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Geoenvironmental Desk Study

Site: Former Metal Box Unit, Neath

Prepared For: 360 Aquaculture Ltd

Issue Date: August 2023

Job No: 17938

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Executive Summary

Site Location	360 Aquaculture Ltd (the Client) are proposing the development of a shrimp farm upon the former metal box unit at Milland Road Industrial Estate, Neath. The proposed development will comprise the adaptation of the rear section of the former metal box unit to form a shrimp farm (aquaculture) facility including reconfiguration of the roof and internal facilities. The development site is roughly square in shape and locates on Milland Road Industrial Estate, Neath. The site centres on an approximate National Grid Reference of 274250, 196360, occupying a plan area of approximately 1.32 Hectares. The site is currently occupied by the former Metal Box Unit, with associated hardstanding to the north of the site. Site boundaries are defined by the current factory building and the hardstanding 'yard' area to the north. Much of the western area beyond the site is comprised of rough grassland, with a pond situated 5-10m northwest. Immediately northeast from the site is further industrial areas. The site elevation is approximately 8.5m AOD and is generally level.
Site History	Since the earliest map edition available (c.1881), the site was seen to be occupied by open rough grassland. From around 1918 a clay pit had been developed on-site, with various tramways linking it to other railways. Circa.1951, the metal box factory was established on-site. The northern area of the site had a refuse heap situated from 1951. Various works have been established within the surrounding area since the earliest map edition available, including a chemical works 260m northeast and the Eagle Bush Tin Works 130m northeast. Further refuse heaps can be seen within the surrounding areas from 1951 to 1967.
Geology	The 1:50,000 and 1:10,560 scale British Geological Maps of the area (Sheet 247 and SS79NW) was consulted for geology underlying the site. The site is shown to be underlain by the Hughes Member. Superficial deposits are recorded as Tidal Flat deposits. Masde ground is expected below the factory building. Strata in the local area have a dip of 15° north. The nearest coal seam to the site is the Mountain seam, situated 10m southwest from the site. This coal seam will likely underlie the site at shallow depth based upon dip direction.
Coal Mining Risk Assessment	The site situates within the South Wales Coal Field. The report did not record ay past underground mining in any coal seams below the site. The report records the site is not situated above possible unrecorded shallow workings. No spine roadways are recorded at shallow depth. The Coal Authority is not aware of any damage due to geological faults or other lines of weakness that have been affected by coal mining at the site. The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres of the enquiry boundary, since 31 October 1994. There is no current Stop Notice delaying the start of remedial works or repairs to the property. The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991. The Coal Authority has no record of a mine gas emission requiring action No mine entries are recorded within 10m of the site's boundary. Given the local geology and the information presented in the Coal Authority report, it can be concluded that the risk from shallow coal mining to the site is negligible.
Recommended Site Investigation	An intrusive site investigation carried out in accordance with guidance provided in BS10175:2011+A2:2017 should be undertaken to achieve the following objectives:

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- *Identify the potential environmental liabilities at the site associated with any soil, gas, vapours and groundwater contamination from past site uses, to substantiate and enhance the conceptual site model, for a commercial scenario.*
- The first phase should comprise:*
- *Windowless sampling to investigate the shallow ground conditions, take samples for contamination testing and to install gas monitoring wells. These wells may also serve as groundwater monitoring points if required.*
 - *Soil samples should be taken for chemical analysis to confirm the characteristics of the ground beneath the site to help inform on the contamination status of the site and the need, if any, for site remediation.*
 - *Radon monitoring should be undertaken in the existing building to determine if radon protection measures need to be retrofitted during the renovation works.*
- Depending on the findings of the first phase additional phases of investigation may be required.*

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SECTION 1 Introduction

1.1 Introduction

360 Aquaculture Ltd (the Client) are proposing the development of a shrimp farm upon the former metal box unit at Milland Road Industrial Estate, Neath. The proposed development will comprise the adaptation of the rear section of the former metal box unit to form a shrimp farm (aquaculture) facility including reconfiguration of the roof and internal facilities.

TFW Group Limited have been commissioned by Ateb Consult to undertake a phase 1 desk study and CMRA for the site.

The main objectives of the assessment programme are to:

- Provide information on past and current uses of the site and surrounding area.
- Provide information on the nature of any hazards and physical constraints, for example buried structures/obstructions.
- Provide information on the likely ground conditions beneath the site, including soil types, groundwater and if made ground is likely to be present.
- Investigate the risk, if any, from historical shallow underground mining features.
- Identify the likely potential environmental liabilities at the site associated with any soil and groundwater contamination from past site uses.
- Identify if gas emissions either from the site or surrounding areas is likely to be present.
- Produce an initial site conceptual model of the site, to detail the nature and extent of potential contamination, its source, potential pathways and likely receptors (pollutant linkage).
- Prepare a human health and environmental risk assessment for the site.
- Provide data to assist in the design of an intrusive site investigation and give early indications of possible remediation requirements.

In order to achieve the above objectives, TFW Group Limited carried out an assessment programme including a site walkover and a review of existing data.

It is beyond the remit of this report to consider the geotechnical aspects of the development.

1.2 Limitations and Exceptions of Investigation

The Client has requested that a Phase 1 Desk Study (DS) and CMRA be undertaken to enable the outlined main objectives.

The DS and CMRA was conducted, and this report has been prepared for the sole internal reliance of the Client and their 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 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 experience geoenvironmental and geotechnical consultants. TFW Group Limited does not provide legal advice and the advice of lawyers may be required.

1.3 Quality Assurance

The quality and environmental aspects of the assessment comply with Terra Firma Wales Ltd business management system which is UKAS Accredited to ISO 9001:2015 and ISO 14001:2015 standards.

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SECTION 2 Review of Existing Data

2.1 Physical Setting and Current Site Use

The development site is roughly square in shape and locates on Milland Road Industrial Estate, Neath. The site centres on an approximate National Grid Reference of 274250, 196360, occupying a plan area of approximately 1.32 Hectares.

The site is currently occupied by the former Metal Box Unit, with associated hardstanding to the north of the site.

Site boundaries are defined by the current factory building and the hardstanding 'yard' area to the north.

Much of the western area beyond the site is comprised of rough grassland, with a pond situated 5-10m northwest. Immediately northeast from the site is further industrial areas.

The site elevation is approximately 8.5m AOD and is generally level.

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



Figure 2.1 Site Location (Envirocheck, 2023)

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2.2 Site History

Historical maps of the site have been obtained in an Envirocheck Report, provided by Landmark Information Group. The history plans are supplied in **Annex A** of this report, and the most relevant editions are summarised in **Table 2.1**. Distances, where quoted are approximate, and any changes in-between map editions may not be recorded.

Table 2.1 Historical Development from Map Information

Map Edition & Scale	Key Features on Site	Key Features off Site
1881 1:2,500	The site is currently occupied by open land, with no major structures on-site. Several drainage ditches/reens flow through the site.	Much of the immediate surrounding area is also comprised of open land. The Neath Canal is situated 100m southeast from the site. Across the canal is various residential properties. Several 'Old Limekilns' can be seen within this area. A 'Brick Field' is situated 150m northeast from the site. The River Neath is situated 120m north from the site.
1884 1:10,560	No significant changes have been made to the site since 1881.	Further detail shows that the Melin Crythan Chemical Works is situated 260m northeast from the site.
1899 1:2,500		A clay pit has been developed 40m northeast from the site. The Eagle Tin Plate Works is now situated 130m northeast from the site. The Rhondda and Swansea Bay Railway has been built, situated 100m northwest from the site.
1900 1:10,560		No significant changes have been made within the immediate surrounding area since 1899.
1918-19 1:2,500	A clay pit is now present in the north western corner of the site with a tramway running to the north. The area is now identified as rough grassland.	Sited immediately west of the site is a factory type building, with an embankment which now forms part of the site and supports a rail line. Further excavations have taken place to the northwest of the site, with these excavated areas now referred to as saltings.
1921 1:10,560	No significant changes have been made to the site since 1919.	
1935-40 1:2,500	The northern edge of the site is now made up of an embankment.	
1951 1:2,500	The Metal Box factory has now been established on-site. A refuse heap is situated towards the north western part of the site.	Further refuse heaps can be seen situated 70m south and 120m north from the site. A pond is now located immediately northwest from the site. Further tramways have been developed within the metal box factory, connected to the Rhondda and Swansea Bay Railway.
1938-51 1:10,560	No significant changes have been made to the site since 1951.	No significant changes have been made within the immediate surrounding area since 1951.
1951-52 1:10,560		
1952-71 1:2,500		
1958-67 1:2,500	The refuse heap is no longer shown on the map, where there is now a yard type area associated with the factory.	The land situated immediately southwest from the site is now labelled as Sports Ground, with a Pavilion built to the south of the site.
1964 1:2,500	No significant changes have been made to the site since 1958.	
1964-65 1:10,000		
1967 1:2,500		A Refuse Tip can now be seen towards the end of a track coming from the factory, situated 100m west.
1970-73 1:10,000		No significant changes have been made within the immediate surrounding area since 1967.
1971-74 1:2,500		
1980-83 1:10,000		
1982-89 1:2,500		
1992 1:10,000		
1993 1:2,500		
1999		

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1:10,000 2000 1:2,500 2006 1:10,000 2023 1:10,000	No significant changes have been made to the site since 1958.	No significant changes have been made within the immediate surrounding area since 1967.
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2.3 Geological Setting

2.3.1 Geology

The 1:50,000 and 1:10,560 scale British Geological Maps of the area (Sheet 247 and SS79NW) was consulted for geology underlying the site. The site is shown to be underlain by the Hughes Member (sandstone). Detailed stratigraphical information is provided in **Table 2.2**.

Table 2.2 Detailed Stratigraphical Information

Period	Group	Formation
Modern	/	MADE/ENGINEERED GROUND associated with buildings that have been on site.
Holocene	/	Tidal Flat Deposits comprising various layers of soft sandy gravelly CLAY and/or layers of SAND and GRAVEL at greater depths
Carboniferous	Pennant Sandstone Formation	Hughes Member: Green-grey, lithic arenites ('Pennant sandstones'), with thin mudstone/siltstone and seatearth interbeds, and mainly thin coals.

Strata in the local area have a dip of 15° north.

Figure 2.2 on the following page shows a section of the geology map.

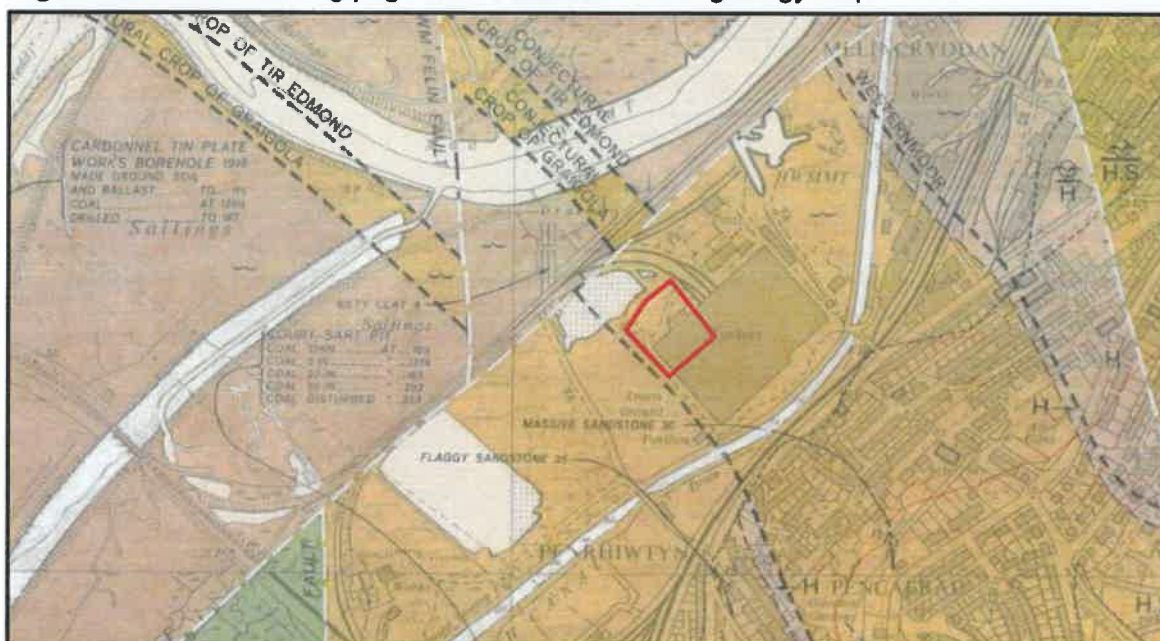


Figure 2.2 1:10,560 SS79NW (Contains BGS Materials [2023])

The nearest coal seam to the site is the Mountain seam, situated 10m southwest from the site. This coal seam will likely underlie the site at shallow depth based upon dip direction.

2.3.2 BGS Borehole Information

There are no recorded BGS boreholes within 250m of the site.

2.3.3 Radon

The Envirocheck Report (**Annex A**) details that full radon protective measures are required for new developments on the investigation site.

2.3.4 Mining

The site situates within the South Wales Coal Fields.

The report did not record ay past underground mining in any coal seams below the site.

The report records the site is not situated above possible unrecorded shallow workings.

No mine entries are recorded within 10m of the site’s boundary.

No spine roadways are recorded at shallow depth.

The Coal Authority is not aware of any damage due to geological faults or other lines of weakness that have been affected by coal mining at the site.

The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres of the enquiry boundary, since 31 October 1994. There is no current Stop Notice delaying the start of remedial works or repairs to the property. The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

The Coal Authority has no record of a mine gas emission requiring action.

The Coal Authority Consultants Coal Mining Report is appended in (**Annex C**).

The Envirocheck report records three BGS Mineral sites within 250 of the site. These are summarised in **Table 2.3**.

Table 2.3 BGS Recorded Mineral Sites

Site Name	Distance/ Direction	Type	Commodity
Pont Y Lady Clay Pit	On-site	Opencast	Common Clay and Shale
Eagle Tin Plate Works Clay Pit	86m, east	Opencast	Common Clay and Shale
Eagle Tin Plate Works Clay Pit	192m, northeast	Opencast	Common Clay and Shale

2.3.5 Natural Hazards

The Envirocheck details the following hazard potentials for the site.

Ground Dissolution:	No Hazard
Collapsible Ground:	No Hazard
Compressible Ground:	No Hazard
Landslide:	Very Low
Running Sand:	No Hazard
Shrinking and Swelling Clays:	Very Low

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2.4 Environmental Setting

The following sections have been compiled using the Landmark Information Group Envirocheck datasheet and maps which can be found in **Annex A**.

2.4.1 Hydrogeology

The 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.

No water abstractions are recorded within 1km of the site.

2.4.2 Hydrology

The nearest surface water feature locates off site 17m northeast and comprises the pond.

The topography of the site slopes down towards to the southwest. Surface water is likely to drain in this direction.

2.4.3 Flooding

The site is at risk from extreme flooding from rivers or sea.

The site is at low to medium risk from flooding from surface water.

The Envirocheck report records the site to have limited potential for groundwater flooding at the surface.

2.4.4 Waste

The Envirocheck report does not record any landfills within 250m of the site.

There are no recorded Waste Management Facilities within a 250m radius of the site.

The nearest discharge consent is situated 135m northwest from the site. This is operated by Dwr Cymru, who are discharging sewage discharges (Storm Overflow) into the river Neath.

2.4.5 Pollution

The Envirocheck report does not record any pollution incidents within 250m of the site.

2.4.6 Sensitive Land Use

There are no areas of sensitive land use within 250m of the site.

2.4.7 Estimated Urban Soil Chemistry

The BGS have published estimated urban soil chemistry concentrations locally to the site for a number of common contaminants, i.e., arsenic, cadmium, chromium, lead and nickel. All of the given determinants have anticipated concentrations that are below the recognised trigger levels for a commercial scenario.

2.4.8 Industrial Land Use

Relevant contemporary trade directory entries recorded within proximity of the site are summarised in Table 2.6.

Table 2.6 Relevant Contemporary Trade Summary

Company	Distance/Direction	Classification	Status
Crown Food UK	18m, east	Can Manufacturers	Inactive
J F Coals	206m, east	Coal and Smokeless Fuel Merchants and Distributors	Inactive

2.4.9 Infilled Land

Potentially infilled land features within 250m of the site are summarised in Table 2.7.

Table 2.7 Potentially Infilled Land

Feature	Distance/Direction
Former clay pit below factory (infilled circa. 1951)	0m, west
Former clay pits (infilled between circa. 1918 – 1967)	69m, east
Infilled streams (infilled circa. 1951)	0m, southeast
	0m, northwest
	0m, east
	54m, north
Infilled pond associated with clay pits (infilled circa. 1918-35)	95m, northeast
Partially infilled pond associated with clay pits (infilled circa. 1967)	186m, northeast

SECTION 3 Coal Mining Risk Assessment

3.1 Geotechnical Risk

3.1.1 Underground Mining

Based upon geological map data and historic borehole records, the stratigraphical sequence within 30m of the ground surface of the site is illustrated in **Figure 3.1**.

Modern	MADE GROUND associated with historic buildings that have been on site	2.0m
Holocene	Tidal flat deposits comprising various layers of soft sandy gravelly CLAY and/or layers of SAND and GRAVEL at greater depths	10.0m
Pennant Sandstone Formation	Hughes Member: Green-grey, lithic arenites ('Pennant sandstones'), with thin mudstone/siltstone and seatearth interbeds, and mainly thin coals.	20.0m
	MOUNTAIN COAL SEAM (thin)	20.1m
	Hughes Member: Green-grey, lithic arenites ('Pennant sandstones'), with thin mudstone/siltstone and seatearth interbeds, and mainly thin coals.	30.0m

Figure 3.1 Geology and Strata Base Below Ground Level

The site situates within the South Wales Coal Fields.

The report did not record ay past underground mining in any coal seams below the site.

The report records the site is not situated above possible unrecorded shallow workings.

No spine roadways are recorded at shallow depth.

The Coal Authority is not aware of any damage due to geological faults or other lines of weakness that have been affected by coal mining at the site.

The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres of the enquiry boundary, since 31 October 1994. There is no current Stop Notice delaying the start of remedial works or repairs to the property. The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

The Coal Authority has no record of a mine gas emission requiring action.

3.1.2 Shafts & Adits

No mine entries are recorded within 10m of the site's boundary.

3.1.3 Conclusion

Given the local geology and the information presented in the Coal Authority report, it can be concluded that the risk from shallow coal mining to the site is negligible.

3.2 Mine Gas Risk Decision Support Tool

This assessment has been completed in accordance with guidance published in CL:AIRE, 2021, Good practice for risk assessment for coal mine gas emissions. In the first instance, the risk assessment process requires the screening out of 'potentially at risk sites' utilising the decision support tool for mine gas risk assessment, provided in Figure 13.1 - CLAIRE 2021. A summary of the decision tool and site outcome is presented in **Table 3.1**.

Table 3.1 Decision Support Tool Summary – Site Specific

Step	Qualifier Question	Outcome	Comment
1	Is the site within a Coal Authority defined Coal Mining Reporting Area?	Yes	Go to step 2
2	Are all these statements true? Mine entries >50m from site boundary Workings >150m depth No faults or other potential pathways connecting surface to deeper unflooded workings Outside area of past or probable shallow workings on Coal Authority Viewer	Yes	Negligible Risk
3	Are all these statements true? Workings between 30m and 150m but permanently flooded or covered by 10m+ of low permeable superficial deposits Mine entries > 50m from site boundary Low permeability superficial deposits of sufficient thickness - <1x10 ⁻⁴ m/s hydraulic conductivity	-	-
4	Are any of these statements true? Mine entries on site or <20m from site boundary Workings below site <30m depth and unflooded or variable water level Faults or other pathways connecting surface to deeper unflooded workings Within area of past or probable shallow workings on Coal Authority Viewer	-	-

It is determined the site is at negligible risk of mine gas, and therefore does not require a detailed mine gas risk assessment to establish whether suitable mitigation measures can be incorporated into the development.

SECTION 4 Site Reconnaissance Findings

A site reconnaissance survey was completed by TFW Group Limited on the 26th July 2023. The characteristics of the site observed during the walkover are summarised in **Table 4.1**. Photographs of the site were taken during the walk over and these have been included in **Annex D**.

Whilst the walkover summary includes consideration of current operations and housekeeping on the site as potential sources of contamination, it does not constitute a comprehensive environmental audit of the site as covered under ISO 14001.

An annotated aerial photograph can be found in **Figure 4.1** identifying some of the buildings and ruins presents on the site.



Figure 4.1 Existing Buildings

Table 4.1 Site Reconnaissance Findings

Feature	Description
Physical Characteristics	
Access Constraints	There are no significant access constraints to the majority of the site. The site is accessed via Milland Road Industrial Estate.
Site Topography	The topography of the site is generally level. Coming into the site from Milland Road Industrial Estate, the topography slightly slopes to the west. Any surface water is likely to drain in this direction.
Surface Cover	The site is mainly covered by the metal box building, with raised concrete slabs. The outdoor area north of the factory building is tarmac hardstanding.
Site Drainage	Several manhole covers were seen within the hardstanding areas within the northern area of the site. These services ran along the eastern edge of the metal box building.
Surface Water	No surface water features are situated within the boundaries of the development site. A pond is situated 5-10m north of the site boundary. Surface water flooding was seen across the hardstanding area north of the site during the site walkover.

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Vegetation	No vegetation areas are situated within the site's boundary. Areas of rough grassland and partially vegetated land lies immediately north of the site's boundary, with a pond also situated north of the site.
Invasive species	No invasive species have been identified during the walkover survey.
Existing Buildings	The existing building on site was the former metal box works, which remains the same as its former use.
Retaining Walls	Retaining walls have not been identified on the site as such.
Basements on Site	The Metal Bok works building incorporates a basement / cellar. Substructures are also exposed within this area.
Adjacent Buildings	A further factory type building adjoins the northeastern edge of the site's boundary.
Potentially Unstable Slopes	Potentially unstable slopes have not been observed during the walkover survey.
Buried and Overhead Services	All services for the current factory building are likely to be buried. Details of buried underground services were not identified during the site walkover.
Areas of Public Open Space and Rights of Way	Terra Firma were not informed of any public open spaces or rights of way crossing the site. There were no signs or regular unauthorised use.
Environmental Characteristics	
Potentially Hazardous Materials Storage and Use	No potentially hazardous materials were observed as being stored or used on site.
Asbestos Containing Materials.	No asbestos containing materials were observed on site, however given the history of the site they are anticipated to be present.
Evidence of Possible Land Contamination	Made ground material was identified within the basement area beneath the site. This material was likely not controlled when the factory building was developed and could contain various contaminants including metals, metalloids, polycyclic aromatic hydrocarbons, petroleum hydrocarbons and asbestos.
Potential Off-Site Sources of Ground Contamination	No potential off site sources of contamination were identified.

SECTION 5 Preliminary Human Health and Environmental Risk Assessment

5.1 General

The preliminary human health and environmental risk assessment is a qualitative evaluation of unacceptable risks to human health or the environment from potential 'contaminated land', based on reviewed information in preceding sections of this report.

For 'contaminated land' to exist as defined in Part 2A of the Environmental Protection Act (EPA) 1990, a Pollutant Linkage needs to be identified. Pollutant linkages are defined by having a valid 'source – pathway – receptor' as established in the preliminary conceptual site model.

For our definitions of pollution linkage and how we define risk please refer to **Annex B** which includes our classifications of consequence and probability, and risk assessment matrix.

5.2 Potential Sources of Contamination

Potential or known sources of contamination associated the sites current and historical land use are summarised in **Table 5.1**.

Table 5.1 Contamination Sources

ID	Source	Contaminant
S1	Made ground situated below site from factory development and refuse tip infilled land to the northwest	Metals, metalloids, PAH, TPH CWG, Asbestos, VOCs and SVOCs, Ground Gas
S2	Infilled Land and Recorded Refuse Heaps	Ground Gas
S3	Bedrock	Radon Gas

No other significant potential on-site or off-site sources of contamination have been identified during the desk study.

5.3 Potential Pollution Pathways

Potential contaminant pathways associated with a commercial development are as follows.

- P1 – Direct soil and dust ingestion
- ~~P2 – Consumption of home-grown produce~~
- P3 – Dermal contact
- P4 – Inhalation of dust and vapours
- P5 – Vertical migration of leachates (unsaturated zone)
- P6 – Horizontal and vertical migration of contaminants (saturated zone)
- P7 – Artificial contaminant pathway (borehole, pile, excavation etc)
- P8 – Surface run-off
- ~~P9 – Plant uptake~~
- P10 – Horizontal and vertical migration of ground gasses and vapours
- P11 – Direct contact with construction materials
- P12 – Inhalation of asbestos fibres

5.4 Potential Receptors

There are human and hydrological receptors to any contamination that may be present on site. Potential receptors include.

- R1 – Construction and maintenance workers
- R2 – Future site users (future site users)
- R3 – Passers-by or neighbouring site users
- R4 – Groundwater (aquifer)

2.4.7 Estimated Urban Soil Chemistry

The BGS have published estimated urban soil chemistry concentrations locally to the site for a number of common contaminants, i.e., arsenic, cadmium, chromium, lead and nickel. All of the given determinants have anticipated concentrations that are below the recognised trigger levels for a commercial scenario.

2.4.8 Industrial Land Use

Relevant contemporary trade directory entries recorded within proximity of the site are summarised in Table 2.6.

Table 2.6 Relevant Contemporary Trade Summary

Company	Distance/Direction	Classification	Status
Crown Food UK	18m, east	Can Manufacturers	Inactive
J F Coals	206m, east	Coal and Smokeless Fuel Merchants and Distributors	Inactive

2.4.9 Infilled Land

Potentially infilled land features within 250m of the site are summarised in Table 2.7.

Table 2.7 Potentially Infilled Land

Feature	Distance/Direction
Former clay pit below factory (infilled circa. 1951)	0m, west
Former clay pits (infilled between circa. 1918 – 1967)	69m, east
Infilled streams (infilled circa. 1951)	0m, southeast
	0m, northwest
	0m, east
	54m, north
Infilled pond associated with clay pits (infilled circa. 1918-35)	95m, northeast
Partially infilled pond associated with clay pits (infilled circa. 1967)	186m, northeast

Superseded

SECTION 3 Coal Mining Risk Assessment

3.1 Geotechnical Risk

3.1.1 Underground Mining

Based upon geological map data and historic borehole records, the stratigraphical sequence within 30m of the ground surface of the site is illustrated in **Figure 3.1**.

Modern	MADE GROUND associated with historic buildings that have been on site	2.0m
Holocene	Tidal flat deposits comprising various layers of soft sandy gravelly CLAY and/or layers of SAND and GRAVEL at greater depths	10.0m
Pennant Sandstone Formation	Hughes Member: Green-grey, lithic arenites ('Pennant sandstones'), with thin mudstone/siltstone and seatearth interbeds, and mainly thin coals.	20.0m
	MOUNTAIN COAL SEAM (thin)	20.1m
	Hughes Member: Green-grey, lithic arenites ('Pennant sandstones'), with thin mudstone/siltstone and seatearth interbeds, and mainly thin coals.	30.0m

Figure 3.1 Geology and Strata Base Below Ground Level

The site situates within the South Wales Coal Fields.

The report did not record ay past underground mining in any coal seams below the site.

The report records the site is not situated above possible unrecorded shallow workings.

No spine roadways are recorded at shallow depth.

The Coal Authority is not aware of any damage due to geological faults or other lines of weakness that have been affected by coal mining at the site.

The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres of the enquiry boundary, since 31 October 1994. There is no current Stop Notice delaying the start of remedial works or repairs to the property. The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

The Coal Authority has no record of a mine gas emission requiring action.

3.1.2 Shafts & Adits

No mine entries are recorded within 10m of the site's boundary.

3.1.3 Conclusion

Given the local geology and the information presented in the Coal Authority report, it can be concluded that the risk from shallow coal mining to the site is negligible.

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3.2 Mine Gas Risk Decision Support Tool

This assessment has been completed in accordance with guidance published in CL:AIRE, 2021, Good practice for risk assessment for coal mine gas emissions. In the first instance, the risk assessment process requires the screening out of 'potentially at risk sites' utilising the decision support tool for mine gas risk assessment, provided in Figure 13.1 - CLAIRE 2021. A summary of the decision tool and site outcome is presented in Table 3.1.

Table 3.1 Decision Support Tool Summary – Site Specific

Step	Qualifier Question	Outcome	Comment
1	Is the site within a Coal Authority defined Coal Mining Reporting Area?	Yes	Go to step 2
2	Are all these statements true? Mine entries >50m from site boundary Workings >150m depth No faults or other potential pathways connecting surface to deeper unflooded workings Outside are of past or probable shallow workings on Coal Authority Viewer	Yes	Negligible Risk
3	Are all these statements true? Workings between 30m and 150m but permanently flooded or covered by 10m+ of low permeable superficial deposits Mine entries > 50m from site boundary Low permeability superficial deposits of sufficient thickness - <1x10 ⁻⁴ m/s hydraulic conductivity	-	-
4	Are any of these statements true? Mine entries on site or <20m from site boundary Workings below site <30m depth and unflooded or variable water level Faults or other pathways connecting surface to deeper unflooded workings Within area of past or probable shallow workings on Coal Authority Viewer	-	-

It is determined the site is at negligible risk of mine gas, and therefore does not require a detailed mine gas risk assessment to establish whether suitable mitigation measures can be incorporated into the development.

SECTION 4 Site Reconnaissance Findings

A site reconnaissance survey was completed by TFW Group Limited on the 26th July 2023. The characteristics of the site observed during the walkover are summarised in **Table 4.1**. Photographs of the site were taken during the walk over and these have been included in **Annex D**.

Whilst the walkover summary includes consideration of current operations and housekeeping on the site as potential sources of contamination, it does not constitute a comprehensive environmental audit of the site as covered under ISO 14001.

An annotated aerial photograph can be found in **Figure 4.1** identifying some of the buildings and ruins presents on the site.



Figure 4.1 Existing Buildings

Table 4.1 Site Reconnaissance Findings

Feature	Description
Physical Characteristics	
Access Constraints	There are no significant access constraints to the majority of the site. The site is accessed via Milland Road Industrial Estate.
Site Topography	The topography of the site is generally level. Coming into the site from Milland Road Industrial Estate, the topography slightly slopes to the west. Any surface water is likely to drain in this direction.
Surface Cover	The site is mainly covered by the metal box building, with raised concrete slabs. The outdoor area north of the factory building is tarmac hardstanding.
Site Drainage	Several manhole covers were seen within the hardstanding areas within the northern area of the site. These services ran along the eastern edge of the metal box building.
Surface Water	No surface water features are situated within the boundaries of the development site. A pond is situated 5-10m north of the site boundary. Surface water flooding was seen across the hardstanding area north of the site during the site walkover.

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Vegetation	No vegetation areas are situated within the site's boundary. Areas of rough grassland and partially vegetated land lies immediately north of the site's boundary, with a pond also situated north of the site.
Invasive species	No invasive species have been identified during the walkover survey.
Existing Buildings	The existing building on site was the former metal box works, which remains the same as its former use.
Retaining Walls	Retaining walls have not been identified on the site as such.
Basements on Site	The Metal Bok works building incorporates a basement / cellar. Substructures are also exposed within this area.
Adjacent Buildings	A further factory type building adjoins the northeastern edge of the site's boundary.
Potentially Unstable Slopes	Potentially unstable slopes have not been observed during the walkover survey.
Buried and Overhead Services	All services for the current factory building are likely to be buried. Details of buried underground services were not identified during the site walkover.
Areas of Public Open Space and Rights of Way	Terra Firma were not informed of any public open spaces or rights of way crossing the site. There were no signs or regular unauthorised use.
Environmental Characteristics	
Potentially Hazardous Materials Storage and Use	No potentially hazardous materials were observed as being stored or used on site.
Asbestos Containing Materials.	No asbestos containing materials were observed on site, however given the history of the site they are anticipated to be present.
Evidence of Possible Land Contamination	Made ground material was identified within the basement area beneath the site. This material was likely not controlled when the factory building was developed and could contain various contaminants including metals, metalloids, polycyclic aromatic hydrocarbons, petroleum hydrocarbons and asbestos.
Potential Off-Site Sources of Ground Contamination	No potential off site sources of contamination were identified.

SECTION 5 Preliminary Human Health and Environmental Risk Assessment

5.1 General

The preliminary human health and environmental risk assessment is a qualitative evaluation of unacceptable risks to human health or the environment from potential 'contaminated land', based on reviewed information in preceding sections of this report.

For 'contaminated land' to exist as defined in Part 2A of the Environmental Protection Act (EPA) 1990, a Pollutant Linkage needs to be identified. Pollutant linkages are defined by having a valid 'source – pathway – receptor' as established in the preliminary conceptual site model.

For our definitions of pollution linkage and how we define risk please refer to **Annex B** which includes our classifications of consequence and probability, and risk assessment matrix.

5.2 Potential Sources of Contamination

Potential or known sources of contamination associated the sites current and historical land use are summarised in **Table 5.1**.

Table 5.1 Contamination Sources

ID	Source	Contaminant
S1	Made ground situated below site from factory development and refuse tip infilled land to the northwest	Metals, metalloids, PAH, TPH CWG, Asbestos, VOCs and SVOCs, Ground Gas
S2	Infilled Land and Recorded Refuse Heaps	Ground Gas
S3	Bedrock	Radon Gas

No other significant potential on-site or off-site sources of contamination have been identified during the desk study.

5.3 Potential Pollution Pathways

Potential contaminant pathways associated with a commercial development are as follows.

- P1 – Direct soil and dust ingestion
- ~~P2 – Consumption of home-grown produce~~
- P3 – Dermal contact
- P4 – Inhalation of dust and vapours
- P5 – Vertical migration of leachates (unsaturated zone)
- P6 – Horizontal and vertical migration of contaminants (saturated zone)
- P7 – Artificial contaminant pathway (borehole, pile, excavation etc)
- P8 – Surface run-off
- ~~P9 – Plant uptake~~
- P10 – Horizontal and vertical migration of ground gasses and vapours
- P11 – Direct contact with construction materials
- P12 – Inhalation of asbestos fibres

5.4 Potential Receptors

There are human and hydrological receptors to any contamination that may be present on site. Potential receptors include.

- R1 – Construction and maintenance workers
- R2 – Future site users (future site users)
- R3 – Passers-by or neighbouring site users
- R4 – Groundwater (aquifer)

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- R5 – Surface waters (river/lake)
- R6 – Area of public open space
- R7 – Construction materials (concrete/potable water pipes)

5.5 Preliminary Conceptual Site Model

The preliminary conceptual site model establishes potential pollutant linkages between contaminants (source), pathways and receptors, realised during the preparation of the desk study report. Where a potential pollutant linkage is identified an assessment of risk is subsequently undertaken. The preliminary conceptual site model is tabulated in **Table 5.2**.

Outcomes of the preliminary conceptual site model are used as a basis for the design and implementation of the site investigation, whereby areas of potential contamination can be targeted as well as investigating the wider site.

Findings of the site investigation can in turn be used to develop and refine the conceptual site model.

Table 5.2 Preliminary Conceptual Site Model

Source	Pathway	Receptor	Preliminary Risk Assessment		
			Consequence	Probability	Risk
Human Health					
Contaminated Soils S1	Direct soil and dust ingestion P1 Dermal contact P3	Construction and maintenance workers R1	Medium	Low Likelihood	Low Risk - COSHH assessment and good level of PPE/ hygiene by site workers/ staff; dust suppression measures if required. Suitably designed site investigation recommended
		Passers-by or neighbouring site users R3	Medium	Low Likelihood	Low Risk - Significant contamination could be anticipated, however dust suppression measures would likely prove effective against low levels of contamination. However, additional precautions may be required if ACMs are present within the made ground deposits.
	Inhalation of dust and vapours P4	Future site users R2	Medium	Likely	Medium Risk – Contamination could be expected within any potential made ground deposits that could be on site. However, as the proposed development is a redevelopment of a commercial unit, it is unlikely that future site users would be exposed to any contamination. Samples to be collected for due diligence.
	Radon Gas S3 Ground Gas S1 & S2	Horizontal and vertical migration of ground gasses and vapours P10	Future site users R2	Medium	High Likelihood
Future site users R2 Construction and maintenance workers R1			Severe	Likely	High Risk – Depending upon the thickness of made ground deposits encountered on-site, ground gas could pose a risk to human health. Furthermore, various areas of infilled land are evident, possibly linked with the nearby collieries. Suitable ground gas monitoring scheme recommended.
Impacted Groundwaters S1	Horizontal and vertical migration of contaminants (saturated zone) P6 Dermal contact P3	Construction and maintenance workers R1	Medium	Low Likelihood	Low Risk – Suitable PPE recommended when working in any potential made ground/contaminated soils during the construction period.
Contaminated Soils S1	Direct Contact P11	Construction materials (water pipes) R7	Mild	Likely	Low Risk - An appropriate water supply pipe material should be chosen after the potable water supplier has completed 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/WM03/21.
		Construction materials (concrete) R7	Mild	Low Likelihood	Low Risk - Chemical analysis of the soils should be undertaken and the appropriate classification of concrete should be specified as per BRE Special Digest 1: Concrete in Aggressive Ground
Aquatic Environment					
Contaminated Soils S1	Vertical migration of leachates (unsaturated zone) P5	Groundwater (aquifer) R4 Surface waters (river/lake) R5	Mild	Low Likelihood	Low Risk – Depending on the presence of made ground on site and underlying superficial deposits, contamination could prove to be mobile into deeper underlying aquifers if foundations disturb contaminated material. A suitable site investigation should be designed to assess this risk.
	Surface run-off P8	Surface waters (river/lake) R5			
	Horizontal and vertical migration of contaminants (saturated zone) P6				

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Superseded

SECTION 6 Anticipated Ground Conditions

6.1 Geology

Based on the available desk study information and previous site investigation, anticipated ground conditions at the site are summarised in **Table 6.1**.

Table 6.1 Anticipated Ground Conditions

Stratum	Depth (m)
MADE GROUND associated with historic buildings that have been on site and refuse tip.	1.0/2.0
Tidal Flat Deposits comprising various layers of soft sandy gravelly CLAY and/or layers of SAND and GRAVEL at greater depths	10.0
Brithdir Member	>30.0

6.2 Groundwater

Groundwater is anticipated within **SAND** and **GRAVEL** deposits that may underlie the site.

SECTION 7 Recommended Site Investigation

7.1 General

An intrusive site investigation carried out in accordance with guidance provided in BS10175:2011+A2:2017 should be undertaken to achieve the following objectives:

- Identify the potential environmental liabilities at the site associated with any soil, gas, vapours and groundwater contamination from past site uses, to substantiate and enhance the conceptual site model, for a commercial scenario.

7.2 Intrusive Investigation

The first phase should comprise:

- Windowless sampling to investigate the shallow ground conditions, take samples for contamination testing and to install gas monitoring wells. These wells may also serve as groundwater monitoring points if required.
- Soil samples should be taken for chemical analysis to confirm the characteristics of the ground beneath the site to help inform on the contamination status of the site and the need, if any, for site remediation.
- Radon monitoring should be undertaken in the existing building to determine if radon protection measures need to be retrofitted during the renovation works.

Depending on the findings of the first phase additional phases of investigation may be required.

7.3 Recommended Soil Chemical Analysis

It is recommended that all natural soil samples are screened for the contaminants listed in Table 7.2.

Table 7.2 Soil Laboratory Analysis

Metals & Metalloids	In-Organics	Organics	Others
Arsenic	Cyanide	Phenols	pH (acidity)
Boron	Sulphate	PAH	
Cadmium			
Chromium III			
Chromium VI			
Copper			
Lead			
Mercury			
Nickel			
Selenium			
Zinc			

Additionally, all made ground soils samples should also be screened for petroleum hydrocarbons, VOCs, SVOCs and asbestos. Any natural soils underlying made ground may also need to be tested for petroleum hydrocarbons.

Soil samples exhibiting elevated levels of metal and metalloid determinands should be further scheduled for leachate testing of the offending substance.

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7.4 Recommended Ground Gas and Vapour Assessment

It is recommended that dedicated shallow gas wells be installed around the existing building in the areas of proposed modification.

Installations should be suitably designed and tested for carbon dioxide, methane, oxygen, hydrogen sulphide and carbon monoxide using a suitable gas analyser. Atmospheric pressure and gas flow should also be recorded.

It may also be prudent to monitor within enclosed spaces within the existing building.

With reference to CIRIA C665:2007 Tables 5.5a and 5.5b, it is considered that a gas monitoring program comprising 6 visits over a 3 month period will be sufficient, however, this may need to be extended if any concerns are raised during the initial monitoring period.