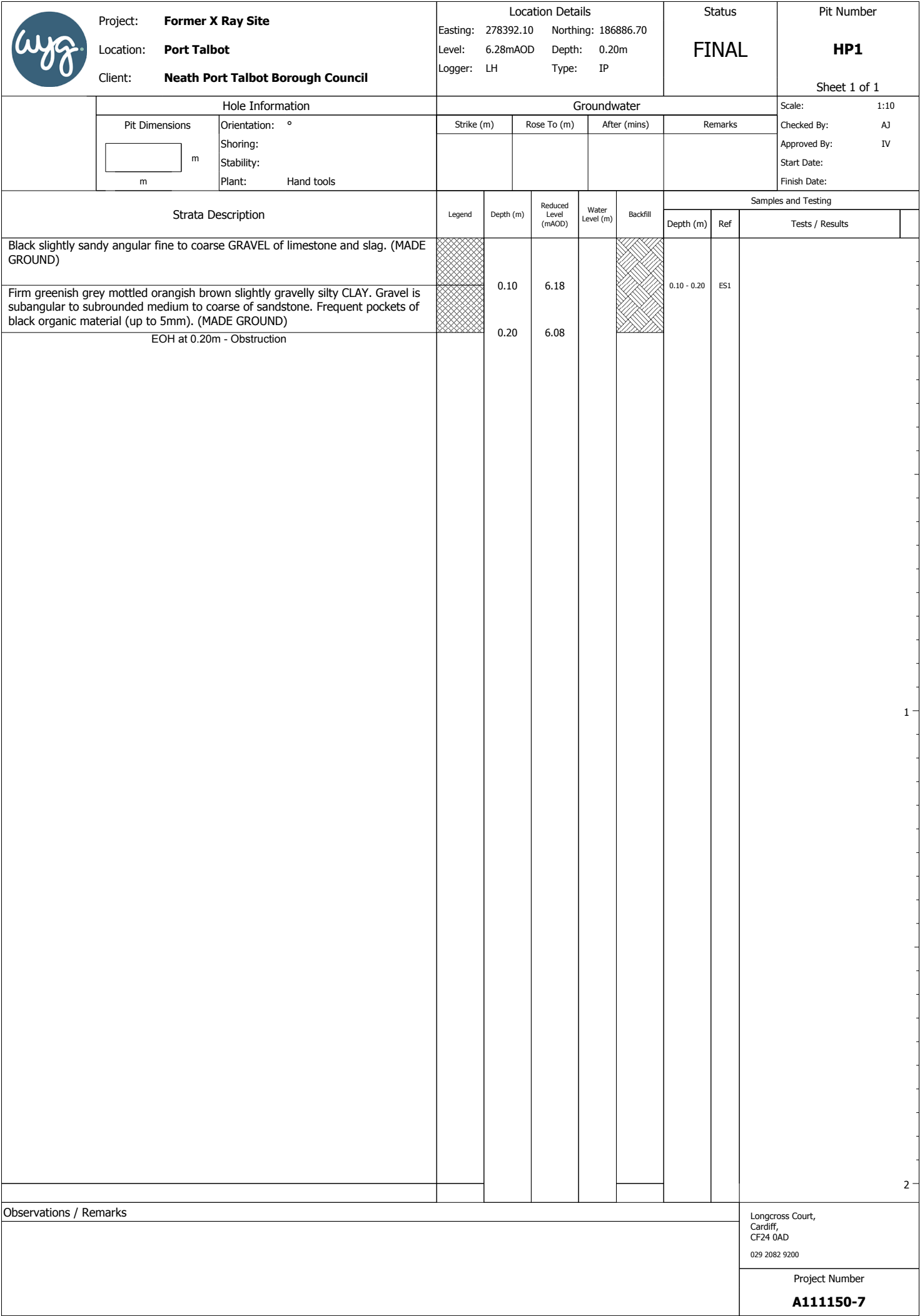
This report refers, within the limitations stated, to the condition of the site at the time of the inspections. No warranty is given as to the possibility of future changes in the condition of the site.

This report is based on a study of readily accessible referenced historical records. Some of the opinions are based on unconfirmed data and information and are presented in good faith without exhaustive clarification. Where ground conditions are discussed but no physical site test results are available to confirm this, the report must be regarded as initial advice only, and further assessment should be undertaken prior to detailed activities related to the site. Where test results undertaken by others have been made available these can only be regarded as a limited sample.

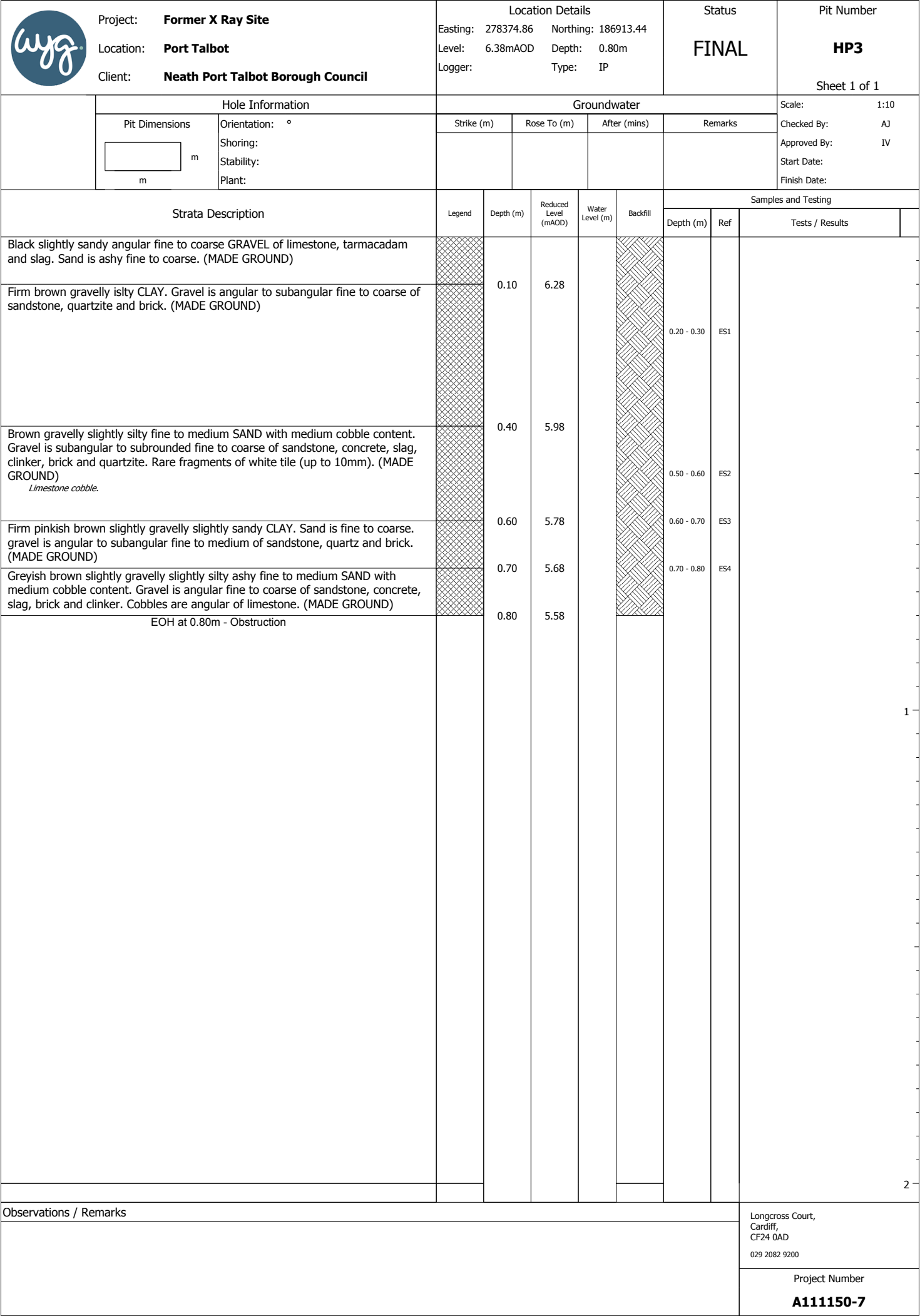
Whilst confident in the findings detailed within this report because there are no exact UK definitions of these matters, we are unable to give categorical assurances that they will be accepted by Authorities or Funds etc. without question, as such bodies may have unpublished, often more stringent objectives. This report is prepared for the proposed uses stated in the report and should not be used in a different context without reference to WYG. In time improved practices or amended guidance may necessitate a re-assessment. The opinions expressed cannot be absolute due to the limitations of time and resources within the context of the agreed brief and the possibility of unrecorded previous use and abuse of the site and adjacent sites. The report concentrates on the site as defined in the report and provides an opinion on surrounding sites.

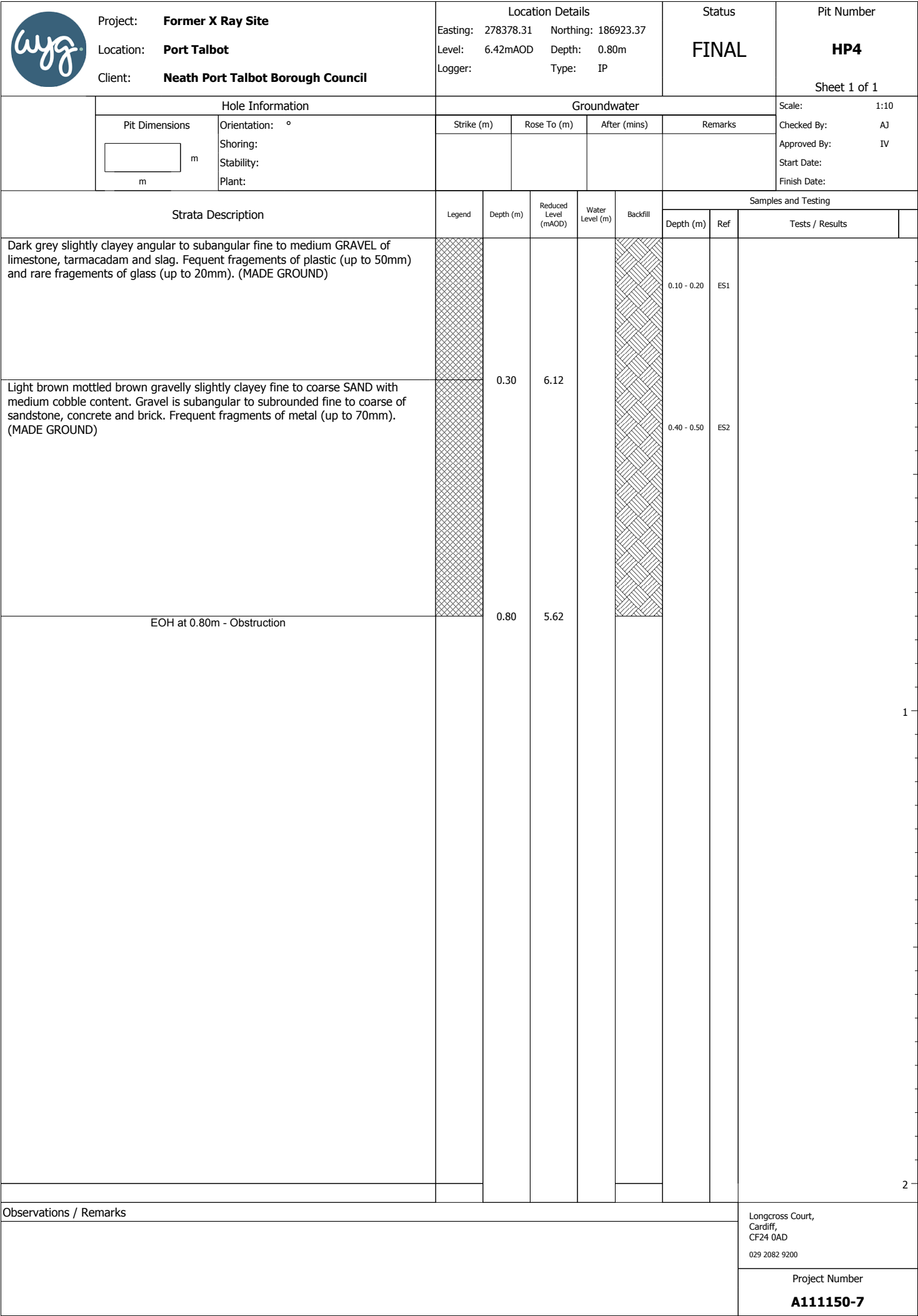


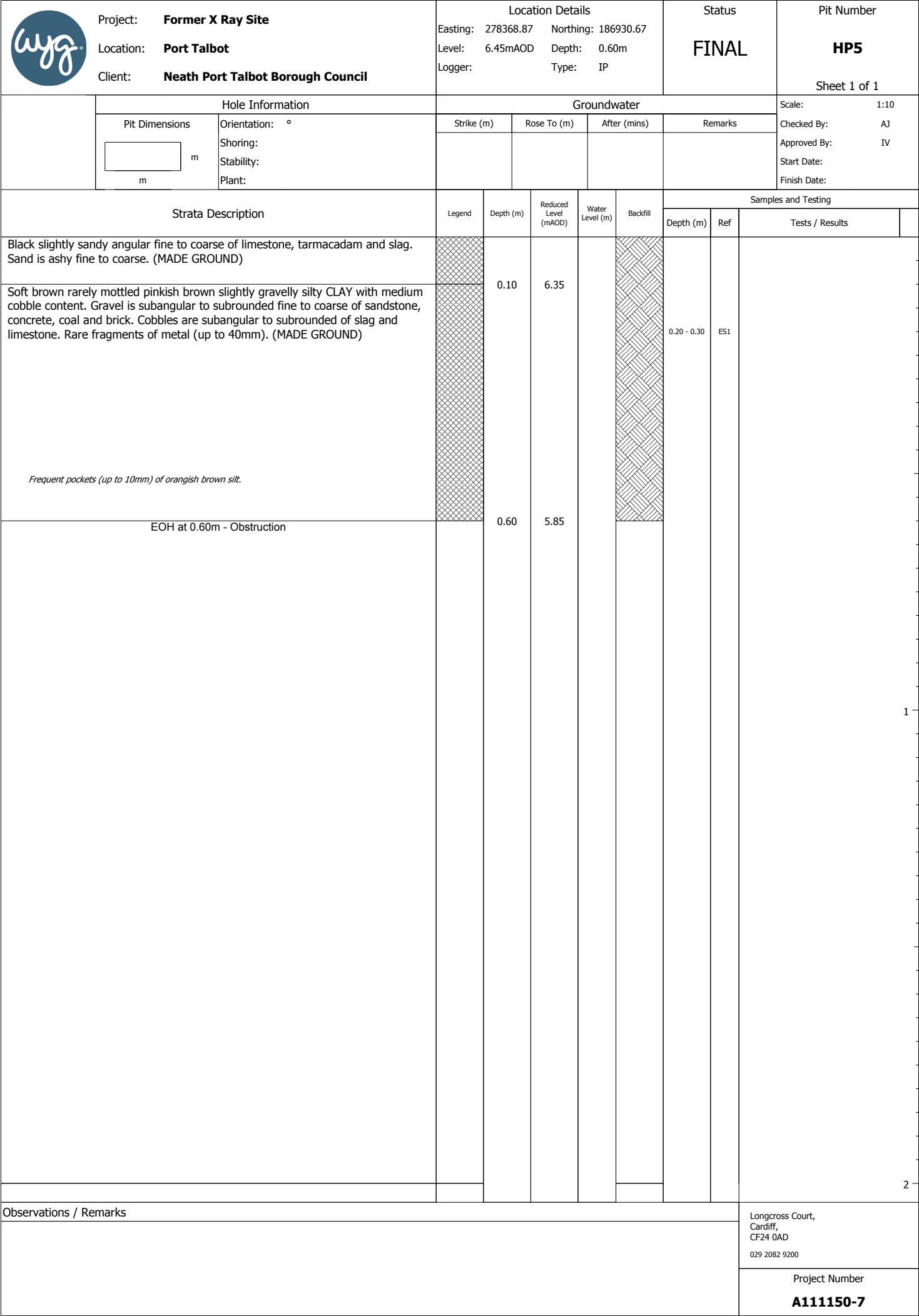
APPENDIX B – EXPLORATORY HOLE LOGS AND PHOTOGRAPHIC PLATES

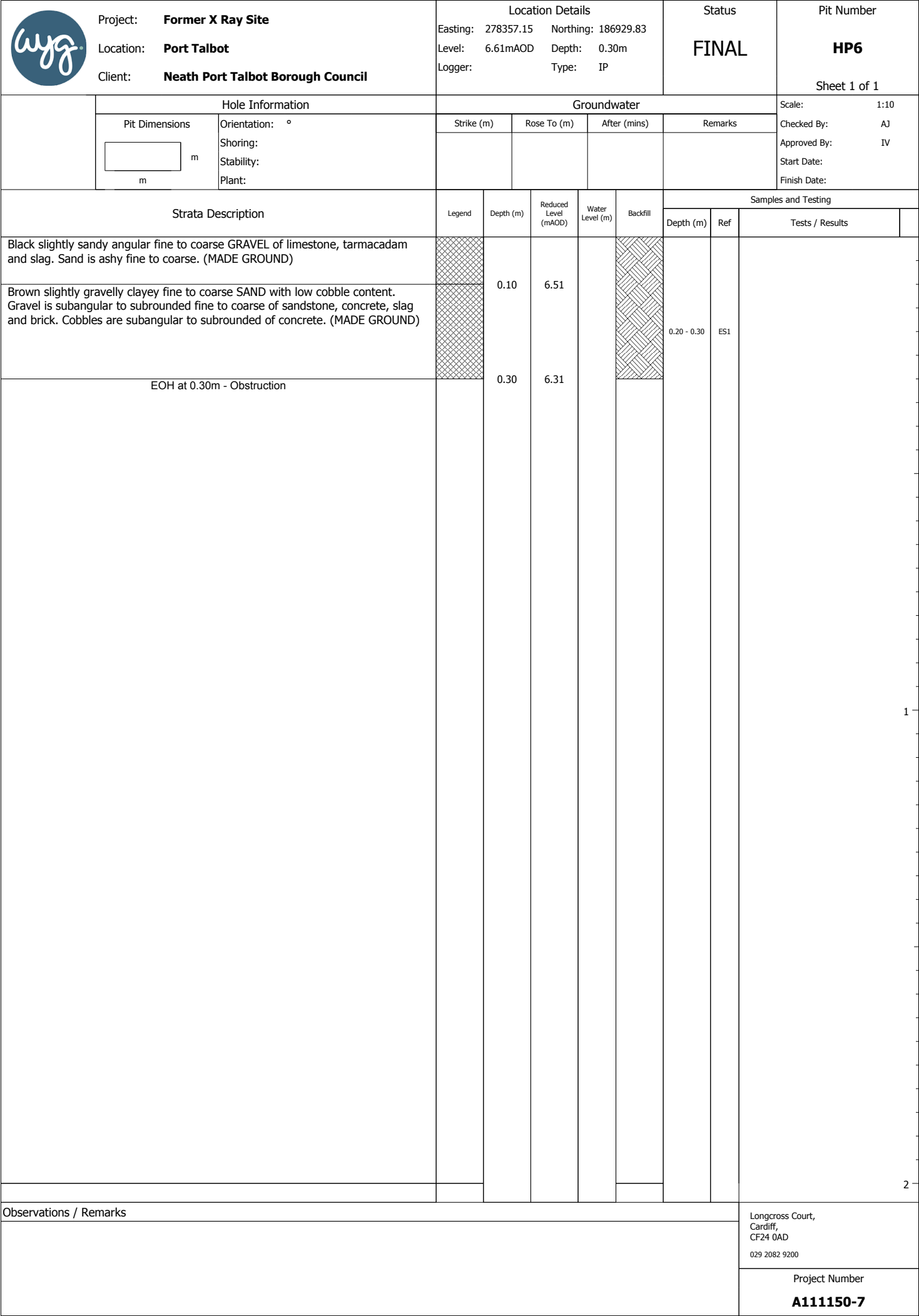


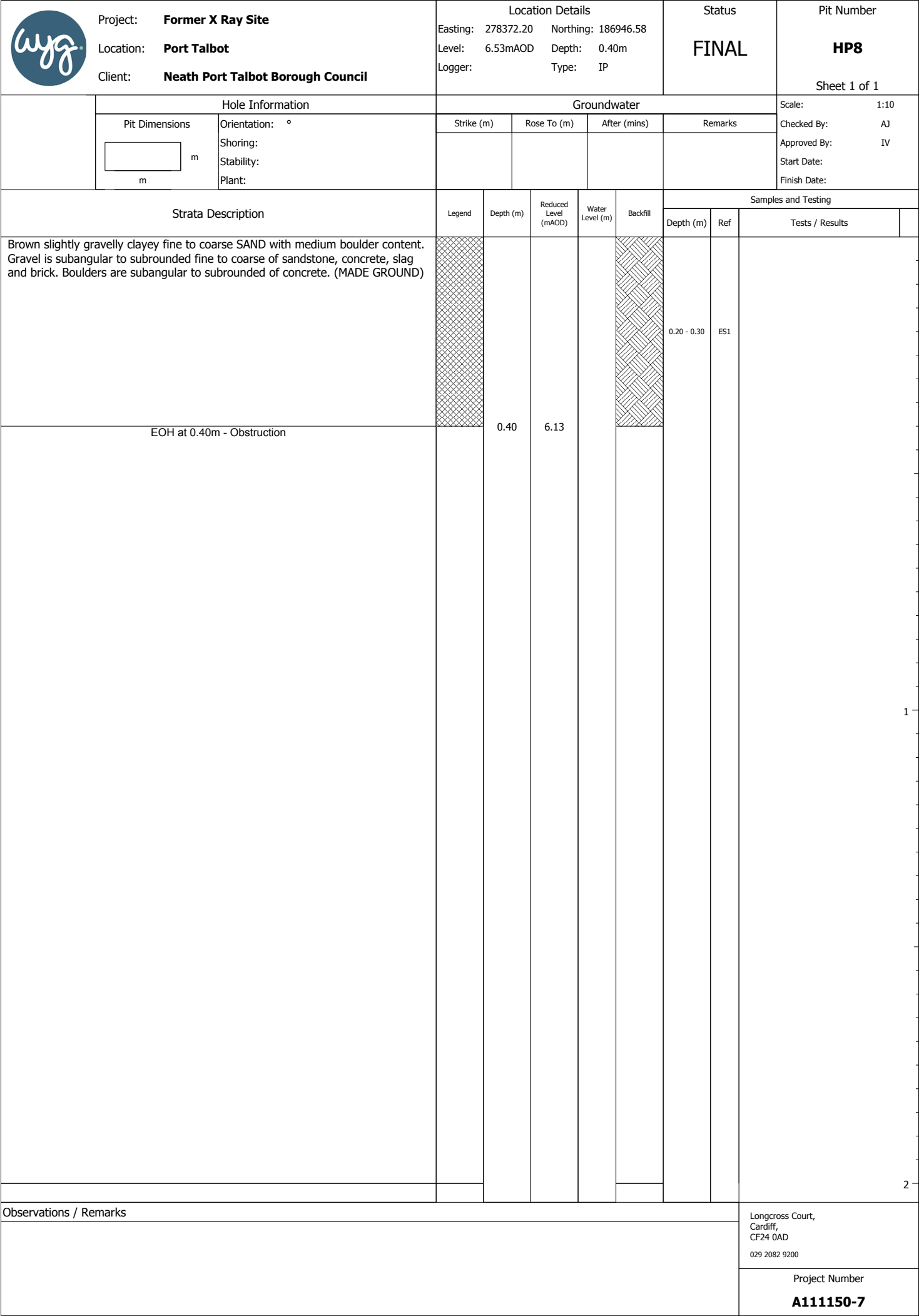
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	Pit Dimensions m m	Orientation: ° Shoring: Stability: Plant:	Strike (m)	Rose To (m)	After (mins)	Remarks	Checked By: AJ			
							Approved By: IV			
							Start Date:			
						Finish Date:				
Strata Description			Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing		
								Depth (m)	Ref	Tests / Results
Black slightly sandy angular fine to coarse GRAVEL of limestone, tarmacadam and slag. Sand is ashy fine to coarse. (MADE GROUND)				0.10	6.12			0.20 - 0.30	ES1	
Brown slightly silty gravelly fine to medium SAND with low cobble content. Gravel is subangular to subrounded fine to coarse of sandstone, concrete, slag, clinker, brick and quartz. Cobbles are subangular to subrounded of slag and brick. (MADE GROUND)										
EOH at 0.80m - Obstruction				0.80	5.42					
Observations / Remarks										
Longcross Court, Cardiff, CF24 0AD 029 2082 9200										
Project Number A111150-7										

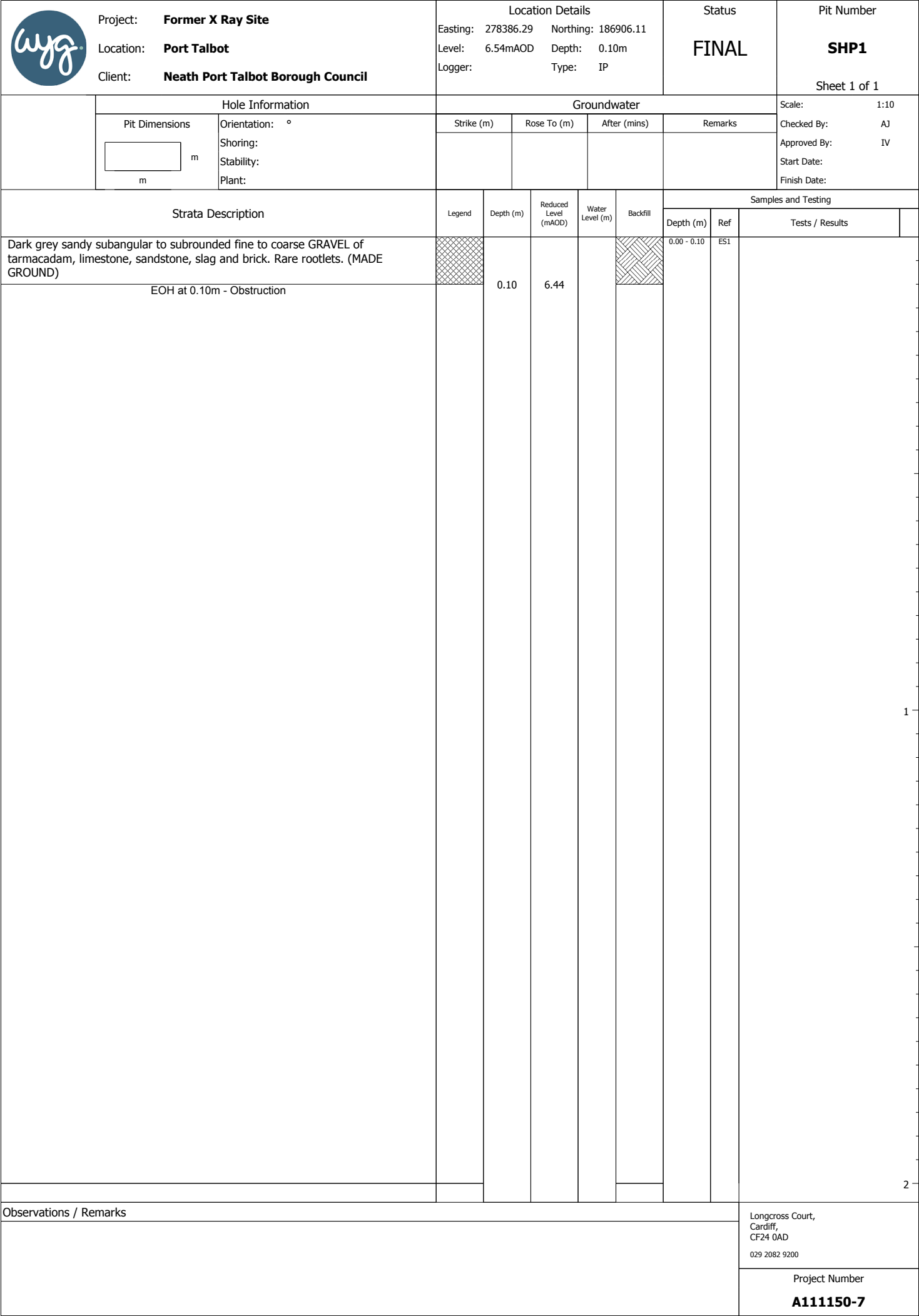








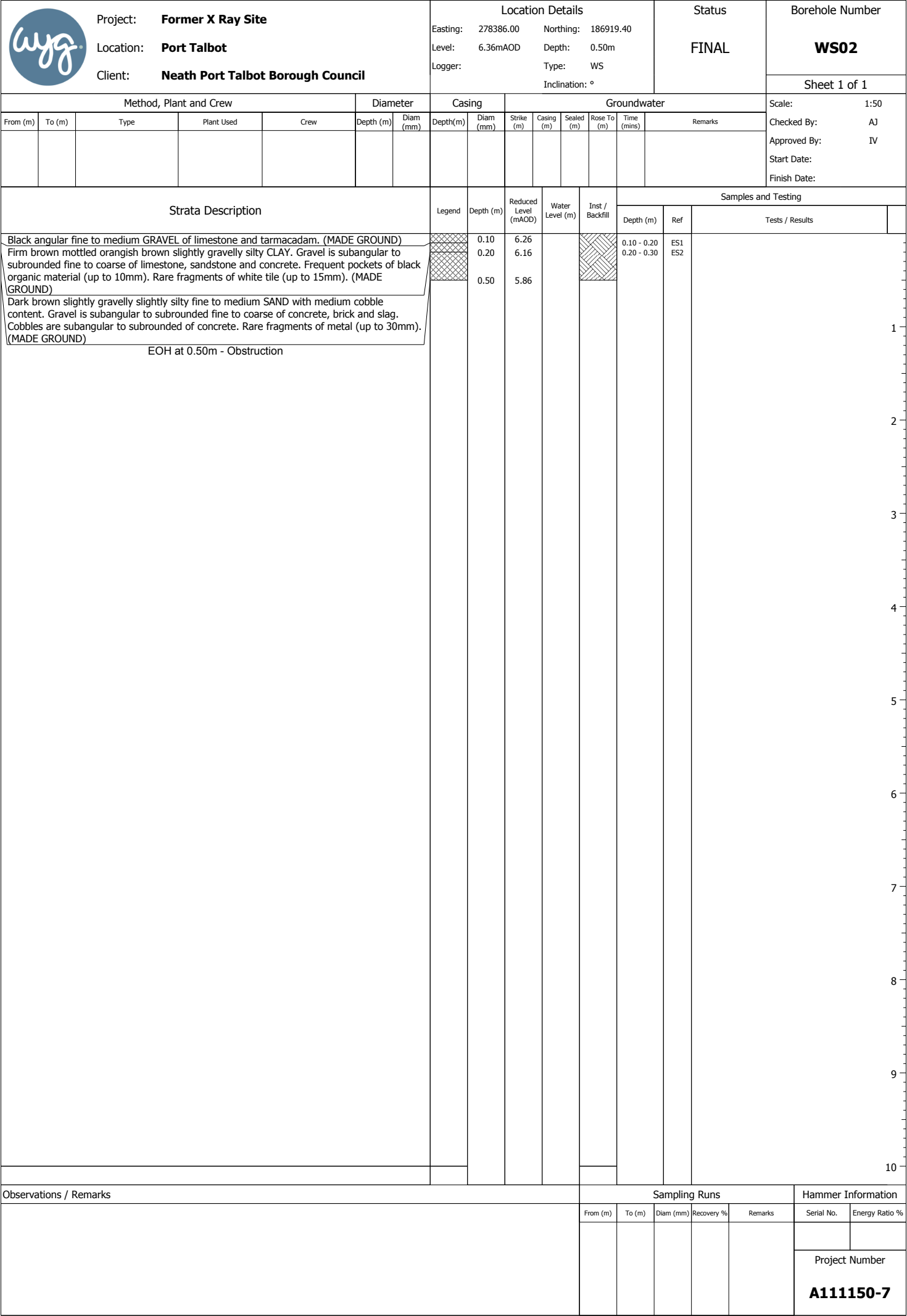




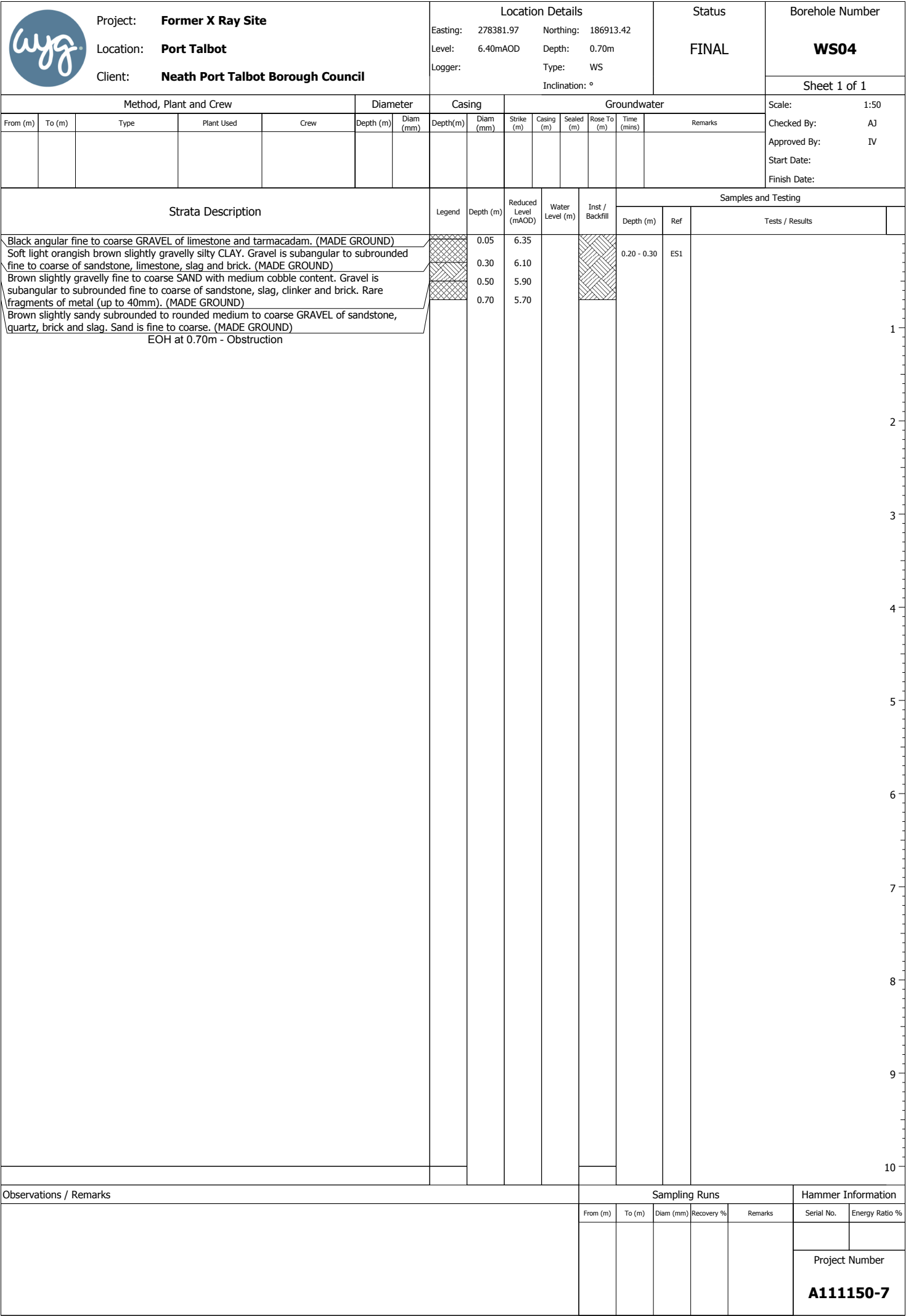
	Project: Former X Ray Site		Location Details				Status		Pit Number		
	Location: Port Talbot		Easting: 278396.71 Northing: 186902.25 Level: 6.29mAOD Depth: 0.10m Logger: Type: IP				FINAL		SHP2		
Client: Neath Port Talbot Borough Council										Sheet 1 of 1	
	Hole Information		Groundwater					Scale: 1:10			
	Pit Dimensions m m	Orientation: °	Strike (m)	Rose To (m)	After (mins)	Remarks	Checked By: AJ				
		Shoring:					Approved By: IV				
		Stability:					Start Date:				
		Plant:					Finish Date:				
Strata Description			Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing			
								Depth (m)	Ref	Tests / Results	
Dark grey sandy subangular to subrounded fine to coarse GRAVEL of tarmacadam, limestone, sandstone, slag and brick. Rare rootlets. (MADE GROUND)				0.10	6.19			0.00 - 0.10	ES1		
EOH at 0.10m - Obstruction											
										1	
										2	
Observations / Remarks									Longcross Court, Cardiff, CF24 0AD 029 2082 9200		
									Project Number A111150-7		



		Project: Former X Ray Site		Location Details										Status		Borehole Number	
		Location: Port Talbot		Easting: 278374.79 Northing: 186905.55 Level: 6.38mAOD Depth: 1.20m Logger: Type: WS Inclination: °										FINAL		WS01	
		Client: Neath Port Talbot Borough Council														Sheet 1 of 1	
Method, Plant and Crew					Diameter		Casing		Groundwater							Scale: 1:50	
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Strike (m)	Casing (m)	Sealed (m)	Rose To (m)	Time (mins)	Remarks	Checked By: AJ		
															Approved By: IV		
Strata Description							Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples and Testing					
												Depth (m)	Ref	Tests / Results			
Black angular fine to coarse GRAVEL of limestone and tarmacadam. (MADE GROUND) Brown sandy slightly clayey subangular to subrounded fine to coarse GRAVEL of sandstone, quartz and brick. Sand is fine to coarse. (MADE GROUND) Soft light orangish brown slightly gravelly silty CLAY. Gravel is subangular to subrounded fine to coarse of sandstone, limestone, slag and brick. Frequent fragments of plastic (up to 50mm) and polystyrene (up to 30mm). Rare fragments of metal (up to 100mm). (MADE GROUND) Brown slightly gravelly fine to coarse SAND with medium cobble content. Gravel is subangular to subrounded fine to coarse of sandstone, concrete, slag , clinker and brick. Cobbles are subangular to subrounded of limestone and sandstone. (MADE GROUND) EOH at 1.20m - Obstruction								0.05	6.33				0.10 - 0.20	ES1	SPT(C) 1.20m, 50 (1,2/50 for 50mm)		
								0.20	6.18				0.20 - 0.30	ES2			
								0.50	5.88				0.50 - 0.60	ES3			
								1.20	5.18								
																1	
																	2
																	3
																	4
																	5
																	6
																	7
																	8
																	9
																	10
Observations / Remarks										Sampling Runs					Hammer Information		
										From (m)	To (m)	Diam (mm)	Recovery %	Remarks	Serial No.	Energy Ratio %	
										Project Number							
										A111150-7							



 Project: Former X Ray Site Location: Port Talbot Client: Neath Port Talbot Borough Council						Location Details						Status FINAL		Borehole Number WS03			
						Easting: 278410.79 Northing: 186863.49 Level: 7.12mAOD Depth: 0.90m Logger: Type: WS Inclination: °											
												Sheet 1 of 1					
Method, Plant and Crew					Diameter		Casing		Groundwater						Scale: 1:50		
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Strike (m)	Casing (m)	Sealed (m)	Rose To (m)	Time (mins)	Remarks	Checked By: AJ		
															Approved By: IV		
Strata Description							Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples and Testing					
												Depth (m)	Ref	Tests / Results			
Soft brown mottled dark grey slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of sandstone, concrete, brick and slag. Frequent pockets of yellowish brown silt (up to 20mm). (MADE GROUND)								0.90	6.22			0.70 - 0.90	ES1				
EOH at 0.90m - Obstruction																	
Observations / Remarks											Sampling Runs			Hammer Information			
											From (m)	To (m)	Diam (mm)	Recovery %	Remarks	Serial No.	Energy Ratio %
											Project Number A111150-7						



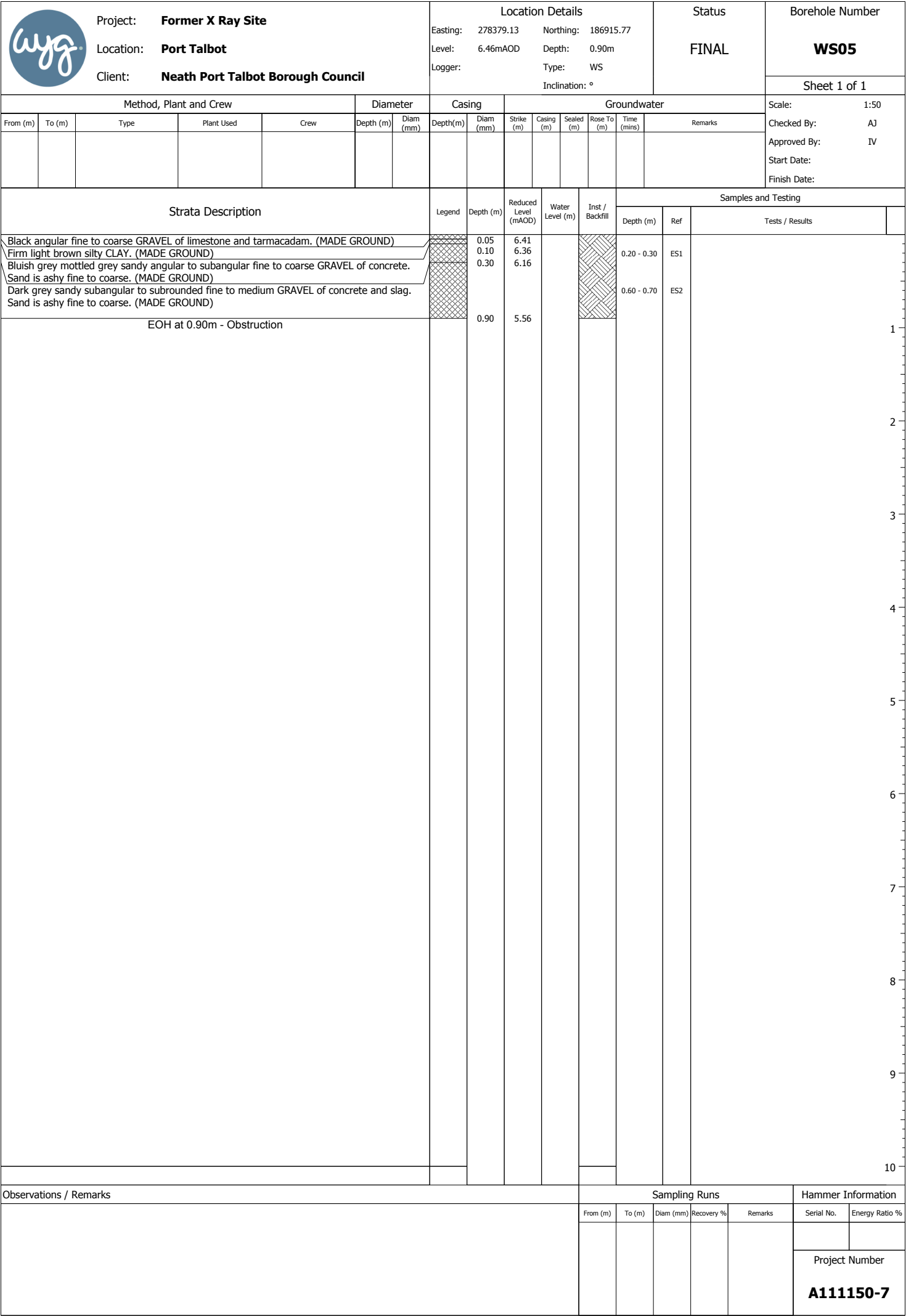




Plate 1 HP1 GL - 0.20m bgl.



Plate 2 HP2 GL - 0.80m bgl

WYG Environment
5th Floor, Longcross Court
47 Newport Road
Cardiff
CF24 0AD

Tel: 029 20 829200
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Environmental Consultancy
Ground Technologies & Investigation



Project :-
Former X-Ray Site

Project No.:

A111150-7-1



Plate 3

HP3 GL - 0.80m bgl



Plate 4

HP4 GL - 0.80m bgl

WYG Environment
5th Floor, Longcross Court
47 Newport Road
Cardiff
CF24 0AD

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Project :-
Former X-Ray Site

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Plate 5

HP5 GL - 0.60m bgl



Plate 6

HP6 GL - 0.3m bgl

WYG Environment
 5th Floor, Longcross Court
 47 Newport Road
 Cardiff
 CF24 0AD

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Project :-
Former X-Ray Site

Project No.:

A111150-7-1



Plate 7 HP8 GL - 0.4m bgl



Plate 8 WS01 GL - 1.20m bgl

WYG Environment
 5th Floor, Longcross Court
 47 Newport Road
 Cardiff
 CF24 0AD

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Project :-
Former X-Ray Site

Project No.:

A111150-7-1



APPENDIX C – ENVIRONMENTAL LABORATORY TEST RESULTS AND M-BAT ASSESSMENT



Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US

Tel: (01244) 528700

Fax: (01244) 528701

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Website: www.alsenvironmental.co.uk

WYG Geo-Environment
5th Floor
Longcross Court
47 Newport Road
Cardiff
CF24 0AD

Attention: Louise Hickman

CERTIFICATE OF ANALYSIS

Date of report Generation:	22 October 2019
Customer:	WYG Geo-Environment
Sample Delivery Group (SDG):	190926-129
Your Reference:	A111150-7-1
Location:	Former X-Ray Site
Report No:	526551

This report has been revised and directly supersedes 526545 in its entirety.

We received 23 samples on Thursday September 26, 2019 and 13 of these samples were scheduled for analysis which was completed on Tuesday October 22, 2019. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

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

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

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

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

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

Approved By:

Sonia McWhan

Operations Manager





CERTIFICATE OF ANALYSIS

Validated

SDG: 190926-129
Location: Former X-Ray Site

Client Reference: A111150-7-1
Order Number: C19/982

Report Number: 526551
Superseded Report: 526545

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
20812922	HP1	ESES1	0.10 - 0.20	23/09/2019
20812972	HP2	ESES2	0.20 - 0.30	23/09/2019
20812995	HP3	ESES3	0.20 - 0.30	23/09/2019
20813001	HP3	ESES4	0.50 - 0.60	23/09/2019
20813005	HP3	ESES5	0.60 - 0.70	23/09/2019
20813009	HP3	ESES6	0.70 - 0.80	23/09/2019
20813013	HP4	ESES7	0.10 - 0.20	23/09/2019
20813020	HP4	ESES8	0.40 - 0.50	23/09/2019
20813024	HP5	ESES9	0.20 - 0.30	23/09/2019
20812926	HP6	ESES10	0.20 - 0.30	23/09/2019
20812931	HP8	ESES11	0.20 - 0.30	23/09/2019
20812968	SHP1	ESES19	0.00 - 0.10	24/09/2019
20812976	SHP2	ESES20	0.00 - 0.10	24/09/2019
20812981	SHP3	ESES21	0.00 - 0.10	24/09/2019
20812936	WS01	ESES12	0.10 - 0.20	24/09/2019
20812940	WS01	ESES13	0.20 - 0.30	24/09/2019
20812944	WS01	ESES14	0.50 - 0.60	24/09/2019
20812949	WS02	ESES15	0.10 - 0.20	24/09/2019
20812954	WS02	ESES16	0.20 - 0.30	24/09/2019
20812960	WS03	ESES17	0.70 - 0.90	24/09/2019
20812964	WS04	ESES18	0.20 - 0.30	24/09/2019
20812985	WS05	ESES22	0.20 - 0.30	24/09/2019
20812990	WS05	ESES23	0.60 - 0.70	24/09/2019

Maximum Sample/Coolbox Temperature (°C) :

ISO5667-3 Water quality - Sampling - Part3 -

During Transportation samples shall be stored in a cooling device capable of maintaining a temperature of (5±3)°C.

11.4

ALS have data which show that a cool box with 4 frozen icepacks is capable of maintaining pre-chilled samples at a temperature of (5±3)°C for a period of up to 24hrs.

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



CERTIFICATE OF ANALYSIS

Validated

SDG: 190926-129
Location: Former X-Ray Site

Client Reference: A111150-7-1
Order Number: C19/982

Report Number: 526551
Superseded Report: 526545

Results Legend

X Test
N No Determination Possible

Sample Types -

S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

Results Legend	Lab Sample No(s)		Customer Sample Reference		AGS Reference		Depth (m)		Container		Sample Type	
	20812976		SHP2		ESES20		0.00 - 0.10		1kg TUB		S	
	20812931		HP8		ESES11		0.20 - 0.30		60g VOC (ALE215)		S	
									250g Amber Jar (ALE210)		S	
									1kg TUB		S	
Alkalinity Filtered as CaCO3	All	NDPs: 0 Tests: 4										
Ammoniacal Nitrogen	All	NDPs: 0 Tests: 4										
Anions by Kone (soil)	All	NDPs: 0 Tests: 12										
Anions by Kone (w)	All	NDPs: 0 Tests: 4										
Asbestos ID in Solid Samples	All	NDPs: 0 Tests: 12										
Asbestos Quantification - Full	All	NDPs: 0 Tests: 1										
Boron Water Soluble	All	NDPs: 0 Tests: 12										
CEN Readings	All	NDPs: 0 Tests: 4										
Chromium III	All	NDPs: 0 Tests: 12										
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 16										
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 4										
Dissolved Organic/Inorganic Carbon	All	NDPs: 0 Tests: 4										
EPH CWG (Aliphatic) Filtered GC (W)	All	NDPs: 0 Tests: 4										
EPH CWG (Aliphatic) GC (S)	All	NDPs: 0 Tests: 12										
EPH CWG (Aromatic) Filtered GC (W)	All	NDPs: 0 Tests: 4										



CERTIFICATE OF ANALYSIS

Validated

SDG: 190926-129
Location: Former X-Ray Site

Client Reference: A111150-7-1
Order Number: C19/982

Report Number: 526551
Superseded Report: 526545

Results Legend

X Test
N No Determination Possible

Sample Types -

S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

	Lab Sample No(s)		Customer Sample Reference		AGS Reference		Depth (m)		Container		Sample Type	
	20812976		SHP2		ESES20		0.00 - 0.10		1kg TUB		S	
	20812931		HP8		ESES11		0.20 - 0.30		60g VOC (ALE215)		S	
									250g Amber Jar (ALE210)		S	
									1kg TUB		S	
EPH CWG (Aromatic) GC (S)	All	NDPs: 0 Tests: 12										
GRO by GC-FID (S)	All	NDPs: 0 Tests: 12										
GRO by GC-FID (W)	All	NDPs: 0 Tests: 4										
Hexavalent Chromium (s)	All	NDPs: 0 Tests: 12										
Mercury Dissolved	All	NDPs: 0 Tests: 4										
Metals in solid samples by OES	All	NDPs: 0 Tests: 12										
Nitrite by Kone (w)	All	NDPs: 0 Tests: 4										
PAH by GCMS	All	NDPs: 0 Tests: 12										
PAH in waters by GC-MS (diss.filt)	All	NDPs: 0 Tests: 4										
pH	All	NDPs: 0 Tests: 12										
pH Value of Filtered Water	All	NDPs: 0 Tests: 4										
Phenols by HPLC (S)	All	NDPs: 0 Tests: 12										
Phenols by HPLC (W)	All	NDPs: 0 Tests: 4										
Sample description	All	NDPs: 0 Tests: 13										
Total Organic Carbon	All	NDPs: 0 Tests: 12										



CERTIFICATE OF ANALYSIS

SDG: 190926-129
Location: Former X-Ray SiteClient Reference: A111150-7-1
Order Number: C19/982Report Number: 526551
Superseded Report: 526545

Results Legend



Test

No Determination
Possible

Sample Types -

S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

Lab Sample No(s)

Customer
Sample Reference

AGS Reference

Depth (m)

Container

Sample Type

TPH CWG Filtered (W)

TPH CWG GC (S)

VOC MS (S)

All

All

All

NDPs: 0
Tests: 4NDPs: 0
Tests: 12NDPs: 0
Tests: 12

X

X

X

X

X

X

X

X

X

X

X

X

X

X

20812990	WS05	ESES23	0.60 - 0.70	60g VOC (ALE215)	S					X
				250g Amber Jar (ALE210)	S					
				1kg TUB	S			X		
				60g VOC (ALE215)	S					
20812985	WS05	ESES22	0.20 - 0.30	60g VOC (ALE215)	S					X
				250g Amber Jar (ALE210)	S			X		
				1kg TUB	S					
				60g VOC (ALE215)	S					
20812960	WS03	ESES17	0.70 - 0.90	60g VOC (ALE215)	S					X
				250g Amber Jar (ALE210)	S			X		
				1kg TUB	S					
				60g VOC (ALE215)	S					
20812949	WS02	ESES15	0.10 - 0.20	250g Amber Jar (ALE210)	S					
				1kg TUB	S					
				60g VOC (ALE215)	S					
				250g Amber Jar (ALE210)	S					
20812940	WS01	ESES13	0.20 - 0.30	60g VOC (ALE215)	S					X
				250g Amber Jar (ALE210)	S			X		
				60g VOC (ALE215)	S					X
				250g Amber Jar (ALE210)	S			X		
20812981	SHP3	ESES21	0.00 - 0.10	60g VOC (ALE215)	S					X
				250g Amber Jar (ALE210)	S			X		
				1kg TUB	S					
				60g VOC (ALE215)	S					
20812976	SHP2	ESES20	0.00 - 0.10	60g VOC (ALE215)	S					X
				250g Amber Jar (ALE210)	S			X		
				1kg TUB	S					
				60g VOC (ALE215)	S					



CERTIFICATE OF ANALYSIS

Validated

SDG: 190926-129
Location: Former X-Ray Site

Client Reference: A111150-7-1
Order Number: C19/982

Report Number: 526551
Superseded Report: 526545

Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm
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Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Inclusions	Inclusions 2
20812972	HP2	0.20 - 0.30	Dark Brown	Loamy Sand	Stones	None
20812995	HP3	0.20 - 0.30	Dark Brown	Sandy Silt Loam	Stones	None
20813005	HP3	0.60 - 0.70	Dark Brown	Sandy Loam	Brick	Stones
20813024	HP5	0.20 - 0.30	Dark Brown	Silty Clay Loam	Stones	None
20812926	HP6	0.20 - 0.30	Dark Brown	Loamy Sand	Stones	None
20812931	HP8	0.20 - 0.30	Dark Brown	Silty Clay Loam	Stones	Vegetation
20812976	SHP2	0.00 - 0.10	Dark Brown	Loamy Sand	Stones	None
20812981	SHP3	0.00 - 0.10	Dark Brown	Loamy Sand	Stones	Vegetation
20812940	WS01	0.20 - 0.30	Dark Brown	Silty Clay Loam	Plastic	Stones
20812949	WS02	0.10 - 0.20	Dark Brown	Sandy Loam	Stones	None
20812960	WS03	0.70 - 0.90	Dark Brown	Silty Clay Loam	Stones	Vegetation
20812985	WS05	0.20 - 0.30	Dark Brown	Sand	Stones	None
20812990	WS05	0.60 - 0.70	Dark Brown	Sand	Stones	Vegetation

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

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

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



CERTIFICATE OF ANALYSIS

Validated

SDG: 190926-129
Location: Former X-Ray Site

Client Reference: A111150-7-1
Order Number: C19/982

Report Number: 526551
Superseded Report: 526545

Asbestos Identification - Solid Samples

Results Legend

ISO17025 accredited.
M mCERTS accredited.
* Subcontracted test.
(F) Trigger breach confirmed
1-5&*\$@ Sample deviation (see appendix)

		Date of Analysis	Analysed By	Comments	Amosite (Brown) Asbestos	Chrysotile (White) Asbestos	Crocidolite (Blue) Asbestos	Fibrous Actinolite	Fibrous Anthophyllite	Fibrous Tremolite	Non-Asbestos Fibre
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	HP2ESES2 0.20 - 0.30 SOLID 23/09/2019 00:00:00 26/09/2019 18:52:00 190926-129 20812972 TM048	02/10/2019	James Richards	-	Not Detected (#)	Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	HP3ESES3 0.20 - 0.30 SOLID 23/09/2019 00:00:00 26/09/2019 18:52:00 190926-129 20812995 TM048	03/10/2019	Agnieszka Chelmonska	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	HP3ESES5 0.60 - 0.70 SOLID 23/09/2019 00:00:00 26/09/2019 18:52:00 190926-129 20813005 TM048	03/10/2019	Agnieszka Chelmonska	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	HP5ESES9 0.20 - 0.30 SOLID 23/09/2019 00:00:00 26/09/2019 18:52:00 190926-129 20813024 TM048	02/10/2019	Barbara Urbanek-Walsh	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	HP6ESES10 0.20 - 0.30 SOLID 23/09/2019 00:00:00 26/09/2019 18:52:00 190926-129 20812926 TM048	03/10/2019	Agnieszka Chelmonska	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	HP8ESES11 0.20 - 0.30 SOLID 23/09/2019 00:00:00 26/09/2019 18:52:00 190926-129 20812931 TM048	03/10/2019	Agnieszka Chelmonska	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	SHP2ESES20 0.00 - 0.10 SOLID 24/09/2019 00:00:00 26/09/2019 18:52:00 190926-129 20812976 TM048	03/10/2019	Lucy Caroe	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	SHP3ESES21 0.00 - 0.10 SOLID 24/09/2019 00:00:00 26/09/2019 18:52:00 190926-129 20812981 TM048	02/10/2019	James Richards	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected



Validated

CERTIFICATE OF ANALYSIS

SDG: 190926-129
Location: Former X-Ray Site

Client Reference: A111150-7-1
Order Number: C19/982

Report Number: 526551
Superseded Report: 526545

		Date of Analysis	Analysed By	Comments	Amosite (Brown) Asbestos	Chrysotile (White) Asbestos	Crocidolite (Blue) Asbestos	Fibrous Actinolite	Fibrous Anthophyllite	Fibrous Tremolite	Non-Asbestos Fibre
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	WS01ESES13 0.20 - 0.30 SOLID 24/09/2019 00:00:00 26/09/2019 18:52:00 190926-129 20812940 TM048	03/10/2019	Lucy Caroe	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	WS03ESES17 0.70 - 0.90 SOLID 24/09/2019 00:00:00 26/09/2019 18:52:00 190926-129 20812960 TM048	02/10/2019	Barbara Urbanek-Wals h	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	WS05ESES22 0.20 - 0.30 SOLID 24/09/2019 00:00:00 26/09/2019 18:52:00 190926-129 20812985 TM048	03/10/2019	Lucy Caroe	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	WS05ESES23 0.60 - 0.70 SOLID 24/09/2019 00:00:00 26/09/2019 18:52:00 190926-129 20812990 TM048	03/10/2019	Lucy Caroe	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected

Asbestos Quantification - Full

Results Legend

ISO17025 accredited.
M mCERTS accredited.
* Subcontracted test.
(F) Trigger breach confirmed
1-5&+5@ Sample deviation (see appendix)

		Additional Asbestos Components	Analysts Comments	Asbestos Quantification - Gravimetric - %	Asbestos Quantification - PCOM	Asbestos Quantification - Total - %
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	HP2ESES2 0.20 - 0.30 SOLID 23/09/2019 00:00:00 26/09/2019 18:52:00 190926-129 20812972 TM304	None (#)	N/A	3.0723 (#)	<0.001 (#)	3.0723 (#)



CERTIFICATE OF ANALYSIS

Validated

SDG: 190926-129
Location: Former X-Ray Site

Client Reference: A111150-7-1
Order Number: C19/982

Report Number: 526551
Superseded Report: 526545

CEN 10:1 SINGLE STAGE LEACHATE TEST

CEN ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference

Mass Sample taken (kg) 0.100

Mass of dry sample (kg) 0.090

Particle Size <4mm >95%

Site Location

Former X-Ray Site

Natural Moisture Content (%) 10.7

Dry Matter Content (%) 90.3

Case

SDG 190926-129

Lab Sample Number(s) 20812949

Sampled Date 24-Sep-2019

Customer Sample Ref. WS02 ESES15

Depth (m) 0.10 - 0.20

Eluate Analysis

	C ₂ Conc ⁿ in 10:1 eluate (mg/l)		A ₂ 10:1 conc ⁿ leached (mg/kg)				
	Result	Limit of Detection	Result	Limit of Detection			
Aliphatics >C12-C16	<0.01	<0.01	<0.1	<0.1	-	-	-
Aliphatics >C16-C21	<0.01	<0.01	<0.1	<0.1	-	-	-
Aliphatics >C21-C35	<0.01	<0.01	<0.1	<0.1	-	-	-
Total Aliphatics >C12-C35	<0.01	<0.01	<0.1	<0.1	-	-	-
Aromatics >EC12-EC16	<0.01	<0.01	<0.1	<0.1	-	-	-
Aromatics >EC16-EC21	<0.01	<0.01	<0.1	<0.1	-	-	-
Aromatics >EC21-EC35	<0.01	<0.01	<0.1	<0.1	-	-	-
Aromatics >EC16-EC35	<0.01	<0.01	<0.1	<0.1	-	-	-
Total Aromatics >EC12-EC35	<0.01	<0.01	<0.1	<0.1	-	-	-
TPH (Total Aliphatics + Total Aromatics) >C5-C35	<0.01	<0.01	<0.1	<0.1	-	-	-
Nitrite as NO ₂	0.119	<0.05	1.19	<0.5	-	-	-
Sulphate (soluble)	<2	<2	<20	<20	-	-	-
Chloride	<2	<2	<20	<20	-	-	-
Dissolved Organic Carbon	5.71	<3	57.1	<30	-	-	-
Mercury Dissolved (CVAf)	0.0000112	<0.00001	0.000112	<0.0001	-	-	-
Antimony	<0.001	<0.001	<0.01	<0.01	-	-	-
Naphthalene (diss.filt)	<0.00001	<0.00001	<0.0001	<0.0001	-	-	-
Total Ammonia as NH ₃	<0.2	<0.2	<2	<2	-	-	-
Total Cyanide (W)	<0.05	<0.05	<0.5	<0.5	-	-	-
Acenaphthene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-
Arsenic	0.00315	<0.0005	0.0315	<0.005	-	-	-
Total Ammonium as NH ₄	<0.3	<0.3	<3	<3	-	-	-
Acenaphthylene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-
Barium	0.194	<0.0002	1.94	<0.002	-	-	-
Nitrate as NO ₃	1.42	<0.3	14.2	<3	-	-	-
Phenol by HPLC (W)	<0.002	<0.002	<0.02	<0.02	-	-	-
Beryllium	<0.0001	<0.0001	<0.001	<0.001	-	-	-
Fluoranthene (diss.filt)	0.0000168	<0.000005	0.000168	<0.00005	-	-	-
Anthracene (diss.filt)	0.00000792	<0.000005	0.0000792	<0.00005	-	-	-
Boron	0.0269	<0.01	0.269	<0.1	-	-	-
Phenanthrene (diss.filt)	0.0000223	<0.000005	0.000223	<0.00005	-	-	-
Total Alkalinity Filtered as CaCO ₃	65	<2	650	<20	-	-	-
Cadmium	<0.00008	<0.00008	<0.0008	<0.0008	-	-	-
Fluorene (diss.filt)	0.0000114	<0.000005	0.000114	<0.00005	-	-	-
Chrysene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-

Leach Test Information

Date Prepared 28-Sep-2019
pH (pH Units) 7.73
Conductivity (µS/cm) 116.00
Temperature (°C) 19.10
Volume Leachant (Litres) 0.890



CERTIFICATE OF ANALYSIS

Validated

SDG: 190926-129
Location: Former X-Ray Site

Client Reference: A111150-7-1
Order Number: C19/982

Report Number: 526551
Superseded Report: 526545

CEN 10:1 SINGLE STAGE LEACHATE TEST

CEN ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference

Mass Sample taken (kg) 0.100

Mass of dry sample (kg) 0.090

Particle Size <4mm >95%

Site Location

Former X-Ray Site

Natural Moisture Content (%) 10.7

Dry Matter Content (%) 90.3

Case

SDG 190926-129

Lab Sample Number(s) 20812949

Sampled Date 24-Sep-2019

Customer Sample Ref. WS02 ESES15

Depth (m) 0.10 - 0.20

Eluate Analysis

	C ₂ Conc ⁿ in 10:1 eluate (mg/l)		A ₂ 10:1 conc ⁿ leached (mg/kg)				
	Result	Limit of Detection	Result	Limit of Detection			
Pyrene (diss.filt)	0.00000998	<0.000005	0.0000998	<0.00005	-	-	-
Benzo(a)anthracene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-
Chromium	0.00107	<0.001	0.0107	<0.01	-	-	-
Benzo(b)fluoranthene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-
Benzo(k)fluoranthene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-
Benzo(a)pyrene (diss.filt)	<0.000002	<0.000002	<0.00002	<0.00002	-	-	-
Copper	0.0053	<0.0003	0.053	<0.003	-	-	-
Dibenzo(a,h)anthracene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-
Lead	<0.0002	<0.0002	<0.002	<0.002	-	-	-
Benzo(g,h,i)perylene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-
Indeno(1,2,3-cd)pyrene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-
Molybdenum	<0.003	<0.003	<0.03	<0.03	-	-	-
PAH 16 EPA Total by GCMS (diss.filt)	<0.000082	<0.000082	<0.00082	<0.00082	-	-	-
Nickel	0.000746	<0.0004	0.00746	<0.004	-	-	-
Selenium	<0.001	<0.001	<0.01	<0.01	-	-	-
Zinc	0.0125	<0.001	0.125	<0.01	-	-	-
TPH CWG (W)							
Surrogate Recovery	-	<0	-	<0	-	-	-
GRO TOT (C5-C12)	<0.05	<0.05	<0.5	<0.5	-	-	-
Aliphatics C5-C6	<0.01	<0.01	<0.1	<0.1	-	-	-
Aliphatics >C6-C8	<0.01	<0.01	<0.1	<0.1	-	-	-
Aliphatics >C8-C10	<0.01	<0.01	<0.1	<0.1	-	-	-
Aliphatics >C10-C12	<0.01	<0.01	<0.1	<0.1	-	-	-
Aromatics C6-C7	<0.01	<0.01	<0.1	<0.1	-	-	-
Aromatics >C7-C8	<0.01	<0.01	<0.1	<0.1	-	-	-
MTBE GC-FID	<0.003	<0.003	<0.03	<0.03	-	-	-
Aromatics >EC8 -EC10	<0.01	<0.01	<0.1	<0.1	-	-	-
Aromatics >EC10-EC12	<0.01	<0.01	<0.1	<0.1	-	-	-
Benzene by GC	<0.007	<0.007	<0.07	<0.07	-	-	-
Toluene by GC	<0.004	<0.004	<0.04	<0.04	-	-	-
Ethylbenzene by GC	<0.005	<0.005	<0.05	<0.05	-	-	-
m & p Xylene by GC	<0.008	<0.008	<0.08	<0.08	-	-	-
o Xylene by GC	<0.003	<0.003	<0.03	<0.03	-	-	-
Sum m&p and o Xylene by GC	<0.011	<0.011	<0.11	<0.11	-	-	-
Sum of BTEX by GC	<0.028	<0.028	<0.28	<0.28	-	-	-

Leach Test Information

Date Prepared	28-Sep-2019
pH (pH Units)	7.73
Conductivity (µS/cm)	116.00
Temperature (°C)	19.10
Volume Leachant (Litres)	0.890



CERTIFICATE OF ANALYSIS

Validated

SDG: 190926-129
Location: Former X-Ray Site

Client Reference: A111150-7-1
Order Number: C19/982

Report Number: 526551
Superseded Report: 526545

CEN 10:1 SINGLE STAGE LEACHATE TEST

CEN ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference		Site Location	Former X-Ray Site
Mass Sample taken (kg)	0.101	Natural Moisture Content (%)	12.4
Mass of dry sample (kg)	0.090	Dry Matter Content (%)	89
Particle Size <4mm	>95%		

Case

SDG	190926-129
Lab Sample Number(s)	20812981
Sampled Date	24-Sep-2019
Customer Sample Ref.	SHP3 ESES21
Depth (m)	0.00 - 0.10

Eluate Analysis	C ₂ Conc ⁿ in 10:1 eluate (mg/l)		A ₂ 10:1 conc ⁿ leached (mg/kg)				
	Result	Limit of Detection	Result	Limit of Detection			
Aliphatics >C12-C16	<0.01	<0.01	<0.1	<0.1	-	-	-
Aliphatics >C16-C21	<0.01	<0.01	<0.1	<0.1	-	-	-
Aliphatics >C21-C35	<0.01	<0.01	<0.1	<0.1	-	-	-
Total Aliphatics >C12-C35	<0.01	<0.01	<0.1	<0.1	-	-	-
Aromatics >EC12-EC16	<0.01	<0.01	<0.1	<0.1	-	-	-
Aromatics >EC16-EC21	<0.01	<0.01	<0.1	<0.1	-	-	-
Aromatics >EC21-EC35	<0.01	<0.01	<0.1	<0.1	-	-	-
Aromatics >EC16-EC35	<0.01	<0.01	<0.1	<0.1	-	-	-
Total Aromatics >EC12-EC35	<0.01	<0.01	<0.1	<0.1	-	-	-
TPH (Total Aliphatics + Total Aromatics) >C5-C35	<0.01	<0.01	<0.1	<0.1	-	-	-
Nitrite as NO ₂	<0.05	<0.05	<0.5	<0.5	-	-	-
Sulphate (soluble)	<2	<2	<20	<20	-	-	-
Chloride	<2	<2	<20	<20	-	-	-
Dissolved Organic Carbon	5.5	<3	55	<30	-	-	-
Mercury Dissolved (CVAf)	0.0000123	<0.00001	0.000123	<0.0001	-	-	-
Antimony	<0.001	<0.001	<0.01	<0.01	-	-	-
Naphthalene (diss.filt)	0.0000152	<0.00001	0.000152	<0.0001	-	-	-
Total Ammonia as NH ₃	<0.2	<0.2	<2	<2	-	-	-
Total Cyanide (W)	<0.05	<0.05	<0.5	<0.5	-	-	-
Acenaphthene (diss.filt)	0.0000063	<0.000005	0.000063	<0.00005	-	-	-
Arsenic	0.00803	<0.0005	0.0803	<0.005	-	-	-
Total Ammonium as NH ₄	<0.3	<0.3	<3	<3	-	-	-
Acenaphthylene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-
Barium	0.0127	<0.0002	0.127	<0.002	-	-	-
Nitrate as NO ₃	1.41	<0.3	14.1	<3	-	-	-
Phenol by HPLC (W)	<0.002	<0.002	<0.02	<0.02	-	-	-
Beryllium	<0.0001	<0.0001	<0.001	<0.001	-	-	-
Fluoranthene (diss.filt)	0.0000313	<0.000005	0.000313	<0.00005	-	-	-
Anthracene (diss.filt)	0.0000111	<0.000005	0.000111	<0.00005	-	-	-
Boron	<0.01	<0.01	<0.1	<0.1	-	-	-
Phenanthrene (diss.filt)	0.0000497	<0.000005	0.000497	<0.00005	-	-	-
Total Alkalinity Filtered as CaCO ₃	60	<2	600	<20	-	-	-
Cadmium	<0.00008	<0.00008	<0.0008	<0.0008	-	-	-
Fluorene (diss.filt)	0.0000106	<0.000005	0.000106	<0.00005	-	-	-
Chrysene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-

Leach Test Information

Date Prepared	28-Sep-2019
pH (pH Units)	8.29
Conductivity (µS/cm)	105.00
Temperature (°C)	19.10
Volume Leachant (Litres)	0.889



CERTIFICATE OF ANALYSIS

Validated

SDG: 190926-129
Location: Former X-Ray Site

Client Reference: A111150-7-1
Order Number: C19/982

Report Number: 526551
Superseded Report: 526545

CEN 10:1 SINGLE STAGE LEACHATE TEST

CEN ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference		Site Location	Former X-Ray Site
Mass Sample taken (kg)	0.101	Natural Moisture Content (%)	12.4
Mass of dry sample (kg)	0.090	Dry Matter Content (%)	89
Particle Size <4mm	>95%		

Case

SDG	190926-129
Lab Sample Number(s)	20812981
Sampled Date	24-Sep-2019
Customer Sample Ref.	SHP3 ESES21
Depth (m)	0.00 - 0.10

Eluate Analysis	C ₂ Conc ⁿ in 10:1 eluate (mg/l)		A ₂ 10:1 conc ⁿ leached (mg/kg)				
	Result	Limit of Detection	Result	Limit of Detection			
Pyrene (diss.filt)	0.0000196	<0.000005	0.000196	<0.000005	-	-	-
Benzo(a)anthracene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-
Chromium	0.00108	<0.001	0.0108	<0.01	-	-	-
Benzo(b)fluoranthene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-
Benzo(k)fluoranthene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-
Benzo(a)pyrene (diss.filt)	<0.000002	<0.000002	<0.00002	<0.00002	-	-	-
Copper	0.00366	<0.0003	0.0366	<0.003	-	-	-
Dibenzo(a,h)anthracene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-
Lead	<0.0002	<0.0002	<0.002	<0.002	-	-	-
Benzo(g,h,i)perylene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-
Indeno(1,2,3-cd)pyrene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-
Molybdenum	<0.003	<0.003	<0.03	<0.03	-	-	-
PAH 16 EPA Total by GCMS (diss.filt)	0.000144	<0.000082	0.00144	<0.00082	-	-	-
Nickel	0.000794	<0.0004	0.00794	<0.004	-	-	-
Selenium	<0.001	<0.001	<0.01	<0.01	-	-	-
Zinc	0.00217	<0.001	0.0217	<0.01	-	-	-
TPH CWG (W)							
Surrogate Recovery	-	<0	-	<0	-	-	-
GRO TOT (C5-C12)	<0.05	<0.05	<0.5	<0.5	-	-	-
Aliphatics C5-C6	<0.01	<0.01	<0.1	<0.1	-	-	-
Aliphatics >C6-C8	<0.01	<0.01	<0.1	<0.1	-	-	-
Aliphatics >C8-C10	<0.01	<0.01	<0.1	<0.1	-	-	-
Aliphatics >C10-C12	<0.01	<0.01	<0.1	<0.1	-	-	-
Aromatics C6-C7	<0.01	<0.01	<0.1	<0.1	-	-	-
Aromatics >C7-C8	<0.01	<0.01	<0.1	<0.1	-	-	-
MTBE GC-FID	<0.003	<0.003	<0.03	<0.03	-	-	-
Aromatics >EC8 -EC10	<0.01	<0.01	<0.1	<0.1	-	-	-
Aromatics >EC10-EC12	<0.01	<0.01	<0.1	<0.1	-	-	-
Benzene by GC	<0.007	<0.007	<0.07	<0.07	-	-	-
Toluene by GC	<0.004	<0.004	<0.04	<0.04	-	-	-
Ethylbenzene by GC	<0.005	<0.005	<0.05	<0.05	-	-	-
m & p Xylene by GC	<0.008	<0.008	<0.08	<0.08	-	-	-
o Xylene by GC	<0.003	<0.003	<0.03	<0.03	-	-	-
Sum m&p and o Xylene by GC	<0.011	<0.011	<0.11	<0.11	-	-	-
Sum of BTEX by GC	<0.028	<0.028	<0.28	<0.28	-	-	-

Leach Test Information

Date Prepared	28-Sep-2019
pH (pH Units)	8.29
Conductivity (µS/cm)	105.00
Temperature (°C)	19.10
Volume Leachant (Litres)	0.889



CERTIFICATE OF ANALYSIS

Validated

SDG: 190926-129
Location: Former X-Ray Site

Client Reference: A111150-7-1
Order Number: C19/982

Report Number: 526551
Superseded Report: 526545

CEN 10:1 SINGLE STAGE LEACHATE TEST

CEN ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference

Mass Sample taken (kg) 0.091

Mass of dry sample (kg) 0.090

Particle Size <4mm >95%

Site Location

Former X-Ray Site

Natural Moisture Content (%) 1.32

Dry Matter Content (%) 98.7

Case

SDG 190926-129

Lab Sample Number(s) 20812995

Sampled Date 23-Sep-2019

Customer Sample Ref. HP3 ESES3

Depth (m) 0.20 - 0.30

Eluate Analysis

	C ₂ Conc ⁿ in 10:1 eluate (mg/l)		A ₂ 10:1 conc ⁿ leached (mg/kg)				
	Result	Limit of Detection	Result	Limit of Detection			
Aliphatics >C12-C16	<0.01	<0.01	<0.1	<0.1	-	-	-
Aliphatics >C16-C21	<0.01	<0.01	<0.1	<0.1	-	-	-
Aliphatics >C21-C35	<0.01	<0.01	<0.1	<0.1	-	-	-
Total Aliphatics >C12-C35	<0.01	<0.01	<0.1	<0.1	-	-	-
Aromatics >EC12-EC16	<0.01	<0.01	<0.1	<0.1	-	-	-
Aromatics >EC16-EC21	<0.01	<0.01	<0.1	<0.1	-	-	-
Aromatics >EC21-EC35	<0.01	<0.01	<0.1	<0.1	-	-	-
Aromatics >EC16-EC35	<0.01	<0.01	<0.1	<0.1	-	-	-
Total Aromatics >EC12-EC35	<0.01	<0.01	<0.1	<0.1	-	-	-
TPH (Total Aliphatics + Total Aromatics) >C5-C35	<0.01	<0.01	<0.1	<0.1	-	-	-
Nitrite as NO ₂	<0.05	<0.05	<0.5	<0.5	-	-	-
Sulphate (soluble)	<2	<2	<20	<20	-	-	-
Chloride	<2	<2	<20	<20	-	-	-
Dissolved Organic Carbon	4.93	<3	49.3	<30	-	-	-
Mercury Dissolved (CVAf)	<0.00001	<0.00001	<0.0001	<0.0001	-	-	-
Antimony	<0.001	<0.001	<0.01	<0.01	-	-	-
Naphthalene (diss.filt)	0.0000157	<0.00001	0.000157	<0.0001	-	-	-
Total Ammonia as NH ₃	<0.2	<0.2	<2	<2	-	-	-
Total Cyanide (W)	<0.05	<0.05	<0.5	<0.5	-	-	-
Acenaphthene (diss.filt)	0.0000151	<0.000005	0.000151	<0.00005	-	-	-
Arsenic	0.00127	<0.0005	0.0127	<0.005	-	-	-
Total Ammonium as NH ₄	<0.3	<0.3	<3	<3	-	-	-
Acenaphthylene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-
Barium	0.19	<0.0002	1.9	<0.002	-	-	-
Nitrate as NO ₃	1.43	<0.3	14.3	<3	-	-	-
Phenol by HPLC (W)	<0.002	<0.002	<0.02	<0.02	-	-	-
Beryllium	<0.0001	<0.0001	<0.001	<0.001	-	-	-
Fluoranthene (diss.filt)	0.0000241	<0.000005	0.000241	<0.00005	-	-	-
Anthracene (diss.filt)	0.0000149	<0.000005	0.000149	<0.00005	-	-	-
Boron	0.0303	<0.01	0.303	<0.1	-	-	-
Phenanthrene (diss.filt)	0.000064	<0.000005	0.00064	<0.00005	-	-	-
Total Alkalinity Filtered as CaCO ₃	50	<2	500	<20	-	-	-
Cadmium	<0.00008	<0.00008	<0.0008	<0.0008	-	-	-
Fluorene (diss.filt)	0.0000172	<0.000005	0.000172	<0.00005	-	-	-
Chrysene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-

Leach Test Information

Date Prepared 27-Sep-2019
pH (pH Units) 8.20
Conductivity (µS/cm) 98.50
Temperature (°C) 18.80
Volume Leachant (Litres) 0.899



CERTIFICATE OF ANALYSIS

Validated

SDG: 190926-129
Location: Former X-Ray Site

Client Reference: A111150-7-1
Order Number: C19/982

Report Number: 526551
Superseded Report: 526545

CEN 10:1 SINGLE STAGE LEACHATE TEST

CEN ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference		Site Location	Former X-Ray Site
Mass Sample taken (kg)	0.091	Natural Moisture Content (%)	1.32
Mass of dry sample (kg)	0.090	Dry Matter Content (%)	98.7
Particle Size <4mm	>95%		

Case

SDG	190926-129
Lab Sample Number(s)	20812995
Sampled Date	23-Sep-2019
Customer Sample Ref.	HP3 ESES3
Depth (m)	0.20 - 0.30

Eluate Analysis	C ₂ Conc ⁿ in 10:1 eluate (mg/l)		A ₂ 10:1 conc ⁿ leached (mg/kg)				
	Result	Limit of Detection	Result	Limit of Detection			
Pyrene (diss.filt)	0.0000161	<0.000005	0.000161	<0.00005	-	-	-
Benzo(a)anthracene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-
Chromium	0.00214	<0.001	0.0214	<0.01	-	-	-
Benzo(b)fluoranthene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-
Benzo(k)fluoranthene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-
Benzo(a)pyrene (diss.filt)	<0.000002	<0.000002	<0.00002	<0.00002	-	-	-
Copper	0.00299	<0.0003	0.0299	<0.003	-	-	-
Dibenzo(a,h)anthracene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-
Lead	<0.0002	<0.0002	<0.002	<0.002	-	-	-
Benzo(g,h,i)perylene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-
Indeno(1,2,3-cd)pyrene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-
Molybdenum	<0.003	<0.003	<0.03	<0.03	-	-	-
PAH 16 EPA Total by GCMS (diss.filt)	0.000167	<0.000082	0.00167	<0.00082	-	-	-
Nickel	0.000477	<0.0004	0.00477	<0.004	-	-	-
Selenium	<0.001	<0.001	<0.01	<0.01	-	-	-
Zinc	0.00823	<0.001	0.0823	<0.01	-	-	-
TPH CWG (W)							
Surrogate Recovery	-	<0	-	<0	-	-	-
GRO TOT (C5-C12)	<0.05	<0.05	<0.5	<0.5	-	-	-
Aliphatics C5-C6	<0.01	<0.01	<0.1	<0.1	-	-	-
Aliphatics >C6-C8	<0.01	<0.01	<0.1	<0.1	-	-	-
Aliphatics >C8-C10	<0.01	<0.01	<0.1	<0.1	-	-	-
Aliphatics >C10-C12	<0.01	<0.01	<0.1	<0.1	-	-	-
Aromatics C6-C7	<0.01	<0.01	<0.1	<0.1	-	-	-
Aromatics >C7-C8	<0.01	<0.01	<0.1	<0.1	-	-	-
MTBE GC-FID	<0.003	<0.003	<0.03	<0.03	-	-	-
Aromatics >EC8 -EC10	<0.01	<0.01	<0.1	<0.1	-	-	-
Aromatics >EC10-EC12	<0.01	<0.01	<0.1	<0.1	-	-	-
Benzene by GC	<0.007	<0.007	<0.07	<0.07	-	-	-
Toluene by GC	<0.004	<0.004	<0.04	<0.04	-	-	-
Ethylbenzene by GC	<0.005	<0.005	<0.05	<0.05	-	-	-
m & p Xylene by GC	<0.008	<0.008	<0.08	<0.08	-	-	-
o Xylene by GC	<0.003	<0.003	<0.03	<0.03	-	-	-
Sum m&p and o Xylene by GC	<0.011	<0.011	<0.11	<0.11	-	-	-
Sum of BTEX by GC	<0.028	<0.028	<0.28	<0.28	-	-	-

Leach Test Information

Date Prepared	27-Sep-2019
pH (pH Units)	8.20
Conductivity (µS/cm)	98.50
Temperature (°C)	18.80
Volume Leachant (Litres)	0.899



CERTIFICATE OF ANALYSIS

Validated

SDG: 190926-129
Location: Former X-Ray Site

Client Reference: A111150-7-1
Order Number: C19/982

Report Number: 526551
Superseded Report: 526545

CEN 10:1 SINGLE STAGE LEACHATE TEST

CEN ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference		Site Location	Former X-Ray Site
Mass Sample taken (kg)	0.106	Natural Moisture Content (%)	17.6
Mass of dry sample (kg)	0.090	Dry Matter Content (%)	85
Particle Size <4mm	>95%		

Case

SDG	190926-129
Lab Sample Number(s)	20813024
Sampled Date	23-Sep-2019
Customer Sample Ref.	HP5 ESES9
Depth (m)	0.20 - 0.30

Eluate Analysis	C ₂ Conc ⁿ in 10:1 eluate (mg/l)		A ₂ 10:1 conc ⁿ leached (mg/kg)				
	Result	Limit of Detection	Result	Limit of Detection			
Aliphatics >C12-C16	<0.01	<0.01	<0.1	<0.1	-	-	-
Aliphatics >C16-C21	<0.01	<0.01	<0.1	<0.1	-	-	-
Aliphatics >C21-C35	<0.01	<0.01	<0.1	<0.1	-	-	-
Total Aliphatics >C12-C35	<0.01	<0.01	<0.1	<0.1	-	-	-
Aromatics >EC12-EC16	<0.01	<0.01	<0.1	<0.1	-	-	-
Aromatics >EC16-EC21	<0.01	<0.01	<0.1	<0.1	-	-	-
Aromatics >EC21-EC35	<0.01	<0.01	<0.1	<0.1	-	-	-
Aromatics >EC16-EC35	<0.01	<0.01	<0.1	<0.1	-	-	-
Total Aromatics >EC12-EC35	<0.01	<0.01	<0.1	<0.1	-	-	-
TPH (Total Aliphatics + Total Aromatics) >C5-C35	<0.01	<0.01	<0.1	<0.1	-	-	-
Nitrite as NO ₂	<0.05	<0.05	<0.5	<0.5	-	-	-
Sulphate (soluble)	<2	<2	<20	<20	-	-	-
Chloride	<2	<2	<20	<20	-	-	-
Dissolved Organic Carbon	<3	<3	<30	<30	-	-	-
Mercury Dissolved (CVAf)	0.0000252	<0.00001	0.000252	<0.0001	-	-	-
Antimony	0.00299	<0.001	0.0299	<0.01	-	-	-
Naphthalene (diss.filt)	0.0000262	<0.00001	0.000262	<0.0001	-	-	-
Total Ammonia as NH ₃	<0.2	<0.2	<2	<2	-	-	-
Total Cyanide (W)	<0.05	<0.05	<0.5	<0.5	-	-	-
Acenaphthene (diss.filt)	0.000019	<0.000005	0.00019	<0.00005	-	-	-
Arsenic	0.0106	<0.0005	0.106	<0.005	-	-	-
Total Ammonium as NH ₄	<0.3	<0.3	<3	<3	-	-	-
Acenaphthylene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-
Barium	0.0118	<0.0002	0.118	<0.002	-	-	-
Nitrate as NO ₃	1.17	<0.3	11.7	<3	-	-	-
Phenol by HPLC (W)	<0.002	<0.002	<0.02	<0.02	-	-	-
Beryllium	<0.0001	<0.0001	<0.001	<0.001	-	-	-
Fluoranthene (diss.filt)	0.0000197	<0.000005	0.000197	<0.00005	-	-	-
Anthracene (diss.filt)	0.0000181	<0.000005	0.000181	<0.00005	-	-	-
Boron	0.0231	<0.01	0.231	<0.1	-	-	-
Phenanthrene (diss.filt)	0.0000669	<0.000005	0.000669	<0.00005	-	-	-
Total Alkalinity Filtered as CaCO ₃	50	<2	500	<20	-	-	-
Cadmium	<0.00008	<0.00008	<0.0008	<0.0008	-	-	-
Fluorene (diss.filt)	0.0000189	<0.000005	0.000189	<0.00005	-	-	-
Chrysene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-

Leach Test Information

Date Prepared	28-Sep-2019
pH (pH Units)	7.93
Conductivity (µS/cm)	92.00
Temperature (°C)	19.30
Volume Leachant (Litres)	0.884



CERTIFICATE OF ANALYSIS

Validated

SDG: 190926-129
Location: Former X-Ray Site

Client Reference: A111150-7-1
Order Number: C19/982

Report Number: 526551
Superseded Report: 526545

CEN 10:1 SINGLE STAGE LEACHATE TEST

CEN ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference		Site Location	Former X-Ray Site
Mass Sample taken (kg)	0.106	Natural Moisture Content (%)	17.6
Mass of dry sample (kg)	0.090	Dry Matter Content (%)	85
Particle Size <4mm	>95%		

Case

SDG	190926-129
Lab Sample Number(s)	20813024
Sampled Date	23-Sep-2019
Customer Sample Ref.	HP5 ESES9
Depth (m)	0.20 - 0.30

Eluate Analysis	C ₂ Conc ⁿ in 10:1 eluate (mg/l)		A ₂ 10:1 conc ⁿ leached (mg/kg)				
	Result	Limit of Detection	Result	Limit of Detection			
Pyrene (diss.filt)	0.0000122	<0.000005	0.000122	<0.00005	-	-	-
Benzo(a)anthracene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-
Chromium	0.00195	<0.001	0.0195	<0.01	-	-	-
Benzo(b)fluoranthene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-
Benzo(k)fluoranthene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-
Benzo(a)pyrene (diss.filt)	<0.000002	<0.000002	<0.00002	<0.00002	-	-	-
Copper	0.0044	<0.0003	0.044	<0.003	-	-	-
Dibenzo(a,h)anthracene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-
Lead	<0.0002	<0.0002	<0.002	<0.002	-	-	-
Benzo(g,h,i)perylene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-
Indeno(1,2,3-cd)pyrene (diss.filt)	<0.000005	<0.000005	<0.00005	<0.00005	-	-	-
Molybdenum	<0.003	<0.003	<0.03	<0.03	-	-	-
PAH 16 EPA Total by GCMS (diss.filt)	0.000181	<0.000082	0.00181	<0.00082	-	-	-
Nickel	<0.0004	<0.0004	<0.004	<0.004	-	-	-
Selenium	0.00108	<0.001	0.0108	<0.01	-	-	-
Zinc	<0.001	<0.001	<0.01	<0.01	-	-	-
TPH CWG (W)							
Surrogate Recovery	-	<0	-	<0	-	-	-
GRO TOT (C5-C12)	<0.05	<0.05	<0.5	<0.5	-	-	-
Aliphatics C5-C6	<0.01	<0.01	<0.1	<0.1	-	-	-
Aliphatics >C6-C8	<0.01	<0.01	<0.1	<0.1	-	-	-
Aliphatics >C8-C10	<0.01	<0.01	<0.1	<0.1	-	-	-
Aliphatics >C10-C12	<0.01	<0.01	<0.1	<0.1	-	-	-
Aromatics C6-C7	<0.01	<0.01	<0.1	<0.1	-	-	-
Aromatics >C7-C8	<0.01	<0.01	<0.1	<0.1	-	-	-
MTBE GC-FID	<0.003	<0.003	<0.03	<0.03	-	-	-
Aromatics >EC8 -EC10	<0.01	<0.01	<0.1	<0.1	-	-	-
Aromatics >EC10-EC12	<0.01	<0.01	<0.1	<0.1	-	-	-
Benzene by GC	<0.007	<0.007	<0.07	<0.07	-	-	-
Toluene by GC	<0.004	<0.004	<0.04	<0.04	-	-	-
Ethylbenzene by GC	<0.005	<0.005	<0.05	<0.05	-	-	-
m & p Xylene by GC	<0.008	<0.008	<0.08	<0.08	-	-	-
o Xylene by GC	<0.003	<0.003	<0.03	<0.03	-	-	-
Sum m&p and o Xylene by GC	<0.011	<0.011	<0.11	<0.11	-	-	-
Sum of BTEX by GC	<0.028	<0.028	<0.28	<0.28	-	-	-

Leach Test Information

Date Prepared	28-Sep-2019
pH (pH Units)	7.93
Conductivity (µS/cm)	92.00
Temperature (°C)	19.30
Volume Leachant (Litres)	0.884



CERTIFICATE OF ANALYSIS

Validated

SDG: 190926-129 Client Reference: A111150-7-1 Report Number: 526551
Location: Former X-Ray Site Order Number: C19/982 Superseded Report: 526545

Table of Results - Appendix

Method No	Reference	Description
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material
PM115		Leaching Procedure for CEN One Stage Leach Test 2:1 & 10:1 1 Step
TM043	Method 2320B, AWWA/APHA, 20th Ed., 1999 / BS 2690: Part109 1984	Determination of alkalinity in aqueous samples
TM048	HSG 248, Asbestos: The analysts' guide for sampling, analysis and clearance procedures	Identification of Asbestos in Bulk Material
TM062 (S)	National Grid Property Holdings Methods for the Collection & Analysis of Samples from National Grid Sites version 1 Sec 3.9	Determination of Phenols in Soils by HPLC
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) by Headspace GC-FID (C4-C12)
TM090	Method 5310, AWWA/APHA, 20th Ed., 1999 / Modified: US EPA Method 415.1 & 9060	Determination of Total Organic Carbon/Total Inorganic Carbon in Water and Waste Water
TM099	BS 2690: Part 7:1968 / BS 6068: Part2.11:1984	Determination of Ammonium in Water Samples using the Kone Analyser
TM116	Modified: US EPA Method 8260, 8120, 8020, 624, 610 & 602	Determination of Volatile Organic Compounds by Headspace / GC-MS
TM132	In - house Method	ELTRA CS800 Operators Guide
TM133	BS 1377: Part 3 1990:BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter
TM151	Method 3500D, AWWA/APHA, 20th Ed., 1999	Determination of Hexavalent Chromium using Kone analyser
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS
TM153	Method 4500A,B,C, I, M AWWA/APHA, 20th Ed., 1999	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate using the Skalar SANS+ System Segmented Flow Analyser
TM173	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GC-FID
TM174	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Waters by GC-FID
TM178	Modified: US EPA Method 8100	Determination of Polynuclear Aromatic Hydrocarbons (PAH) by GC-MS in Waters
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers
TM218	Shaker extraction - EPA method 3546.	The determination of PAH in soil samples by GC-MS
TM222	In-House Method	Determination of Hot Water Soluble Boron in Soils (10:1 Water:soil) by IRIS Emission Spectrometer
TM227	Standard methods for the examination of waters and wastewaters 20th Edition, AWWA/APHA Method 4500.	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate
TM243		Mixed Anions In Soils By Kone
TM245	By GC-FID	Determination of GRO by Headspace in waters
TM256	The measurement of Electrical Conductivity and the Laboratory determination of pH Value of Natural, Treated and Wastewaters. HMSO, 1978. ISBN 011 751428 4.	Determination of pH in Water and Leachate using the GLpH pH Meter
TM259	by HPLC	Determination of Phenols in Waters and Leachates by HPLC
TM304	HSE Contract research Report no 83/1996	Asbestos Quantification in Soil: Fibres identified by morphology only

NA = not applicable.

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



CERTIFICATE OF ANALYSIS

Validated

SDG: 190926-129
Location: Former X-Ray Site

Client Reference: A111150-7-1
Order Number: C19/982

Report Number: 526551
Superseded Report: 526545

Test Completion Dates

Lab Sample No(s)
Customer Sample Ref.

AGS Ref.
Depth
Type

	20812972	20812995	20813005	20813024	20812926	20812931	20812976	20812981	20812940	20812949
	HP2	HP3	HP3	HP5	HP6	HP8	SHP2	SHP3	WS01	WS02
	ESES2	ESES3	ESES5	ESES9	ESES10	ESES11	ESES20	ESES21	ESES13	ESES15
	0.20 - 0.30	0.20 - 0.30	0.60 - 0.70	0.20 - 0.30	0.20 - 0.30	0.20 - 0.30	0.00 - 0.10	0.00 - 0.10	0.20 - 0.30	0.10 - 0.20
	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
Alkalinity Filtered as CaCO3		01-Oct-2019		04-Oct-2019				04-Oct-2019		04-Oct-2019
Ammoniacal Nitrogen		01-Oct-2019		02-Oct-2019				01-Oct-2019		01-Oct-2019
Anions by Kone (soil)	30-Sep-2019	01-Oct-2019	01-Oct-2019	01-Oct-2019	01-Oct-2019	01-Oct-2019	01-Oct-2019	01-Oct-2019	01-Oct-2019	
Anions by Kone (w)		03-Oct-2019		03-Oct-2019				03-Oct-2019		03-Oct-2019
Asbestos ID in Solid Samples	15-Oct-2019	03-Oct-2019	03-Oct-2019	02-Oct-2019	03-Oct-2019	03-Oct-2019	03-Oct-2019	02-Oct-2019	03-Oct-2019	
Asbestos Quantification - Full	22-Oct-2019									
Boron Water Soluble	03-Oct-2019	03-Oct-2019	02-Oct-2019	02-Oct-2019	02-Oct-2019	02-Oct-2019	01-Oct-2019	03-Oct-2019	03-Oct-2019	
CEN 10:1 Leachate (1 Stage)		28-Sep-2019		28-Sep-2019				28-Sep-2019		28-Sep-2019
CEN Readings		03-Oct-2019		03-Oct-2019				03-Oct-2019		03-Oct-2019
Chromium III	03-Oct-2019	03-Oct-2019	02-Oct-2019	02-Oct-2019	03-Oct-2019	03-Oct-2019	03-Oct-2019	02-Oct-2019	02-Oct-2019	
Cyanide Comp/Free/Total/Thiocyanate	01-Oct-2019	01-Oct-2019	02-Oct-2019	03-Oct-2019	01-Oct-2019	01-Oct-2019	01-Oct-2019	02-Oct-2019	01-Oct-2019	01-Oct-2019
Dissolved Metals by ICP-MS		07-Oct-2019		09-Oct-2019				07-Oct-2019		07-Oct-2019
Dissolved Organic/Inorganic Carbon		01-Oct-2019		02-Oct-2019				01-Oct-2019		01-Oct-2019
EPH CWG (Aliphatic) Filtered GC (W)		03-Oct-2019		04-Oct-2019				03-Oct-2019		03-Oct-2019
EPH CWG (Aliphatic) GC (S)	02-Oct-2019	03-Oct-2019	01-Oct-2019	03-Oct-2019	02-Oct-2019	03-Oct-2019	01-Oct-2019	03-Oct-2019	03-Oct-2019	
EPH CWG (Aromatic) Filtered GC (W)		03-Oct-2019		04-Oct-2019				03-Oct-2019		03-Oct-2019
EPH CWG (Aromatic) GC (S)	02-Oct-2019	03-Oct-2019	01-Oct-2019	03-Oct-2019	02-Oct-2019	03-Oct-2019	02-Oct-2019	03-Oct-2019	03-Oct-2019	
GRO by GC-FID (S)	02-Oct-2019	02-Oct-2019	02-Oct-2019	03-Oct-2019	02-Oct-2019	02-Oct-2019	03-Oct-2019	02-Oct-2019	02-Oct-2019	
GRO by GC-FID (W)		02-Oct-2019		02-Oct-2019				02-Oct-2019		02-Oct-2019
Hexavalent Chromium (s)	01-Oct-2019	01-Oct-2019	01-Oct-2019	01-Oct-2019	01-Oct-2019	01-Oct-2019	30-Sep-2019	01-Oct-2019	01-Oct-2019	
Mercury Dissolved		01-Oct-2019		03-Oct-2019				01-Oct-2019		01-Oct-2019
Metals in solid samples by OES	03-Oct-2019	03-Oct-2019	02-Oct-2019	02-Oct-2019	03-Oct-2019	03-Oct-2019	03-Oct-2019	02-Oct-2019	02-Oct-2019	
Nitrite by Kone (w)		30-Sep-2019		02-Oct-2019				30-Sep-2019		30-Sep-2019
PAH by GCMS	01-Oct-2019	01-Oct-2019	30-Sep-2019	01-Oct-2019	02-Oct-2019	01-Oct-2019	01-Oct-2019	01-Oct-2019	01-Oct-2019	
PAH in waters by GC-MS (diss.filt)		02-Oct-2019		04-Oct-2019				02-Oct-2019		02-Oct-2019
pH	03-Oct-2019	03-Oct-2019	03-Oct-2019	03-Oct-2019	03-Oct-2019	03-Oct-2019	03-Oct-2019	02-Oct-2019	02-Oct-2019	
pH Value of Filtered Water		03-Oct-2019		03-Oct-2019				03-Oct-2019		30-Sep-2019
Phenols by HPLC (S)	03-Oct-2019	02-Oct-2019	02-Oct-2019	02-Oct-2019	02-Oct-2019	02-Oct-2019	02-Oct-2019	03-Oct-2019	03-Oct-2019	
Phenols by HPLC (W)		01-Oct-2019		03-Oct-2019				02-Oct-2019		01-Oct-2019
Sample description	27-Sep-2019	27-Sep-2019	27-Sep-2019	27-Sep-2019	27-Sep-2019	27-Sep-2019	27-Sep-2019	27-Sep-2019	27-Sep-2019	27-Sep-2019
Total Organic Carbon	01-Oct-2019	01-Oct-2019	01-Oct-2019	01-Oct-2019	01-Oct-2019	01-Oct-2019	01-Oct-2019	01-Oct-2019	01-Oct-2019	
TPH CWG Filtered (W)		03-Oct-2019		04-Oct-2019				03-Oct-2019		03-Oct-2019
TPH CWG GC (S)	02-Oct-2019	03-Oct-2019	02-Oct-2019	03-Oct-2019	02-Oct-2019	03-Oct-2019	03-Oct-2019	03-Oct-2019	03-Oct-2019	
VOC MS (S)	01-Oct-2019	01-Oct-2019	01-Oct-2019	01-Oct-2019	03-Oct-2019	03-Oct-2019	03-Oct-2019	03-Oct-2019	01-Oct-2019	

Lab Sample No(s)
Customer Sample Ref.

AGS Ref.
Depth
Type

	20812960	20812985	20812990
	WS03	WS05	WS05
	ESES17	ESES22	ESES23
	0.70 - 0.90	0.20 - 0.30	0.60 - 0.70
	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
Anions by Kone (soil)	01-Oct-2019	01-Oct-2019	01-Oct-2019
Asbestos ID in Solid Samples	02-Oct-2019	03-Oct-2019	03-Oct-2019
Boron Water Soluble	03-Oct-2019	02-Oct-2019	02-Oct-2019
Chromium III	02-Oct-2019	02-Oct-2019	02-Oct-2019
Cyanide Comp/Free/Total/Thiocyanate	02-Oct-2019	01-Oct-2019	02-Oct-2019
EPH CWG (Aliphatic) GC (S)	02-Oct-2019	01-Oct-2019	02-Oct-2019
EPH CWG (Aromatic) GC (S)	02-Oct-2019	01-Oct-2019	02-Oct-2019
GRO by GC-FID (S)	02-Oct-2019	02-Oct-2019	02-Oct-2019
Hexavalent Chromium (s)	01-Oct-2019	01-Oct-2019	01-Oct-2019
Metals in solid samples by OES	03-Oct-2019	03-Oct-2019	03-Oct-2019
PAH by GCMS	30-Sep-2019	30-Sep-2019	01-Oct-2019
pH	02-Oct-2019	03-Oct-2019	02-Oct-2019
Phenols by HPLC (S)	02-Oct-2019	03-Oct-2019	02-Oct-2019
Sample description	27-Sep-2019	27-Sep-2019	27-Sep-2019
Total Organic Carbon	01-Oct-2019	01-Oct-2019	01-Oct-2019
TPH CWG GC (S)	02-Oct-2019	02-Oct-2019	02-Oct-2019
VOC MS (S)	03-Oct-2019	01-Oct-2019	03-Oct-2019



CERTIFICATE OF ANALYSIS

Validated

SDG: 190926-129
Location: Former X-Ray Site

Client Reference: A111150-7-1
Order Number: C19/982

Report Number: 526551
Superseded Report: 526545

ASSOCIATED AQC DATA

Alkalinity Filtered as CaCO₃

Component	Method Code	QC 2071	QC 2064
Total Alkalinity Filtered as CaCO ₃	TM043	101.01 95.62 : 106.88	101.01 95.62 : 106.88

Ammoniacal Nitrogen

Component	Method Code	QC 2075	QC 2001	QC 2061
Ammoniacal Nitrogen as N	TM099	100.0 93.14 : 108.60	98.8 93.14 : 108.60	100.4 93.14 : 108.60

Anions by Kone (soil)

Component	Method Code	QC 2026	QC 2057
Chloride (soluble)	TM243	100.0 77.23 : 120.97	112.95 77.23 : 120.97
Water Soluble Sulphate as SO ₄ 2:1 Extract	TM243	93.93 75.60 : 131.10	91.12 75.60 : 131.10

Anions by Kone (w)

Component	Method Code	QC 2041	QC 2066
Chloride	TM184	107.0 92.93 : 115.43	109.0 92.93 : 115.43
Sulphate (soluble)	TM184	101.6 90.53 : 113.03	104.4 90.53 : 113.03
TON as NO ₃	TM184	103.0 96.26 : 111.21	107.5 96.26 : 111.21

Boron Water Soluble

Component	Method Code	QC 2037	QC 2064	QC 2081	QC 2094
Water Soluble Boron	TM222	107.0 86.05 : 109.75	98.5 86.05 : 109.75	105.0 86.05 : 109.75	103.5 86.05 : 109.75

Cyanide Comp/Free/Total/Thiocyanate

Component	Method Code	QC 2032	QC 2046	QC 2087	QC 2086	QC 2052	QC 2077
Free Cyanide	TM153	86.5 83.05 : 112.74	86.8 83.05 : 112.74		99.2 91.00 : 109.60	97.5 91.00 : 109.60	
Free Cyanide (W)	TM227			101.0 93.25 : 112.75			99.75 92.00 : 113.00
Thiocyanate	TM153	89.82 89.81 : 110.19	89.82 89.81 : 110.19		89.22 92.09 : 108.16	91.02 92.09 : 108.16	



CERTIFICATE OF ANALYSIS

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SDG: 190926-129
Location: Former X-Ray Site

Client Reference: A111150-7-1
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Cyanide Comp/Free/Total/Thiocyanate

		QC 2032	QC 2046	QC 2087	QC 2086	QC 2052	QC 2077
Thiocyanate (W)	TM227			105.5 96.25 : 111.25			100.25 95.50 : 107.50
Total Cyanide	TM153	97.86 88.29 : 111.43	95.0 88.29 : 111.43		100.71 91.71 : 108.86	100.0 91.71 : 108.86	
Total Cyanide (W)	TM227			100.25 92.25 : 111.75			100.0 91.75 : 112.75

Dissolved Metals by ICP-MS

Component	Method Code	QC 2040	QC 2072	QC 2089	QC 2099	QC 2078	QC 2004
Aluminium	TM152	106.67 94.19 : 114.31	105.67 94.19 : 114.31	115.67 94.12 : 114.23	105.33 94.19 : 114.31	104.67 94.19 : 114.31	110.33 93.15 : 113.42
Antimony	TM152	104.5 79.80 : 122.00	108.0 79.80 : 122.00	110.5 88.00 : 112.00	104.67 79.80 : 122.00	107.17 79.80 : 122.00	117.5 88.37 : 130.57
Arsenic	TM152	97.0 90.42 : 111.32	97.67 90.42 : 111.32	108.83 88.00 : 112.00	101.5 90.42 : 111.32	110.17 90.42 : 111.32	105.33 92.62 : 113.52
Barium	TM152	102.67 90.79 : 113.16	104.17 90.79 : 113.16	109.0 88.00 : 112.00	100.33 90.79 : 113.16	102.33 90.79 : 113.16	108.83 93.15 : 115.52
Beryllium	TM152	101.83 85.99 : 112.78	101.5 85.99 : 112.78	110.17 81.30 : 113.51	100.33 85.99 : 112.78	98.0 85.99 : 112.78	107.0 85.23 : 107.63
Bismuth	TM152	102.33 91.88 : 114.28	104.17 91.88 : 114.28	108.83 91.90 : 112.20	101.67 91.88 : 114.28	101.33 91.88 : 114.28	105.67 92.62 : 115.02
Borate	TM152	109.88 88.00 : 112.00	106.79 88.00 : 112.00	115.43 88.00 : 112.00	104.32 88.00 : 112.00	101.85 88.00 : 112.00	
Boron	TM152	110.0 86.68 : 117.67	107.0 86.68 : 117.67	115.33 96.48 : 114.93	104.33 86.68 : 117.67	101.67 86.68 : 117.67	110.0 86.31 : 120.88
Cadmium	TM152	105.0 94.60 : 112.40	106.0 94.60 : 112.40	109.83 98.47 : 110.87	103.33 94.60 : 112.40	102.0 94.60 : 112.40	107.83 93.85 : 111.65
Calcium	TM152	94.0 83.40 : 121.11	96.67 83.40 : 121.11	115.33 81.38 : 119.09	104.0 83.40 : 121.11	105.33 83.40 : 121.11	106.67 89.20 : 126.91
Chromium	TM152	98.67 84.77 : 111.71	98.0 84.77 : 111.71	110.83 94.62 : 110.87	102.67 84.77 : 111.71	102.5 84.77 : 111.71	100.17 92.22 : 109.85
Cobalt	TM152	83.83 84.39 : 114.26	83.5 84.39 : 114.26	108.5 88.00 : 112.00	100.0 84.39 : 114.26	100.0 84.39 : 114.26	98.83 85.01 : 114.87
Copper	TM152	99.33 88.86 : 118.72	98.17 88.86 : 118.72	115.17 92.47 : 118.11	105.5 88.86 : 118.72	105.67 88.86 : 118.72	103.17 89.87 : 119.73
Iron	TM152	99.33 92.00 : 113.00	99.33 92.00 : 113.00	112.0 92.00 : 113.00	104.67 92.00 : 113.00	105.33 92.00 : 113.00	102.67 93.02 : 113.86
Lead	TM152	99.33 89.25 : 115.12	100.33 89.25 : 115.12	110.5 88.00 : 112.00	101.83 89.25 : 115.12	102.17 89.25 : 115.12	107.5 91.11 : 116.98
Lithium	TM152	107.33 89.26 : 119.04	107.67 89.26 : 119.04	114.0 98.47 : 115.47	104.33 89.26 : 119.04	101.33 89.26 : 119.04	111.0 86.01 : 115.79
Magnesium	TM152	102.67 90.67 : 117.69	102.67 90.67 : 117.69	112.67 90.25 : 114.53	103.33 90.67 : 117.69	103.33 90.67 : 117.69	103.33 89.60 : 116.61
Manganese	TM152	99.67 94.24 : 112.74	100.33 94.24 : 112.74	111.5 97.94 : 109.97	103.5 94.24 : 112.74	105.33 94.24 : 112.74	103.67 93.97 : 112.46
Molybdenum	TM152	95.33 87.00 : 108.89	95.17 87.00 : 108.89	101.83 88.00 : 112.00	97.33 87.00 : 108.89	98.83 87.00 : 108.89	100.17 89.07 : 110.96
Nickel	TM152	97.33 95.34 : 113.79	96.67 95.34 : 113.79	110.0 88.00 : 112.00	104.0 95.34 : 113.79	103.67 95.34 : 113.79	100.83 93.70 : 112.15
Phosphorus	TM152	99.83 85.44 : 110.40	101.5 85.44 : 110.40	108.33 88.00 : 112.00	99.67 85.44 : 110.40	100.33 85.44 : 110.40	101.0 89.24 : 114.18
Potassium	TM152	103.33 99.20 : 111.05	105.33 99.20 : 111.05	114.0 91.13 : 112.48	103.33 99.20 : 111.05	105.33 99.20 : 111.05	108.0 97.98 : 117.40



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Dissolved Metals by ICP-MS

		QC 2040	QC 2072	QC 2089	QC 2099	QC 2078	QC 2004
Selenium	TM152	101.67 88.44 : 113.86	102.83 88.44 : 113.86	108.67 91.58 : 115.98	99.67 88.44 : 113.86	109.17 88.44 : 113.86	111.17 91.69 : 117.12
Silver	TM152	104.33 94.40 : 114.74	103.17 94.40 : 114.74	111.83 94.91 : 114.41	105.83 94.40 : 114.74	106.83 94.40 : 114.74	107.0 96.95 : 117.30
Sodium	TM152	102.67 94.83 : 112.16	102.0 94.83 : 112.16	111.33 95.92 : 112.85	103.33 94.83 : 112.16	103.33 94.83 : 112.16	102.67 92.42 : 113.24
Strontium	TM152	103.67 90.72 : 114.82	104.0 90.72 : 114.82	108.67 88.00 : 112.00	101.67 90.72 : 114.82	103.67 90.72 : 114.82	108.33 92.14 : 116.24
Tellurium	TM152	97.17 90.72 : 112.62	98.5 90.72 : 112.62	106.67 93.32 : 114.66	97.33 90.72 : 112.62	99.67 90.72 : 112.62	106.83 89.88 : 111.78
Thallium	TM152	102.67 86.08 : 122.48	104.67 86.08 : 122.48	108.67 88.00 : 112.00	99.83 86.08 : 122.48	100.0 86.08 : 122.48	103.5 86.08 : 122.48
Tin	TM152	101.5 91.00 : 109.00	103.5 91.00 : 109.00	110.67 91.00 : 109.00	104.17 91.00 : 109.00	105.83 91.00 : 109.00	110.33 91.00 : 109.00
Titanium	TM152	96.5 88.82 : 109.83	96.33 88.82 : 109.83	104.17 88.36 : 106.06	96.67 88.82 : 109.83	95.0 88.82 : 109.83	101.33 86.17 : 105.17
Tungsten	TM152	103.83 78.12 : 132.82	107.0 78.12 : 132.82	116.17 81.32 : 124.72	170.0 78.12 : 132.82	108.5 78.12 : 132.82	131.17 77.61 : 132.31
Uranium	TM152	101.0 90.58 : 113.28	101.83 90.58 : 113.28	108.5 88.00 : 112.00	99.5 90.58 : 113.28	99.33 90.58 : 113.28	104.5 86.97 : 115.76
Vanadium	TM152	103.83 88.43 : 114.30	102.67 88.43 : 114.30	110.33 88.00 : 112.00	103.33 88.43 : 114.30	100.67 88.43 : 114.30	110.17 89.61 : 115.48
Zinc	TM152	89.33 86.52 : 115.27	89.33 86.52 : 115.27	114.67 98.64 : 121.36	103.33 86.52 : 115.27	105.67 86.52 : 115.27	104.0 87.51 : 116.26

Dissolved Organic/Inorganic Carbon

Component	Method Code	QC 2077	QC 2035	QC 2096
Dissolved Inorganic Carbon	TM090	101.5 93.58 : 112.28	107.67 93.58 : 112.28	101.17 91.27 : 109.87
Dissolved Organic Carbon	TM090	101.67 96.28 : 110.58	101.0 96.28 : 110.58	103.83 97.87 : 108.77

EPH CWG (Aliphatic) GC (S)

Component	Method Code	QC 2048	QC 2082	QC 2076	QC 2032
Total Aliphatics >C12-C35	TM173	77.29 70.76 : 104.69	87.08 66.17 : 105.28	89.38 70.76 : 104.69	83.54 70.71 : 106.26

EPH CWG (Aromatic) Filtered GC (W)

Component	Method Code	QC 2007	QC 2074
Total Aromatics >EC10-EC40	TM174	87.8 73.75 : 120.32	89.02 73.75 : 120.32

EPH CWG (Aromatic) GC (S)



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EPH CWG (Aromatic) GC (S)

Component	Method Code	QC 2048	QC 2082	QC 2076	QC 2032
Total Aromatics >EC12-EC35	TM173	80.0 68.16 : 102.29	86.67 65.78 : 102.90	86.67 68.16 : 102.29	73.33 65.82 : 105.00

GRO by GC-FID (S)

Component	Method Code	QC 2040
QC	TM089	102.87 72.28 : 114.54

GRO by GC-FID (W)

Component	Method Code	QC 2029
Benzene by GC	TM245	88.5 76.38 : 121.90
Ethylbenzene by GC	TM245	92.5 74.02 : 123.14
m & p Xylene by GC	TM245	89.75 74.03 : 123.21
MTBE GC-FID	TM245	100.0 76.82 : 121.46
o Xylene by GC	TM245	94.5 74.37 : 122.75
QC	TM245	113.52 63.32 : 125.20
Toluene by GC	TM245	89.5 75.75 : 124.83

Hexavalent Chromium (s)

Component	Method Code	QC 2048	QC 2062	QC 2075	QC 2088	QC 2009
Hexavalent Chromium	TM151	104.0 90.20 : 107.00	102.0 90.20 : 107.00	102.0 90.20 : 107.00	102.0 90.20 : 107.00	106.0 90.20 : 107.00

Mercury Dissolved

Component	Method Code	QC 2010	QC 2063
Mercury Dissolved (CVAf)	TM183	97.2 76.80 : 117.12	93.1 75.00 : 111.00

Metals in solid samples by OES



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Metals in solid samples by OES

Component	Method Code	QC 2055	QC 2019	QC 2043	QC 2064	QC 2002
Aluminium	TM181	95.58 77.84 : 119.01	95.58 77.84 : 119.01	84.96 77.84 : 119.01	96.46 77.84 : 119.01	102.65 77.84 : 119.01
Antimony	TM181	101.63 84.28 : 107.67	110.98 84.28 : 107.67	103.25 84.28 : 107.67	102.85 84.28 : 107.67	102.03 84.28 : 107.67
Arsenic	TM181	100.58 87.05 : 109.36	100.87 87.05 : 109.36	100.58 87.05 : 109.36	102.62 87.05 : 109.36	102.62 87.05 : 109.36
Barium	TM181	94.5 82.49 : 109.34	100.92 82.49 : 109.34	85.69 82.49 : 109.34	94.5 82.49 : 109.34	95.41 82.49 : 109.34
Beryllium	TM181	101.12 85.44 : 109.61	104.85 85.44 : 109.61	101.12 85.44 : 109.61	102.99 85.44 : 109.61	102.99 85.44 : 109.61
Boron	TM181	91.98 73.51 : 104.66	95.42 73.51 : 104.66	88.25 73.51 : 104.66	91.4 73.51 : 104.66	97.42 73.51 : 104.66
Cadmium	TM181	92.18 81.46 : 106.43	94.65 81.46 : 106.43	95.88 81.46 : 106.43	96.71 81.46 : 106.43	97.94 81.46 : 106.43
Chromium	TM181	96.55 82.26 : 104.55	101.42 82.26 : 104.55	94.73 82.26 : 104.55	94.93 82.26 : 104.55	96.55 82.26 : 104.55
Cobalt	TM181	91.19 86.54 : 106.87	92.45 86.54 : 106.87	91.51 86.54 : 106.87	93.71 86.54 : 106.87	95.28 86.54 : 106.87
Copper	TM181	96.48 82.40 : 105.45	100.88 82.40 : 105.45	94.89 82.40 : 105.45	95.25 82.40 : 105.45	95.77 82.40 : 105.45
Iron	TM181	96.83 82.95 : 110.58	96.03 82.95 : 110.58	95.24 82.95 : 110.58	98.41 82.95 : 110.58	99.21 82.95 : 110.58
Lead	TM181	93.69 78.24 : 104.05	92.34 78.24 : 104.05	96.17 78.24 : 104.05	97.07 78.24 : 104.05	96.17 78.24 : 104.05
Manganese	TM181	108.61 94.29 : 119.51	113.61 94.29 : 119.51	109.72 94.29 : 119.51	109.44 94.29 : 119.51	108.33 94.29 : 119.51
Mercury	TM181	92.75 83.74 : 105.34	94.44 83.74 : 105.34	94.2 83.74 : 105.34	95.17 83.74 : 105.34	97.1 83.74 : 105.34
Molybdenum	TM181	99.59 87.11 : 106.87	104.12 87.11 : 106.87	99.59 87.11 : 106.87	101.65 87.11 : 106.87	101.23 87.11 : 106.87
Nickel	TM181	92.91 81.92 : 102.18	96.09 81.92 : 102.18	92.67 81.92 : 102.18	94.13 81.92 : 102.18	96.33 81.92 : 102.18
Phosphorus	TM181	107.27 94.56 : 124.28	108.89 94.56 : 124.28	106.67 94.56 : 124.28	107.07 94.56 : 124.28	108.08 94.56 : 124.28
Selenium	TM181	100.78 86.28 : 110.48	104.31 86.28 : 110.48	102.35 86.28 : 110.48	102.75 86.28 : 110.48	103.53 86.28 : 110.48
Strontium	TM181	95.1 79.13 : 102.79	99.78 79.13 : 102.79	91.98 79.13 : 102.79	94.43 79.13 : 102.79	97.55 79.13 : 102.79
Thallium	TM181	97.79 82.94 : 111.86	96.9 82.94 : 111.86	104.87 82.94 : 111.86	105.31 82.94 : 111.86	106.19 82.94 : 111.86
Tin	TM181	101.52 90.25 : 108.86	104.94 90.25 : 108.86	101.52 90.25 : 108.86	103.42 90.25 : 108.86	104.56 90.25 : 108.86
Titanium	TM181	87.02 66.23 : 102.06	87.79 66.23 : 102.06	80.92 66.23 : 102.06	83.97 66.23 : 102.06	87.79 66.23 : 102.06
Vanadium	TM181	100.0 86.37 : 107.94	104.4 86.37 : 107.94	97.44 86.37 : 107.94	99.27 86.37 : 107.94	100.73 86.37 : 107.94
Zinc	TM181	100.0 84.68 : 113.99	104.93 84.68 : 113.99	98.77 84.68 : 113.99	100.21 84.68 : 113.99	103.29 84.68 : 113.99

PAH by GCMS



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PAH by GCMS

Component	Method Code	QC 2039	QC 2057	QC 2083	QC 2012	QC 2096
Acenaphthene	TM218	94.5 76.79 : 103.90	88.0 76.79 : 103.90	93.5 80.97 : 105.99	100.5 76.82 : 113.72	88.5 80.97 : 105.99
Acenaphthylene	TM218	94.0 78.40 : 108.66	88.5 78.40 : 108.66	93.0 80.24 : 105.29	102.5 75.95 : 108.85	88.0 80.24 : 105.29
Anthracene	TM218	91.5 76.15 : 110.07	85.0 76.15 : 110.07	92.5 73.72 : 109.23	94.0 76.67 : 109.58	92.0 73.72 : 109.23
Benz(a)anthracene	TM218	96.5 73.77 : 119.26	102.5 73.77 : 119.26	95.0 79.72 : 116.84	88.0 70.05 : 119.30	94.5 79.72 : 116.84
Benzo(a)pyrene	TM218	97.5 73.20 : 114.18	107.0 73.20 : 114.18	96.0 69.58 : 110.26	83.5 68.22 : 116.60	97.0 69.58 : 110.26
Benzo(b)fluoranthene	TM218	92.0 75.36 : 117.58	100.5 75.36 : 117.58	89.5 77.35 : 112.97	80.0 75.44 : 113.45	90.5 77.35 : 112.97
Benzo(ghi)perylene	TM218	92.5 70.73 : 116.12	108.0 70.73 : 116.12	94.0 77.68 : 107.38	76.0 70.79 : 114.76	92.5 77.68 : 107.38
Benzo(k)fluoranthene	TM218	94.5 75.98 : 116.59	99.5 75.98 : 116.59	99.0 82.61 : 111.93	79.0 81.43 : 115.17	97.0 82.61 : 111.93
Chrysene	TM218	95.5 74.82 : 114.18	101.5 74.82 : 114.18	96.0 80.28 : 111.42	84.0 75.94 : 114.39	96.5 80.28 : 111.42
Dibenzo(ah)anthracene	TM218	92.0 69.17 : 115.30	103.5 69.17 : 115.30	94.5 79.17 : 106.41	76.5 71.87 : 118.97	98.5 79.17 : 106.41
Fluoranthene	TM218	94.5 75.88 : 112.84	95.5 75.88 : 112.84	93.5 79.07 : 112.75	89.5 77.92 : 113.69	92.0 79.07 : 112.75
Fluorene	TM218	94.0 78.50 : 114.02	86.5 78.50 : 114.02	94.5 80.52 : 110.90	101.5 82.02 : 108.34	91.0 80.52 : 110.90
Indeno(123cd)pyrene	TM218	91.0 70.26 : 117.95	92.5 70.26 : 117.95	83.5 76.97 : 113.36	73.0 67.80 : 113.60	93.0 76.97 : 113.36
Naphthalene	TM218	94.5 75.24 : 111.26	88.5 75.24 : 111.26	97.5 83.50 : 110.02	109.5 88.41 : 116.04	90.5 83.50 : 110.02
Phenanthrene	TM218	92.5 77.07 : 107.43	86.5 77.07 : 107.43	95.0 79.34 : 111.91	95.5 78.26 : 113.22	92.5 79.34 : 111.91
Pyrene	TM218	94.5 78.74 : 112.56	96.5 78.74 : 112.56	95.0 74.43 : 114.36	92.5 74.86 : 116.81	94.0 74.43 : 114.36

PAH in waters by GC-MS (diss.filt)

Component	Method Code	QC 2008	QC 2075
Acenaphthene (diss.filt)	TM178	105.6 94.00 : 120.40	110.4 94.00 : 120.40
Acenaphthylene (diss.filt)	TM178	104.4 91.20 : 117.60	107.6 91.20 : 117.60
Anthracene (diss.filt)	TM178	107.6 91.20 : 112.80	105.6 91.20 : 112.80
Benzo(a)anthracene (diss.filt)	TM178	106.4 86.80 : 115.60	105.2 86.80 : 115.60
Benzo(a)pyrene (diss.filt)	TM178	98.4 90.40 : 116.80	102.4 90.40 : 116.80
Benzo(b)fluoranthene (diss.filt)	TM178	101.2 86.40 : 117.60	99.2 86.40 : 117.60
Benzo(g,h,i)perylene (diss.filt)	TM178	103.6 87.60 : 121.20	109.6 87.60 : 121.20
Benzo(k)fluoranthene (diss.filt)	TM178	102.8 91.20 : 124.80	105.6 91.20 : 124.80
Chrysene (diss.filt)	TM178	104.8 95.20 : 124.00	111.6 95.20 : 124.00



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PAH in waters by GC-MS (diss.filt)

		QC 2008	QC 2075
Dibenzo(a,h)anthracene (diss.filt)	TM178	100.4 84.80 : 118.40	108.4 84.80 : 118.40
Fluoranthene (diss.filt)	TM178	110.8 91.20 : 120.00	109.6 91.20 : 120.00
Fluorene (diss.filt)	TM178	108.4 93.20 : 119.60	110.0 93.20 : 119.60
Indeno(1,2,3-cd)pyrene (diss.filt)	TM178	104.4 86.80 : 115.60	105.6 86.80 : 115.60
Naphthalene (diss.filt)	TM178	101.2 90.40 : 126.40	104.0 90.40 : 126.40
Phenanthrene (diss.filt)	TM178	105.6 94.40 : 118.40	108.0 94.40 : 118.40
Pyrene (diss.filt)	TM178	110.4 93.60 : 120.00	111.6 93.60 : 120.00

pH

Component	Method Code	QC 2066	QC 2015	QC 2093
pH	TM133	98.84 97.69 : 101.15	99.07 98.24 : 100.97	98.84 98.24 : 100.97

pH Value of Filtered Water

Component	Method Code	QC 2063	QC 2070
pH Value of Filtered Water	TM256	101.35 99.73 : 102.16	101.08 99.73 : 102.16

Phenols by HPLC (S)

Component	Method Code	QC 2005	QC 2024	QC 2043	QC 2002
2,3,5 Trimethyl-Phenol by HPLC (S)	TM062 (S)	92.21 65.50 : 89.50	96.75 83.23 : 109.71	102.6 65.50 : 89.50	103.9 83.23 : 109.71
2-Isopropyl Phenol by HPLC (S)	TM062 (S)	92.98 86.25 : 116.25	98.25 76.34 : 104.11	94.15 86.25 : 116.25	97.66 76.34 : 104.11
Catechol by HPLC (S)	TM062 (S)	70.48 19.39 : 135.70	82.86 22.43 : 157.02	87.62 19.39 : 135.70	95.24 22.43 : 157.02
Cresols by HPLC (S)	TM062 (S)	92.69 81.00 : 112.20	96.87 85.60 : 112.00	96.03 81.00 : 112.20	97.49 85.60 : 112.00
Napthol by HPLC (S)	TM062 (S)	100.0 57.50 : 102.50	101.43 75.62 : 124.38	113.57 57.50 : 102.50	111.43 75.62 : 124.38
Phenol by HPLC (S)	TM062 (S)	102.65 95.33 : 123.33	96.69 79.53 : 120.47	111.26 95.33 : 123.33	106.62 79.53 : 120.47
Resorcinol HPLC (S)	TM062 (S)	101.89 69.99 : 127.22	103.77 71.43 : 129.59	108.18 69.99 : 127.22	110.06 71.43 : 129.59
Xylenols by HPLC (S)	TM062 (S)	89.48 90.22 : 114.22	94.38 89.90 : 107.23	101.56 90.22 : 114.22	106.25 89.90 : 107.23

Phenols by HPLC (W)



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Phenols by HPLC (W)

Component	Method Code	QC 2081	QC 2041	QC 2053
2,3,5 Trimethyl-Phenol by HPLC (W)	TM259	99.0 93.10 : 108.70	98.0 93.10 : 108.70	107.0 93.10 : 108.70
2-Isopropyl Phenol by HPLC (W)	TM259	109.0 90.00 : 114.00	109.0 90.00 : 114.00	108.0 90.00 : 114.00
Cresols by HPLC (W)	TM259	101.67 90.02 : 130.15	101.0 90.02 : 130.15	107.67 90.02 : 130.15
Napthol by HPLC (W)	TM259	110.0 94.72 : 118.72	110.0 94.72 : 118.72	109.0 94.72 : 118.72
Phenol by HPLC (W)	TM259	106.0 85.89 : 109.89	104.0 85.89 : 109.89	105.0 85.89 : 109.89
Xylenols by HPLC (W)	TM259	105.67 98.67 : 108.67	105.83 98.67 : 108.67	106.0 98.67 : 108.67

Total Organic Carbon

Component	Method Code	QC 2023	QC 2043	QC 2063	QC 2036
Total Organic Carbon	TM132	83.2 69.88 : 102.67	78.91 69.88 : 102.67	81.25 69.88 : 102.67	83.2 69.88 : 102.67

VOC MS (S)

Component	Method Code	QC 2068	QC 2098
1,1,1,2-tetrachloroethane	TM116	106.8 79.10 : 119.66	100.2 79.10 : 119.66
1,1,1-Trichloroethane	TM116	108.6 87.51 : 115.37	99.2 87.51 : 115.37
1,1,2-Trichloroethane	TM116	103.4 75.16 : 112.70	92.4 75.16 : 112.70
1,1-Dichloroethane	TM116	117.8 89.44 : 121.71	105.8 89.44 : 121.71
1,2-Dichloroethane	TM116	115.6 86.58 : 129.62	105.0 86.58 : 129.62
1,4-Dichlorobenzene	TM116	112.4 84.04 : 124.40	110.6 84.04 : 124.40
2-Chlorotoluene	TM116	111.2 66.81 : 118.43	99.0 66.81 : 118.43
4-Chlorotoluene	TM116	103.2 65.88 : 114.76	95.2 65.88 : 114.76
Benzene	TM116	105.8 85.63 : 110.10	96.0 85.63 : 110.10
Carbon Disulphide	TM116	117.4 75.11 : 124.81	102.2 75.11 : 124.81
Carbontetrachloride	TM116	107.0 82.35 : 126.46	102.6 82.35 : 126.46
Chlorobenzene	TM116	108.2 82.88 : 122.42	99.6 82.88 : 122.42
Chloroform	TM116	116.8 91.34 : 123.04	102.6 91.34 : 123.04
Chloromethane	TM116	132.0 52.88 : 131.36	115.6 52.88 : 131.36



CERTIFICATE OF ANALYSIS

Validated

SDG: 190926-129
Location: Former X-Ray Site

Client Reference: A111150-7-1
Order Number: C19/982

Report Number: 526551
Superseded Report: 526545

VOC MS (S)

		QC 2068	QC 2098
Cis-1,2-Dichloroethene	TM116	105.8 78.27 : 128.90	97.6 78.27 : 128.90
Dibromomethane	TM116	102.6 71.69 : 119.43	95.8 71.69 : 119.43
Dichloromethane	TM116	122.6 89.49 : 128.89	107.0 89.49 : 128.89
Ethylbenzene	TM116	96.6 70.95 : 113.07	92.4 70.95 : 113.07
Hexachlorobutadiene	TM116	77.4 7.32 : 139.00	86.4 7.32 : 139.00
Isopropylbenzene	TM116	93.8 52.15 : 132.52	87.0 52.15 : 132.52
Naphthalene	TM116	115.0 80.29 : 135.77	109.2 80.29 : 135.77
o-Xylene	TM116	93.8 68.16 : 107.61	82.8 68.16 : 107.61
p/m-Xylene	TM116	94.3 73.52 : 108.71	89.0 73.52 : 108.71
Sec-Butylbenzene	TM116	89.2 49.79 : 125.67	94.6 49.79 : 125.67
Tetrachloroethene	TM116	109.6 81.43 : 126.65	104.4 81.43 : 126.65
Toluene	TM116	97.8 85.50 : 114.89	87.6 85.50 : 114.89
Trichloroethene	TM116	102.6 79.80 : 112.33	88.8 79.80 : 112.33
Trichlorofluoromethane	TM116	127.2 88.86 : 128.82	114.0 88.86 : 128.82
Vinyl Chloride	TM116	134.2 69.66 : 136.55	124.6 69.66 : 136.55

The above information details the reference name of the analytical quality control sample (AQC) that has been run with the samples contained in this report for the different methods of analysis .

The figure detailed is the percentage recovery result for the AQC .

The subscript numbers below are the percentage recovery lower control limit (LCL) and the upper control limit (UCL). The percentage recovery result for the AQC should be between these limits to be statistically in control .



CERTIFICATE OF ANALYSIS

SDG:	190926-129	Client Reference:	A111150-7-1	Report Number:	526551
Location:	Former X-Ray Site	Order Number:	C19/982	Superseded Report:	526545

Appendix

General

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

2. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

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

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

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

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

7. Results relate only to the items tested.

8. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

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

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

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

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

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

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

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

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

17. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as "mixed hydrocarbons". Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

18. Sample Deviations

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

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

19. Asbestos

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

Identification of Asbestos in Bulk Materials & Soils

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

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Respirable Fibres

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

Standing Committee of Analysts, *The Quantification of Asbestos in Soil* (2107).

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

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

INPUT DATA											RESULTS (Copper)				RESULTS (Zinc)			
ID	Location	Waterbody	Date	Measured Cu Concentration (dissolved) (µg l ⁻¹)	Measured Zn Concentration (dissolved) (µg l ⁻¹)	Measured Mn Concentration (dissolved) (µg l ⁻¹)	Measured Ni Concentration (dissolved) (µg l ⁻¹)	pH	DOC	Ca	Site-specific PNEC Dissolved Copper (µg l ⁻¹)	BioF	Bioavailable Copper Concentration (µg l ⁻¹)	Risk Characterisation Ratio	Site-specific PNEC Dissolved Zinc (µg l ⁻¹)	BioF	Bioavailable Zinc Concentration (µg l ⁻¹)	Risk Characterisation Ratio
WS02				0.53	1.25			7.73	5.71	65	22.99	0.04	0.02	0.02	30.07	0.36	0.45	0.04
HP3				0.299				8.2	4.93	50	12.04	0.08	0.02	0.02	28.50	0.38		
HP5				0.44				7.93	3	50	9.08	0.11	0.05	0.05	21.21	0.51		
SHP3				0.366				8.29	5.5	60	12.10	0.08	0.03	0.03	30.76	0.35		



APPENDIX D – GROUND GAS MONITORING RESULTS

5th Floor, Longcross Court, 47 Newport Road, Cardiff, CF24 0AD



Date Monitored: 04/10/19
Monitoring Engineer: LH
Weather: Rainy

[illegible]

Notes

nt = not tested
nd = not detected

Data Compiled by: LH
Data Checked by: AJ

5th Floor, Longcross Court, 47 Newport Road, Cardiff, CF24 0AD



Date Monitored: 11/10/19
Monitoring Engineer: LH
Weather: Rainy

[illegible]

Notes

nt = not tested
nd = not detected

Data Compiled by: LH
Data Checked by: AJ

5th Floor, Longcross Court, 47 Newport Road, Cardiff, CF24 0AD



Date Monitored: 18/10/19
Monitoring Engineer: LH
Weather: Rainy

[illegible]

Notes

nt = not tested
nd = not detected

Data Compiled by: LH
Data Checked by: AJ

5th Floor, Longcross Court, 47 Newport Road, Cardiff, CF24 0AD



Date Monitored: 25/10/19
Monitoring Engineer: LH
Weather: Rainy

Notes nt = not tested
 nd = not detected

Data Compiled by: LH
Data Checked by: AJ

5th Floor, Longcross Court, 47 Newport Road, Cardiff, CF24 0AD



Date Monitored: 01/11/19
Monitoring Engineer: LH
Weather: Rainy

Notes nt = not tested
 nd = not detected

Data Compiled by: LH
Data Checked by: AJ

5th Floor, Longcross Court, 47 Newport Road, Cardiff, CF24 0AD



Date Monitored: 08/11/19
Monitoring Engineer: JD
Weather: Clear

[illegible]

Notes

nt = not tested
nd = not detected

Data Compiled by: LH
Data Checked by: AJ



APPENDIX E – CIRIA C552 RISK METHODOLOGY

The following tables are derived from CIRIA C552 and have been used to define the risk rating presented in the Qualitative Risk Assessment matrix.

Classification of consequence

Classification	Definition
Severe	Short term (acute) risk to human health likely to result in 'significant harm' as defined by the Environment Protection Act 1990, Part IIA. Short term risk of pollution (note; Water Resources Act contains no scope for considering significant pollution) of sensitive water resource. Catastrophic damage to building/property. A short-term risk to a particular ecosystem, or organism forming part of such ecosystem. (Note the definitions of ecological systems within the Draft Circular on Contaminated Land DETR, 2000).
Medium	Chronic damage to human health ('significant harm', as defined In DETR, 2000). Pollution of sensitive water resources (note; Water Resources Act contains no scope for considering significant pollution). A significant change in a particular ecosystem, or an organism forming part of such an ecosystem. (Note the definitions of ecological systems within the Draft Circular on Contaminated Land DETR, 2000).
Mild	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services ('significant harm', as defined In DETR, 2000). Damage to sensitive buildings/structures/services or the environment.
Minor	Harm, although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve. Non-permanent health effects to human health (easily prevented by means such as personal protective clothing etc). Easily repairable effects of damage to buildings, structures and services.

Classification of probability

Classification	Definition
High likelihood	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term or there is evidence at the receptor of harm or pollution.
Likely	There is a 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.
Low likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period that such an event would take place, and is even less likely in the shorter term.
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

Matrix of consequence against probability to gain a risk classification

		Consequence			
		Severe	Medium	Mild	Minor
Probability	High Likelihood	Very High Risk	High Risk	Moderate Risk	Moderate/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



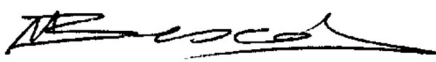
APPENDIX F – RADIOLOGICAL SURVEY



Radman Associates

Specialists in Radiological Protection Management

Non-intrusive Radiological Survey Report

Client:	WYG
Address:	5 th Floor Longcross Court 47 Newport Road Cardiff CF24 0AD
Client contact:	Adam James (Principal Consultant)
Address of premises surveyed:	Former X-ray Building and Yard Cefn Gwrgan Road Margam Port Talbot SA13 2EZ
Survey date:	24 September 2019
Report date:	14 October 2019
Author:	 Dr Mark Bescoby Accredited Radiation protection Adviser & Radioactive Waste Adviser
Document status:	1 st Issue
Document reference:	WYG/MAR/SR1
Document approved:	 Robert Collins Accredited Radiation Protection Adviser
<i>This report has been prepared by Radman Associates with all reasonable skill, care and diligence, within the terms of the contract with the client. The report is confidential to the client and Radman Associates accepts no responsibility of whatever nature to third parties to whom this report may be made known. No part of this document may be reproduced without the prior written approval of Radman Associates.</i>	

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1. Introduction

This report relates to a non-intrusive radiological survey of the former X-ray Building and Yard, Margam, Port Talbot, as part of ground investigations works to support future development of the site.

The aim of the survey was to identify any radiologically significant contamination as a result of historic use of the site. Radiologically significant is defined as falling within scope of the Environmental Permitting Regulations 2016 *as amended*¹.

2. Potential radioactive contaminants

It is understood that cobalt-60 (Co-60) waste was buried in a storage pit on site, with an activity of < 27 kBq in December 1995. The half life of Co-60 is 5.26 years; therefore, given the amount of time that has elapsed the activity would now be < 0.9 kBq which, depending on the mass of contaminated material, is now likely to be out of scope of the Environmental Permitting (England and Wales) Regulations 2016 *as amended*.

Any cobalt waste contains gamma-emitting radionuclides and, therefore, screening for significant radiological contamination may be performed using suitable solid state (or 'scintillation') detectors (see Section 4).

An X-ray radiography bay is situated within the building; however, given the nature of X-rays no radiological contamination would be produced.

On any brownfield site there is the potential for naturally occurring radioactive material (NORM) to be present as such material was commonly used as aggregate in hardstanding areas.

3. Monitoring instruments

During investigations, the identification of radiological contaminants was possible via detection of the gamma radiation.

Measurements were performed using the following hand-held instruments:

	Monitor	Serial No.	Detector type	Background (cps)
1	Georadis GT-40	C0027	Scintillation detector	300
2	Mini 900 44A	19624/19639	Scintillation detector	< 10

cps =counts per second.

The instruments were calibrated in compliance with Reg 20 of the IRR17² and in accordance with guidance published by the National Physical Laboratory³.

Background readings were taken from grassed areas to the north of the site, assumed to be representative of the local area background.

4. Monitoring methodology

4.1 Walkover survey

A non-intrusive walk-over survey was performed by a Radiation Protection Adviser using a battery operated hand-held Georadis GT-40 NaI scintillation detector (Instrument 1) according to an approximate 1 metre transect and 0.5 m above ground level. The walkover survey was conducted at approximately 1 m/sec. The instrumentation integrates counts every 1 second to provide a count rate reading approximately every metre.

The instrument is considered suitable for the identification of radiologically significant Co-60 and for naturally occurring radioactive material (NORM), including Ra-226, via detection of the photon radiation emitted by U-235 and various U-238 and Th-232 daughter nuclides.

The external areas surveyed are highlighted in Appendix 1.

4.2 Instrument responses & actions

A reading greater than twice the local area background indicates material that is considered to be potentially radiologically contaminated. Given the uncertainties associated with confirming anthropogenic activity, twice background count rate is accepted practice in identifying radiological contamination in excess of the normal fluctuations in natural background.

5. Monitoring results

No elevated readings were obtained from the interior of the building indicating the absence of any radiologically significant contamination within the building.

Some elevated readings were obtained during the external walkover survey. These were recorded over tarmac/hand standing. Low resolution gamma spectroscopy was performed over a number of areas and all returned spectra which indicated naturally occurring radioactive material. No peaks were evident at the Co-60 energies indicating the absence of any radiologically significant Co-60 contamination.

6. Conclusions and recommendations

Although the absence of any radiologically significant contamination across the entire site cannot be guaranteed the results of the non-intrusive survey, indicate a low risk of such contamination being present on site. It is understood that the plan for the site is to refurbish the existing building and not redevelop the entire site; therefore, any risk to construction workers and future occupiers of the site is deemed to be negligible.

It is recommended that a watching brief is maintained during groundworks for any signs of potential radiological contamination. If any such material is discovered monitoring should be performed to ascertain if the material is radioactive.

The radiation warning signs on the door of the radiography bay (Appendix 2) should be removed and destroyed to prevent any misinterpretation that a radiation hazard is present.

References

1. Environmental Permitting (England and Wales) Regulations 2016 S.I. 1154.
2. Radiological Remediation Report for Alun Griffiths (Contractors) Ltd at St Athan. Aurora. January 2019.
3. Ionising Radiations Regulations 2017 S.I. 1075.
4. Measurement Good Practice Guide No 14: The Examination, Testing & Calibration of Portable Radiation Protection Instruments ISSN 1368-6550. Issue 2 (August 2014).

Appendix 1 – Approximate coverage of walkover survey.



Appendix 2 – Radiography bay within the building with X-ray warning signs.

