

Remediation Strategy

Proposed Residential Development at
the Former Afan Lido, The Princess
Margaret Way, Port Talbot

Prepared for:

Persimmon Homes West Wales

April 2022

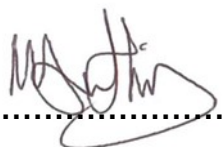
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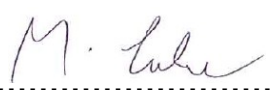
REPORT TITLE : **Remediation Strategy:**
Former Afan Lido, Aberavon, Port Talbot

REPORT STATUS : **Issue 03**

JOB NUMBER : **14647/RS**

DATE : **April 2022**

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Executive Summary

Introduction	<i>Persimmon Homes West Wales is proposing the residential development of the former Afan Lido and adjacent car park of The Princess Margaret Way in Aberavon, Port Talbot.</i>
Site History	<i>The west of the site has previously been occupied by Afan Lido; a swimming pool built in 1964-65. A large fire caused irreparable damage in December 2009 and in 2012 the Lido was demolished, leaving the site in its current vacant condition. The west of the site has been occupied by a car park since 1964-65 until present day.</i>
Laboratory chemical testing	<i>Laboratory chemical analysis of samples of site soils has identified contamination by arsenic, cadmium, copper, lead, zinc, PAHs, amosite and crocidolite.</i>
Remedial Measures	<i>The mitigation and remedial measures to be implemented are summarised as follows:</i> <i>1. Protection of construction workers during site development through a good level of PPE and hygiene, as well as dust suppression measures if required.</i> <i>2. Capping within garden and soft landscaped areas with at least 600mm of imported clean soils underlain by a high visibility geotextile at the base of the capping layer.</i> <i>3. Validation of all imported soils/aggregate</i> <i>4. Installation of appropriate water supply pipes.</i> <i>Mitigation and remedial measures must be approved by the Local Authority</i>
Validation	<i>The Verification Report should include, but not limited to, the following:</i> <i>1. A record of any areas where made ground is removed.</i> <i>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.</i> <i>3. A record of the number of imported soil sources and their respective volumes.</i> <i>4. Details of the source and supplier of all imported soils.</i> <i>5. Chemical test certificates for imported soils where available from the provider.</i> <i>6. Chemical test data for all imported soils as sampled at source (if possible) and on site.</i>

TABLE OF CONTENTS

Section 1 Introduction and Proposed Development

1.1 Limitations and Exceptions

Section 2 Site Summary

2.1 Site History

2.2 Geology and Ground Conditions

2.3 Radon and Ground Gas

2.4 Human Health and Environmental Risk Assessment

Section 3 Proposed Mitigation During Site Construction Works

Section 4 Remedial Measures for the Protection of Future Site Users

4.1 Validation of Imported Soils

4.2 Potable Water Supply

4.3 Management and Disposal of Excavated Materials

4.4 Unexpected Ground Conditions

Section 5 Verification and Validation Works

Tables

Table 2.1 Summary of Ground Conditions

Table 2.2 Summary of Contaminants of Concern in Soils

Table 4.1 Guideline Values - Imported Soils

Figures

Figure 2.1 Terra Firma Exploratory Hole Layout

Figure 2.2 Hyder Exploratory Hole Layout

Annexes

Annex A Proposed Layout

SECTION 1 Introduction and Proposed Development

Persimmon Homes West Wales is proposing the residential development of the former Afan Lido and adjacent car park of The Princess Margaret Way in Aberavon, Port Talbot.

Persimmon Homes West Wales has commissioned Terra Firma (Wales) Limited to prepare a Remediation Strategy for the site.

The objective of the Remediation Strategy is to address the human health risks identified, using the best practicable option.

1.1 Limitations and Exceptions

Persimmon Homes West Wales has requested that a Remediation Strategy be prepared, detailing the remedial steps which need to be undertaken to render the site fit for its intended use.

This report has been prepared for the sole internal reliance of Persimmon Homes West Wales 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 Terra Firma (Wales) Limited. 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 geo-environmental and geotechnical consultants. Terra Firma (Wales) Limited does not provide legal advice and the advice of lawyers may also be required.

It is not within the scope of Terra Firma (Wales) Limited to:

- Provide Method Statements and Risk Assessments for the site remediation, preparation and development.
- Design, install and validate the pipes for potable water supply beneath the site.

Mitigation and remedial measures must be approved by the Local Authority

This remediation strategy uses data from Clarke Bond report WB03278/R1 dated 14th October 2013, and Hyder Consulting (UK) Limited's report dated July 2015. Terra Firma (Wales) Limited do not have reliance on these reports.

SECTION 2 Site Summary

Hyder Consulting (UK) Limited completed a Geo-environmental and Geotechnical Site Investigation in July 2015 (Report No. UA007442-001-R001). Terra Firma (Wales) Limited completed a Supplementary Geotechnical and Geo-environmental Site Investigation Report in November 2018. Relevant information from these reports is summarised in the following sections.

2.1 Site History

The west of the site has previously been occupied by Afan Lido; a swimming pool built in 1964-65. A large fire caused irreparable damage in December 2009 and in 2012 the Lido was demolished, leaving the site in its current vacant condition. The west of the site has been occupied by a car park since 1964-65 until present day.

The general arrangement of the proposed plots in relation to the site prior to development is presented in **Annex A**.

2.2 Geology and Ground Conditions

2.2.1 Geology

The 1:50,000 scale geological map of the area (Sheet 247) was consulted for geology underlying the site.

The site is shown to be underlain by the South Wales Middle Coal Measures Formation. These rocks comprise grey, coal-bearing mudstones/siltstones, with seatearths and minor sandstones, and are Carboniferous in age.

Blown sand is shown overlying the bedrock. Blown sand is sand that has been transported by wind, or sand consisting predominantly of wind-borne particles.

Made ground covers the majority of the site.

2.3 Ground Conditions

The ground conditions encountered by the exploratory holes by both the Terra Firma (Wales) Limited investigation, and the Hyder site investigation can in general be summarised as shown in **Table 3.1**.

Table 3.1 Summary of Ground Conditions				
Depth (m)			Thickness (m)	Stratum
GL	-	0.12/2.9	0.12/2.9	MADE GROUND: Variable composition including soils dominated by building rubble, re-worked natural soils, granular soils dominated by slag, ash and clinker.
0.12/2.9	-	6.6/13.8	5.7/10.9	BLOWN SAND: Loose to medium dense pale brown, orange brown to yellow brown slightly silty fine to medium SAND with occasional cemented laminae and rare coarse gravel size grey mudstone and shell fragments.
6.6/13.8	-	20.4/22.8	13.8/19.0	TIDAL FLAT DEPOSITS: Interlayered sand, silt and clay units, which locally form distinct lenses or beds several metres thick but are interlaminated with sand, silt and clay.
20.4/22.8	-	28.7	8.3/>4.65	MARINE BEACH DEPOSITS: Dense grey clayey silty sandy Gravel with medium cobble content.
28.7	-	>30.4	-	GLACIAL DEPOSITS: Very stiff to hard dark grey to greyish brown slightly sandy gravelly CLAY .

2.4 Radon and Ground Gas

Clarke Bond report WB03278/R1 states that no radon protection measures are required for the development.

Based on a programme of gas monitoring, it is considered that in reference to Table 8.5 of CIRIA report C665, the site should be classified as 'gas characteristic situation 1'. No gas protection measures are therefore required for the proposed development.

2.4 Human Health and Environmental Risk Assessment

Several substances tested for were found to be present at concentrations above their respective human health threshold levels. The substances, locations and depths of these exceedances is summarised in **Tables 2.4 to 2.6**.

Table 2.5 Summary of Contaminants of Concern in Soils – Former Afan Lido Site				
Sample	Contaminant of concern	Measured concentration (mg/kg)	Comparable soil guideline value (mg/kg)	Stratum
TP06 0.10m	Arsenic Lead	83 2300	37 200	Made ground
TP08 0.60m	Arsenic	41	37	Made ground
TP11 0.30m	Arsenic Lead Zinc	460 12000 14000	37 200 3700	Made ground
TP12 0.40m	Arsenic Lead Zinc	180 3500 6700	37 200 3700	Made ground
TP13 0.50m	Lead	390	200	Made ground
TP14 0.30m	Arsenic Lead	41 360	37 200	Made ground
TP17 0.50m	Arsenic Copper Lead Zinc	470 2500 2300 5400	37 2400 200 3700	Made ground
TP18 0.40m	Arsenic Copper Lead Zinc	540 3200 4000 6800	37 2400 200 3700	Made ground
TP23 0.30m	Amosite present in microscopic asbestos sheeting board debris	Detected	Zero tolerance	Made Ground
TP26 0.60m	Arsenic Lead	43 270	37 200	Made ground
TP27 0.10m	Arsenic Copper Lead Crocidolite present	75 3200 210 Detected	37 2400 200 Zero tolerance	Made ground
TP28 0.20m	Arsenic Lead Zinc	150 5900 8400	37 200 3700	Made ground
TP28 0.60m	Arsenic Lead Zinc	190 7100 10000	37 200 3700	Made ground
TP29 0.30m	Arsenic Lead Zinc	360 7700 9400	37 200 3700	Made ground
WS01 0.40m	Arsenic Lead Zinc	110 4300 46000	37 200 3700	Made ground
WS02 0.30m	Arsenic Copper Lead	260 2700 640	37 2400 200	Made ground
WS03 0-0.40m	Arsenic Copper Lead	350 3900 230	37 2400 200	Made ground
WS05 0-30m	Dibenzo(ah)anthracene	0.35	0.24	Made ground
WS05 0-30m	Arsenic Lead Dibenzo(ah)anthracene	53 280	37 200 0.24	Made ground

BH101 0.50m	Lead Benzo(a)anthracene Benzo(b)fluoranthene Benzo(a)pyrene Dibenz(a,h)anthracene	350 12 9.7 8.1 1.2	200 7.2 2.6 2.2 0.24	Made Ground
BH101 1.00m	Lead Benzo(b)fluoranthene Benzo(a)pyrene Dibenz(a,h)anthracene	310 3.3 2.9 0.33	200 2.6 2.2 0.24	Made Ground
WS141 0.30-0.50m	Lead	930	200	Made ground
WS145 0.15-0.25m	Lead	950	200	Made ground
WS142 0.50-0.60m	Arsenic Copper Lead	380 3900 560	37 2400 200	Made Ground
WS147 0.20-0.30m	Arsenic Cadmium Lead Zinc	600 27 23000 40000	37 11 200 3700	Made Ground
WS148 0.50-0.60m	Arsenic Lead Zinc	210 2500 5200	37 200 3700	Made Ground
TP123 0.50m	Arsenic	53	37	Natural
TP126 0.50m	Lead	300	200	Made ground
TP128 0.25m	Arsenic Lead	110 1500	37 200	Made ground
TP132 0.20m	Arsenic Cadmium Lead Zinc	1200 63 23000 47000	37 11 200 3700	Made Ground
TP132 0.40m	Arsenic Cadmium Lead Zinc	130 12 2000 4500	37 11 200 3700	Made Ground
TP133 0.20m	Arsenic Cadmium Lead Zinc	1100 64 24000 40000	37 11 200 3700	Made Ground
TP133 0.40m	Arsenic Lead Dibenz(a,h)anthracene Crocidolite present in loose fibres	40 280 0.27 Detected	37 200 0.24 Zero tolerance	Made Ground
TP134 0.40m	Crocidolite present in loose fibres	Detected	Zero tolerance	Made Ground
TP137 0.40m	Arsenic Lead Amosite present in loose fibres	45 340 Detected	37 200 Zero tolerance	Made Ground

2.4 Human Health and Environmental Risk Assessment (Continued)

Pit locations are illustrated on **Figures 2.1** and **2.2** below.



Figure 2.1: Terra Firma Exploratory Hole Layout

2.4 Human Health and Environmental Risk Assessment (Continued)



Figure 2.2: Hyder Exploratory Hole Layout

The mitigation and remedial measures to be implemented are summarised as follows:

1. Protection of construction workers during site development through a good level of PPE and hygiene, as well as dust suppression measures if required.
2. Capping within garden and soft landscaped areas with at least 600mm of imported clean soils underlain by a by a high visibility geotextile (as described in Section 4.1).
3. Validation of all imported soils/aggregate
4. Service trenches should be infilled with clean imported material and lined with a high visibility geotextile.
5. Installation of appropriate water supply pipes.

These mitigation and remedial measures are covered in detail in the following sections.

SECTION 3 Proposed Mitigation During Site Construction Works

All health and safety measures and risk assessments should detail the proposed measures to be put in place to protect construction workers and neighbouring site users. For protection of human health this should include dust suppression when necessary.

It is recommended that the contractor(s) work in accordance with to CIRIA Report 132: A Guide for Safe Working on Contaminated Sites.

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 no spillage from the vehicle.
- Any detergents, paints, chemicals etc should not be allowed to be discharged into surface drains.
- 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.

SECTION 4 Remedial Measures for the Protection of Future Site Users

4.1 General

In order to interrupt the pathway of ingestion of soil/soil dust, dermal contact with soil/soil dust and inhalation of soil/soil dust and consumption of site produce grown in the contaminated soil a capping remedial option is recommended.

4.2 Garden and Landscaped Areas

The proposed houses and flats will have garden areas. There will also be soft landscaped areas across the site. All garden and soft landscaped areas should be underlain by a minimum 600mm of clean imported soils. A high visibility geotextile should be placed at the base of the capping layer.

4.2.1 Capping Soils

In accordance with publication 'Requirements for the Chemical testing of Imported Materials for Various End Uses and Validation of Cover Systems' any soils or aggregate (excluding virgin quarry stone) must be confirmed uncontaminated with respect to human health and suitable for use.

Details of the source and/or supplier or any materials should be provided.

The provider should supply a laboratory analysis report to confirm that the materials are 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 soils once imported will be required in addition to any taken at source.

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.

All samples should be analysed for the substances listed in **Table 4.1** below. These are soil thresholds for a residential (including plant uptake) scenario.

4.2.1 Capping Soils (Continued)

Table 4.1 Guideline Values - Imported Soils and Aggregate				
Determinant	Comparable Guideline Value (mg/kg)			Source
Arsenic	37			CIEH
Boron	290			CIEH
Cadmium	11			CIEH
Chromium III	910			CIEH
Chromium VI	6			CIEH
Copper	2400			CIEH
Lead	200			C4SL
Mercury	40			CIEH
Nickel	130			CIEH
Selenium	250			CIEH
Zinc	3700			CIEH
Cyanide	Limit of laboratory detection*			CLEA
Phenols	120			CIEH
pH (acidity)	-			-
Asbestos	Not detected			-
Speciated PAH	1% SOM	2.5% SOM	6% SOM	
Naphthalene	2.3	5.6	13	CIEH
Acenaphthylene	170	420	920	CIEH
Acenaphthene	210	510	1100	CIEH
Fluorene	170	400	860	CIEH
Phenanthrene	95	220	440	CIEH
Anthracene	2400	5400	11000	CIEH
Fluoranthene	280	560	890	CIEH
Pyrene	620	1200	2000	CIEH
Benzo(a)anthracene	7.2	11	13	CIEH
Chrysene	15	22	27	CIEH
Benzo(b)fluoranthene	2.6	3.3	3.7	CIEH
Benzo(k)fluoranthene	77	93	100	CIEH
Benzo(a)pyrene	2.2	2.7	3.0	CIEH
Indeno(123cd)pyrene	27	36	41	CIEH
Dibenzo(ah)anthracene	0.24	0.28	0.3	CIEH
Benzo(ghi)perylene	320	340	350	CIEH

- If results exceed the limit of laboratory detection then results should be compared with assessment criteria agreed with Neath Port Talbot Council

4.2.1 Capping Soils (Continued)

Table 4.2 (Continued) Guideline Values - Imported Soils and Aggregate				
Determinant	Comparable Guideline Value (mg/kg)			Source
<u>Aliphatic</u>				
PH C5 – C6 Ali	42	78	160	CIEH
PH C6 – C8 Ali	100	23	530	CIEH
PH C8 – C10 Ali	27	65	150	CIEH
PH C10 – C12 Ali	130	330	760	CIEH
PH C12 – C16 Ali	1100	2400	430	CIEH
PH C16 – C35 Ali*	65000	92000	110000	CIEH
PH C21 – C35 Ali*	65000	92000	110000	CIEH
PH C35 – C44 Ali	65000	92000	110000	CIEH
<u>Aromatic</u>				
PH C5 – C7 Arom	70	140	300	CIEH
PH C7 – C8 Arom	130	290	660	CIEH
PH C8 – C10 Arom	34	83	190	CIEH
PH C10 – C12 Arom	74	180	380	CIEH
PH C12 – C16 Arom	140	330	660	CIEH
PH C16 – C21 Arom	260	540	930	CIEH
PH C21 – C35 Arom	1100	1500	1700	CIEH
PH C35 – C44 Arom	1100	1500	1700	CIEH

4.3 Buried Services

Service trenches should be infilled with clean imported material which satisfies the criteria in Table 4.1 and lined with a high visibility geotextile. The geotextile will separate clean material from the potential contaminants identified on site.

4.4 Management and Disposal of Excavated Materials

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.

Excavated made ground may be disposed of at landfill following classification in accordance with Environment Agency protocol detailed in 'Technical Guidance WM3 – Waste Classification - Guidance on the Classification and Assessment of Waste'.

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

4.5 Potable Water Supply

The potable water supply may be at risk from contamination. Plastic pipes are likely to prove unsuitable as contaminants identified may be absorbed through the pipes into the water supply.

All pipes must be designed to appropriate 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.

If these guidelines are exceeded along the route of the proposed pipe, specialist pipe materials should be employed.

Information detailing the design, installation and validation of water pipes should be provided by the client for review by the Neath Port Talbot Pollution Control Officer prior to installation.

SECTION 5 Verification and Validation Works

An Environmental Consultant must verify that the remediation works have been carried out to the satisfaction of the authorities and client.

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 (gardens, 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. A record of the number of imported soil sources and their respective volumes
4. Details of the source and supplier of all imported soils
5. Chemical test certificates for imported soils where available from the provider
6. Chemical test data for all imported soils as sampled at source (if possible) and on site
7. Validation of the minimum 600mm capping thickness and high visibility geotextile placed at the base of the capping layer.

ANNEX A
Proposed Layout

