



Remediation Strategy Report

Site: Proposed Residential Development,
Former Ysgol Santes Tudful

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SECTION 1 Introduction and Proposed Development

1.1 Introduction

The Priority Organisation Limited (the Client) is proposing the development of ten residential units at Former Ysgol Santes Tudful, Queens Road, Merthyr Tydfil.

TFW Group Ltd has been commissioned by the Client to prepare a Remediation Strategy report for the site.

Previous investigations and assessments have identified that remediation of contamination is required for the development. This report presents a Remediation Strategy for the site based on these previous investigations and assessments.

1.2 Objectives

The objective of the Remediation Strategy is to detail the remedial steps that are required to render the site fit for its intended use.

In summary, the following remediation requirements have been identified and are covered in detail in this report.

- Capping with buildings, hardstanding, and by 600mm of imported, uncontaminated soil in gardens and landscaped areas.

1.3 Previous Investigations and Assessments

The Remediation Strategy is based on the findings of previous investigations and assessments. This report shall be read in conjunction with the following documents.

- Geoenvironmental Report Proposed Development, Former Ysgol Santes Tudful. Report Reference: 09/12/20-16404-ISSUE-1, Report Number: 16404, dated: December 2020.

1.4 Limitations and Exceptions of Investigation

This report has been prepared for the sole internal reliance of the Client and its design and construction team. This report shall not be relied upon or transferred to any other parties without the express written authorisation of TFW Group Ltd. If an unauthorised third party comes into possession of this report, they rely on it at their peril and the authors owe them no duty of care and skill. The report represents the findings and opinions of experienced geoenvironmental and geotechnical consultants. TFW Group Ltd does not provide legal advice and the advice of lawyers may be required.

It is not within the scope of TFW Group Ltd to:

- Provide Method Statements and Risk Assessments for the site remediation, preparation, and development.
- Design, assess or install utility service trench fill and pipes for potable water supply beneath the site.

1.5 Quality Assurance

The quality and environmental aspects of the assessment and investigation comply with UKAS Accredited ISO 9001:2015 and ISO 14001:2015 standards.

SECTION 2 Site Characteristics

The following subsection information has been summarised from previous investigation and assessments listed in **Section 1.3**.

2.1 Site Location and Description

The development site is rectangular in shape and locates East of Queens Road, Merthyr Tydfil. The site centres on an approximate National Grid Reference of 305360 206540, occupying a plan area of approximately 0.8 Hectares.

The site is currently unoccupied and is currently under preparation for development. Queens Road runs alongside the west of the site boundary. Located to the east is the Cyfarthfa High School. The perimeter of the site is occupied by trees and grassland.

Site boundaries are defined to the north by fencing and trees, to the east by fencing to Cyfarthfa High School, to the south by fencing along the residential area characterised by large dwellings of low density and to the west by a public footpath alongside Queens Road.

Offsite to the southwest is a cluster of tennis courts and to the west is Thomastown Park recreation ground. To the north is the Gorsedd stone circle.

The site elevation is approximately 228m AOD steeply sloping down to the west/southwest.

The site location can be seen on **Figure 2.1**.

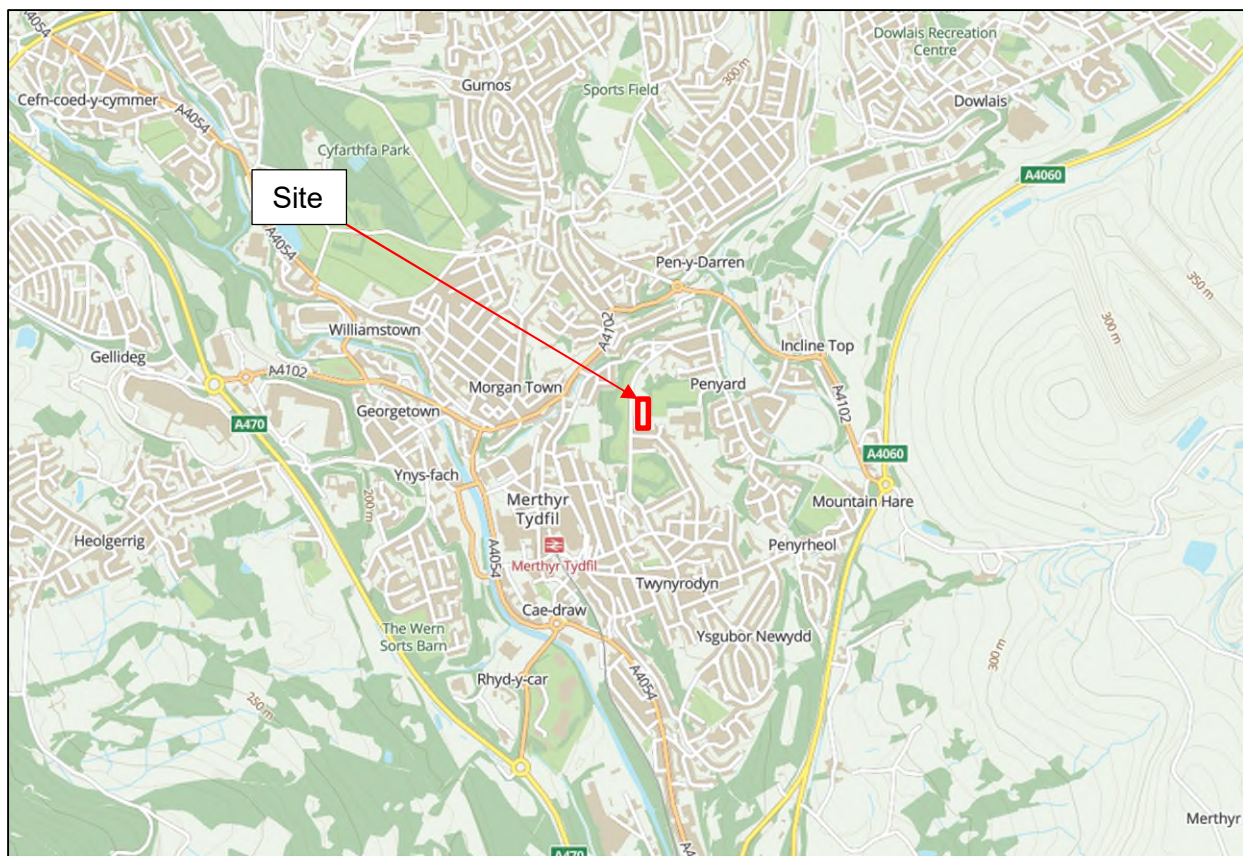


Figure 2.1 Site Location

2.2 Site History Summary

Historical maps of the site have been obtained from an Envirocheck Report, provided by Landmark Information Group, and summarised in **Table 2.1**. Distances, where quoted are approximate, and any changes in-between map editions may not be recorded.

Table 2.1 Site History Summary

Map Edition & Scale	Key Features on Site	Key Features off Site
1875 1:2,500	To the southwest there is a definitive square shape boundary that is crossing into the site boundary. Roughly half of the southern end of the site is covered by scrubland.	There is an infirmary located ~100m to the southwest. A spring is situated <100m to the northeast.
1900 1:2,500	Scrubland has been removed from within the site boundary. No significant change in subsequent maps to 1905.	There has been an extension to the infirmary to the southwest with an additional building. No significant change in subsequent maps up to 1905.
1919 (1:2,500)	The site is now developed. The development comprises of a series of 3 detached educational buildings (Queens Road County secondary school). Landscaped area of fill is also present to the west of site with two access roads in parallel trending northeast to southwest.	Construction of residential dwelling <10m from the southern boundary of the site is evident. A public monument has been erected to the north of the site (stone circle). The definitive site boundary has now been established.
1958 1:2,500	The site remains unchanged.	Additional residential buildings to the south.
1969 – 1977 1:2,500	Two of the school's buildings have linked together at the centre.	The surrounding area is mostly unchanged
1993 1:1,250	The site remains unchanged.	Light development surrounding the site that is mainly residential has occurred. Infilled land is recorded towards the north/northwest of the site.
2006 1:10,000	The site remains unchanged.	The site remains unchanged.
2020 1:10,000	The school has now been demolished; a large concrete slab remains.	The surrounding area is mostly unchanged

2.3 Geology and Ground Conditions

The 1:50,000 scale (Sheet 231) British Geological Map of the area was consulted for geology underlying the site. Detailed stratigraphical information is provided in **Table 2.2**.

Table 2.2 Detailed Stratigraphical Information

Period	Group	Formation
Quaternary	N/a	Superficial Glacial Deposits (TILL) These deposits consist of Clay and Sands.
Carboniferous	South Wales Coal Measures	South Wales Lower Coal Measures Formation Grey, (productive) coal-bearing mudstones/siltstones, with seatearths and minor sandstones.

Superficial deposits are recorded as Glacial Till.

Made ground to a depth of 3.10m was encountered at the site.

2.4 Radon

No radon protective measures are required for new developments on the investigation site.

2.5 Hydrogeology and Hydrology

Superficial deposits beneath the site have an aquifer designation of secondary aquifer - Undifferentiated.

The bedrock deposits beneath the site have an aquifer designation of secondary aquifer – A.

Deeper groundwater flow within the underlying bedrock will be controlled by the strata dip and any fractures or bedding planes within the rock units.

The hydraulic gradient will be at its steepest during periods of heavy rainfall and aquifer recharge.

The site does not locate within a groundwater source protection zone.

There are no groundwater abstraction points within a relevant distance of the site.

2.6 Identified Contamination

2.6.1 Soils

Contaminants of concern are those that were found to exceed their residential with plant uptake threshold level.

A summary of substances tested for that were found to be present at concentrations above their respective human health threshold levels used in a residential setting with home grown produce land are summarised in **Table 2.3**.

Table 2.3 Contaminants of Concern

Location	Depth (m)	Contaminant	Source
TP1	0.4	Benzo(a)anthracene, Chrysene, benzo(b)fluoranthene, Benzo(a)pyrene, Indeno(123cd)pyrene, Dibenzo(ah)anthracene.	Made Ground (S1)
TP4	0.2	Phenanthrene, Benzo(a)anthracene, Chrysene, benzo(b)fluoranthene, Benzo(a)pyrene, Indeno(123cd)pyrene, Dibenzo(ah)anthracene.	Made Ground (S1)
TP5	0.5	Benzo(b)fluoranthene, Benzo(a)pyrene, Dibenzo(ah)anthracene.	Made Ground (S1)
TP7	0.3	Benzo(a)anthracene, Chrysene, benzo(b)fluoranthene, Benzo(a)pyrene, Dibenzo(ah)anthracene.	Made Ground (S1)

SECTION 3 Sources of Contamination Requiring Remediation

The summary of the refined conceptual site model is presented in **Table 3.1** and based on findings of previous investigations and assessments, detailing significant pollutant linkages requiring remediation or mitigation.

Table 3.1 Summary of Significant Pollutant Linkages

Source	Pathway	Receptor
Contaminated Soils S1	Direct soil and dust ingestion P1 Dermal contact P3 Inhalation of dust and vapours P4	Construction and Maintenance Workers R1
	Direct soil and dust ingestion P1 Dermal contact P3 Inhalation of dust and vapours P4	Future Site Users (Residents and Visitors) R2
	Direct soil and dust ingestion P1 Dermal contact P3 Inhalation of dust and vapours P4	Passers-by and Neighbouring Site Users R3

SECTION 4 Proposed Remedial and Mitigating Measures

4.1 General

Based on the finding of previous investigations and assessments and the identified pollutant linkages the following remedial measures have been devised for the site.

Specific validation requirements for the proposed remedial measures are discussed in the following section.

4.1.1 Protection of Construction & Maintenance Workers and Passers-by or Neighbouring Site Users

The potential production of soil dust containing contaminants during construction works presents a risk to construction and maintenance workers as well as passers-by or adjacent site users through direct soil and dust ingestion, dermal contact, and inhalation of dust.

A selection of mitigating measures is presented below to disrupt the contaminant pathway to the receptor.

- Dust suppression and measures to dampen the material
- Suitable PPE for site workers
- Air monitoring on the site boundary
- Site perimeter screening

Standard PPE equipment such as gloves and goggles will be effective in mitigating most risks. Advice on the most appropriate PPE and other necessary protection measures should be sought from a specialist.

It is therefore essential that the contractor puts in place adequate measures to ensure the safety of all workers.

These measures should be detailed in the contractor's Risk Assessment and Method Statements as well as the contractor's Construction Management Plan.

If during the development works any other unexpected ground conditions or evidence of contamination is found, inspection by a geoenvironmental engineer should be made, and any required testing or investigation carried out prior to continuation of works.

4.1.2 Protection of Future Site Users (Residents and visitors)

Future site users will be potentially at risk from direct soil and dust ingestion, dermal contact and inhalation of dust from soils containing PAHs.

The capping system should be installed across the site and should comprise the proposed buildings and hard standing. In landscaped areas, 600mm of suitable clean topsoil/subsoil should be utilised.

All imported soils should be validated as clean and suitable for use in accordance with 'Requirements for the Chemical Testing of Imported Soils for Various End Uses and Validation Cover Systems'.

Validation of the capping system and imported materials will be required.

Clean material should also be placed along service runs.

4.1.3 Protection of Construction Materials (Potable Water Supply Pipes)

Potable water supply pipes are at risk of degradation when in contact with made ground soils containing contaminants.

It is recommended that a Potable Water Supplier should complete an assessment in accordance with UK Water Industry Research guidance; Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites, UKWIR Report Ref: 10/WM/03/21. The assessment should determine the selection of Water Supply Pipe material.

SECTION 5 Validation of Remedial and Mitigating Measures

The following remedial measure will require verification and inclusion within a Validation Report:

- Capping system (importation of soils and installation)
- Potable water supply pipe (assessment and installation)

5.1 Imported Soil Validation

Importation of soils will be required to provide a capping layer of clean inert material in identified landscaped and garden areas.

The soils should also be physically suitable and contain no 'sharps' as defined in BS8332:2015 Specification for Topsoil and BS8601:2013 Specification for Subsoil and Requirements for Use.

All imported soils, aggregate or stone that are not virgin quarry stone should be validated as suitable for use. Imported materials exempt from validation testing should be accompanied by a transfer note. Transfer notes should be retained and submitted for inclusion within the Validation Report upon completion of the works.

The provider should supply a laboratory analysis report to confirm that the soil/aggregate/stone is suitable for use. Depending on the source and available test data, it may be prudent to independently sample and analyse the materials (if practical) prior to being brought to site.

Sampling and analysis of the soil/aggregate/stone once imported will be required in addition to any taken at source. It is recommended that samples are taken from a stockpile on site, prior to being laid down in garden/landscaped areas.

In accordance with publication 'Requirements for the Chemical testing of Imported Materials for Various End Uses and Validation of Cover Systems' the number of representative samples required for analysis is dependent on the volume of each source soil. For a volume between 20m³ and 250m³ four samples should be taken. For a volume greater than 250m³, 4 samples per 250m³ should be taken.

Where quantities are lower than 20m³ or exceed 1000m³, the CLO/EHO should be contacted to agree a sampling scheme.

All samples should be analysed for the determinants listed in **Table 5.1**.

Table 5.1 Validation Criteria

Determinand	Units	Guideline Value (Residential)	Source
Inorganic			
Arsenic	mg/kg	37	1
Cadmium	mg/kg	11	1
Chromium III	mg/kg	910	1
Chromium VI	mg/kg	6	1
Copper	mg/kg	2400	1
Lead	mg/kg	200	1
Mercury (inorganic)	mg/kg	40	2
Nickel	mg/kg	180	1
Selenium	mg/kg	250	1
Zinc	mg/kg	3700	1
Cyanide	mg/kg	-	1
Boron	mg/kg	290	3

Asbestos	%	Non Detected	-
Organics – Phenol & PAH			
Phenol	mg/kg	120	1
Naphthalene	mg/kg	2.3	4
Acenaphthylene	mg/kg	170	4
Acenaphthene	mg/kg	210	4
Fluorene	mg/kg	170	4
Phenanthrene	mg/kg	95	4
Anthracene	mg/kg	2400	4
Fluoranthene	mg/kg	280	4
Pyrene	mg/kg	620	4
Benzo(a)anthracene	mg/kg	7.2	4
Chrysene	mg/kg	15	4
Benzo(b)fluoranthene	mg/kg	2.6	4
Benzo(k)fluoranthene	mg/kg	77	4
Benzo(a)pyrene	mg/kg	2.2	4
Indeno(123cd)pyrene	mg/kg	27	4
Dibenzo(ah)anthracene	mg/kg	0.24	4
Benzo(ghi)perylene	mg/kg	320	4
Organics – TPH			
VPH C5 – C6 Ali	mg/kg	42	4
VPH C6 – C7 Ali	mg/kg	100^	4
VPH C7 -C8 Ali	mg/kg	100^	4
VPH C8 – C10 Ali	mg/kg	27	4
EPH C10 – C12 Ali	mg/kg	130	4
EPH C12 – C16 Ali	mg/kg	1100	4
EPH C16 – C21 Ali	mg/kg	65000*	4
EPH C21 – C35 Ali	mg/kg	65000*	4
EPH C35 – C40 Ali		65000	
VPH C5 – C7 Arom	mg/kg	70	4
VPH C7 – C8 Arom	mg/kg	130	4
VPH C8 – C10 Arom	mg/kg	34	4
EPH C10 – C12 Arom	mg/kg	74	4
EPH C12 – C16 Arom	mg/kg	140	4
EPH C16 – C21 Arom	mg/kg	260	4
EPH C21 – C35 Arom	mg/kg	1100	
EPH C35 – C40 Arom	mg/kg	1100	
1 - LQM/CIEH Suitable For Use Level (S4UL) 2015 2 - Defra Category 4 Screening Level (Provisional value) 3 - Environment Agency CLEA v1.06 Derived Value (Now withdrawn) 4 - S4UL threshold based on 1% soil organic matter PH – Petroleum Hydrocarbon Ali – Aliphatic Arom – Aromatic Thresholds based on 1.0% soil organic matter * – Ali C16-21 and C21-C35 based on criteria for Ali EC >16-35			

5.2 Capping System

Following the importation and placement of 600mm of clean inert material in the soft landscaped areas, verification of the capping thickness should be undertaken.

Validation of the capping system will comprise photographic evidence clearly showing the thickness, depth of individual strata. Soil samples can be obtained at this point for validation testing of imported soils if they have not already been taken. However, as previously stated, it is recommended that they should be taken from a stockpile on site prior to being laid.

A validation report including a description of the works undertaken, validation photographs and chemical validation test results shall be presented upon completion.

5.3 Potable Water Supply Pipes

A copy of the potable water supply pipe assessment, along with evidence of the water supply pipe installation, should be retained **by the groundworker** for inclusion in the Validation Report.

Photographic evidence of the installation shall be provided **by the groundworker** for inclusion in the Validation Report.

5.4 Validation Report

Following completion of the works a verification report should be compiled demonstrating the completion and effectiveness of the works set out in the Remediation Strategy.

The Verification Report should include, but not limited to, the following:

1. A record of any areas where made ground is removed (service runs, under roads etc).
2. If made ground is disposed of off-site, a record of the volume removed, from which areas and details of the receiving landfill. Transfer tickets should be retained.
3. If excavated made ground is to be retained on site the CL:AIRE materials management plan should be provided.
4. A record of the number of imported soil sources and their respective volumes.
5. Details of the source and supplier of all imported soils.
6. Chemical test certificates for imported soils where available from the provider.
7. Chemical test data for all imported soils as sampled at source (if possible) and on site.
8. Details of the source and volume of any imported stone/aggregate.

SECTION 6 Working Practices

6.1 Protection of Construction Workers

In order that construction workers are protected during site works across the site the following should be adhered to:

1. Compliance with health and safety regulations.
2. Provision of Method Statements and Risk Assessments.
3. Compliance with Control of Substances Hazardous to Health (COSHH) Assessment.
4. Good level of Personal Protection Equipment (PPE).
5. Good level of hygiene by site workers.
6. Dust suppression measures.
7. Emergency contingencies should be defined prior to commencement of site works.

6.2 Protection of the Environment

During the remediation and construction periods, there is a risk to the environment and adjacent sites from de-watering, excavations, moving contaminated soil, drainage misconnections, discharges of perched groundwater to local surface waters or the ground, runoff from construction materials and/or exposed ground, wheel washing and oil or chemical spills.

A drainage plan should be devised, identifying manholes to prevent pollutants accidentally reaching surface water sewers. Temporary drainage measures may need to be put in place.

The contractor(s) must also strictly adhere to the Pollution Prevention Guidelines for Working at Construction and Demolition Sites (PPG6). This publication gives both advice and guidelines which should be followed with regards to the planning and preparation of site works, site drainage, delivery and storage of construction materials, the management of waste, good housekeeping in particular to prevent runoff of silt and other fines into nearby water courses, refuelling, concrete and what to do in the event of an emergency.

Within the documentation prepared by the contractor(s), the following information should be provided, but not limited to:

- Project Description.
- Key participants/contractor(s).
- Technical procedures.
- Phasing of works and approximate timescales.
- Site plans to scale.
- Details of consents or license needed.
- Health and Safety, COSHH Assessment, Method Statements and Risk Assessments.
- Emergency contingencies.

In addition, the following precautions should also be taken.

- All potential chemicals and associated risks and emergency procedures for spills/leaks should be considered in the site risk assessment and the details provided to all site employees.
- Any potential pollutant materials or chemicals/detergents used on site should be adequately stored in suitable containers, with clear labelling.
- Any oil or hazardous substance containers and associated pipe works should be enclosed within a bund.
- Care taken during delivery of materials, with correct supervision and labelling detailing the substance and its quantities.

- All delivery drivers should be informed of procedures and restrictions.
- Any materials on delivery should be covered to ensure there is no spillage.
- Any detergents, paints, chemicals etc should not be allowed to be discharged into surface drains or water courses.
- Washing out and cleaning of concrete/cement plant should be carried out in a contained area with adequate measures to collect all run-off water.
- Security and prevention of vandalism, especially of oil drums/containers.

6.3 Management & Disposal of Soils

During site works excavations of the made ground are anticipated.

All materials excavated should be managed and stored appropriately in a controlled manner to ensure protection of site construction workers and neighbouring site users, and to prevent the transfer of contamination to other areas of the site.

If possible, and if levels allow, any excavated made ground should be retained on site and relocated beneath areas of hardstanding. This would provide the most sustainable approach and avoid landfill and haulage fees, disruption and aggravation of local residents caused by haulage lorries and would avoid unnecessary CO₂ emissions.

Any movement and transfer of materials on site should be documented in a materials management plan, in accordance with 'CL:AIRE Definition of Waste: Development Industry Code of Practice (DoW CoP)'.

Alternatively, excavated made ground may be disposed of at landfill. Prior to disposal classification of the material will need to be completed in accordance with Environment Agency protocol detailed in 'Technical Guidance WM3 – Waste Classification - Guidance on the Classification and Assessment of Waste'.

A contaminated land specialist should supervise and document any earthworks on site.

Waste transfer and disposal must be undertaken by an authorised person. A waste transfer note must accompany each load and records should be maintained for inspection if required.



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