Geraint John Planning Limited

LAND ADJACENT TO A48, PYLE, BRIDGEND

Desk Study Report

12305/LP/18/DS

Intégral
Géotechnique

CLIENT: **Geraint John Planning Limited**

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1.0 INTRODUCTION

1.1 GENERAL

Geraint John Planning Limited are preparing a candidate site submission for parcels of land adjacent to A48 in Pyle, in order to be considered for LDP for Bridgend County Borough Council following a shortfall of land supply.

Intégral Géotechnique (Wales) Limited have been appointed as the Geotechnical Engineers to undertake a geoenvironmental and geotechnical desk study of the site.

The objectives of the geoenvironmental and geotechnical appraisal are to:

- Assess the degree, nature and extent of possible contamination and its implications for ownership and site development;
- Identify any geotechnical constraints on development; and
- Provide recommendations for physical site investigation works.

This report presents the findings of the desk study, and provides guidance on the scope of the geoenvironmental and geotechnical investigation.

The opinions and preliminary assessments presented are based on desk-based research and should be reviewed after intrusive investigation, if required.

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1.2 PROPOSED DEVELOPMENT

There are no current development proposals for the site but the proposals are for the land to be included within the revised plan for a residential led mixed-use strategic allocation as part of Bridgend County Borough Council LDP.

1.3 SCOPE OF WORKS

The work instructed included a desk study of available information, together with an initial conceptual site model. The desk study comprised a review of:

- An Envirocheck Report obtained for the site;
- Old Ordnance Survey maps covering the site, included within the Envirocheck Report;
- Geological maps of the area provided by the British Geological Survey;
- The Environment Agency groundwater vulnerability map and aquifer database for the area; and
- Existing site investigation data

1.4 LIMITATIONS

This document is intended to be a working document for further development in discussion with all concerned including the Local Planning Authority, Natural Resources Wales (NRW), and the NHBC as appropriate.

"Contamination" is taken throughout the report to mean the "presence of one or more potentially harmful substances as a result of human activity". The use of the term in this way does not imply that harm is being or might be caused by the contamination. It should be noted that "contamination" can have different meanings under different regulatory regimes, for example, planning, building control and Part IIA of the Environmental Protection Act 1990. Naturally elevated concentrations of potentially harmful substances may also be of concern and the significance of any that have been found is also evaluated in this report.

2.0 THE SITE

2.1 SITE LOCATION AND DESCRIPTION

The site comprises two parcels of land (A and B) which are located adjacent to the A48 in Pyle at a National Grid Reference of 283818, 181521, see Figure 1.

The sites are irregular in shape and occupy a combined area of approximately 69 hectares. The boundaries of Land Parcel A are defined by undeveloped fields to the south, a farm with associated land and the A4229 to the west and the A48 to the north and northeast. The boundaries of Land Parcel B are defined by the M4 to the south, the A48 to the southwest, an existing access road and undeveloped fields to the east and west and the railway line to the north. A site plan is presented in Figure 2.

The land parcels are situated on undulating ground which rise from an approximate elevation of 47m AOD in the northwest to an approximate elevation of 96m AOD in the southeast.

The two land parcels are generally occupied by a number of undeveloped fields which are currently utilised as agricultural land with the fields bounded by mature hedgerows. A wooded area, approximately 50m across, is located within the western field of Land Parcel A. Stormy Farm is located on the eastern side of Land Parcel B which comprises a number of farm buildings and including a slurry bed and tanks. A stone outbuilding is also located within the southeast field.

The A48 separates the two land parcels and runs in a southeast to northwest direction towards the roundabout which connects it to the A4229. The A48 is lined with hedgerows and mature trees.

The northern boundary of Land Parcel B, along the railway line, is also lined with mature trees. It is also wooded in the northeast area adjacent to the railway line and in the vicinity of an existing watercourse known as Afon Fach.

Overhead electricity lines pass over the northeast corner of Land Parcel B with a pylon located within the northeast field. Other services are also known to be present beneath the site.

2.2 SITE OPERATIONS

The land parcels are currently farmland and utilised for agricultural purposes.

2.3 SURROUNDING LAND USE

The areas to the south and east of the land parcels are generally undeveloped farmland. Beyond the railway line to the north the area is developed to form Village Farm Industrial Estate. Beyond the road to the west is extensively developed for mainly residential use within North Cornelly.

2.4 AVAILABLE SITE INVESTIGATION DATA

There are available BGS trial pits and boreholes in close proximity of the land parcels which were drilled as part of the Stormy Down link road and the M4. The trial pit and borehole logs and a plan showing their approximate locations are presented in Figure A1 presented in Appendix A.

The trial pits and boreholes generally encountered topsoil overlying soft to firm reddish-brown silt/clayey silt and sand with gravel and occasional cobbles or moderately compact sub-rounded to sub-angular gravel and sand and firm reddish-brown silt.

Borehole SS 88 SW 70 which was drilled in the southeast area adjacent to the M4, encountered weak to moderately weak sandstone directly beneath the topsoil. Weathered conglomerate and weathered mudstone/siltstone were encountered within trial pit SS 88 SW 104 and borehole SS 88 SW 111 at 2.5m and 2.35m depths respectively.

3.0 SITE HISTORY

The recent history of the two land parcels has been traced with the aid of an Envirocheck Report, a copy of which is included in Appendix B. The Envirocheck Report includes a selection of 1:10,000. 1:10,560, 1:2500 and 1:1250 scale historical maps.

The earliest editions of the maps dated 1876-1885 indicated both land parcels to be largely undeveloped fields with many field boundaries and some footpaths which crossed the areas. The northern boundary of Land Parcel B was formed by the existing Great Western Railway line and the western boundary was an existing road. A smaller railway line (Llynfi and Ogmore Section of the Porthcawl Branch of the Great Western Railway) loops across Land Parcel B from the north and it then ran in a westerly direction to loop around to the north and west Land Parcel A. Another tramway passed across the northern boundary of Land Parcel B and showed evidence of disturbed and rough vegetated ground. A surface water feature was also indicated within this area. There was an existing development within the north eastern corner of Land Parcel B in between the railway to the north and the road to the east. A well was also indicated in the vicinity of these buildings. Stormy Farm was located on the eastern boundary of Land Parcel B with a small track which passed across the site to access the buildings. Another small building, likely to be associated with the farm, was located within the southeast area of Land Parcel B. A small pond feature was indicated within the western area of Land Parcel B just to the south of the Porthcawl Branch line. A small wooded area was indicated within the western area of Land Parcel A. An old quarry was indicated adjacent to the southern boundary of Land Parcel A. The larger active Pant Mawr quarry was located approximately 1200m to the southwest of the sites, a smaller quarry with engine house was indicated approximately 400m to the southeast and other smaller quarries and limekilns were evident to the south. The two land parcels were separated by an existing road which ran in an approximately southeast to northwest direction. Archaeological information suggests this could be an old Roman road.

The 1899-1900 editions of the maps showed Land Parcel A to have remained relatively unchanged. The railway line which passed through Land Parcel B now appeared to have been widened and slightly rerouted off site to the west. There was also evidence of stockpiles of material between the railway and the northern boundary of the site. A spring was now indicated adjacent to the buildings which formed Stormy Farm. The buildings and well within the northeast corner were no longer present and the area was indicated to be rough pasture and trees. The active quarries within the areas to the south were indicated to be expanding.

3.0 SITE HISTORY (CONTINUED)

The sites remained relatively unchanged over the subsequent years. By 1950 a well was indicated adjacent to Stormy Farm and with surface water features indicated within this area of the site. The pond feature within the western area of Land Parcel B to the south of the branch line, was now indicated to be a reservoir. Overhead electricity lines were indicated to pass over the northeast corner. A large building had also been constructed to the west of Land Parcel B just to the south of the railway. Pant Mawr Quarry to the south continued to expand and was now also a lime works. The quarries to the south and southeast also continued to expand and a Royal Air Force Camp was constructed to the south of the quarry area. It is known that the camp was constructed in the 1940's.

The editions of the maps dated 1964-1969 indicated that the railway which passed through Land Parcel B was now a mineral railway and the section of the line which looped around to the north and west of Land Parcel A was now dismantled. The ground between the mineral railway and the main railway line was very disturbed. The road which passed between the two land parcels was now more established, had been widened and was now known as the A48. North Cornelly was now well established beyond the dismantled railway to the west of the sites. The large quarry to the south was now known as Cornelly Quarry and had expanded further and the quarry to the southeast and south were known as Stormy West Quarry and Stormy Down Quarry respectively. The camp and airfield to the south of the quarry was now disused.

By the 1980's the railway had been dismantled along the full length with only the railway cutting evident through Land Parcel B. The area adjacent and to the north of Stormy Farm was now indicated to be marshy ground associated with all the surface water features within the area. The A48 now connected into a new roundabout which had been constructed to the northwest of Land Parcel A. Another new road, the A4229, was constructed off the roundabout and to the west of the site which connected into the newly constructed M4 which formed the southern boundary of Land Parcel B. Ty Draw Farm had been constructed to the west of Land Parcel A, in between the site and the new road. The industrial estate was beginning to develop beyond the railway to the north of the sites by this time.

The sites remained relatively unchanged through the 1990's with Stormy Farm remaining as the only development on site which continued to expand over the years. Village Farm Industrial Estate continued to expand to the north of the railway line. Stormy West Quarry was indicated to be disused by the map dated 1999.

3.0 SITE HISTORY (CONTINUED)

By 2006 the former railway line which passed through Land Parcel B had been infilled. There was also no longer any evidence of the reservoir within Land Parcel A. Stormy Down Quarry to the south was now disused. Both land parcels have remained in use as agricultural land.

A summary of the approximate locations of historical interest from a geotechnical or geo-environmental aspect are shown on Figure 3.

4.0 SITE ENVIRONMENTAL SETTING

4.1 PHYSICAL SETTING

The land parcels are situated on undulating ground which rise from an approximate elevation of 47m AOD in the northwest to an approximate elevation of 96m AOD in the southeast. Surface water features are evident within the northern area of Land Parcel B.

4.2 GEOLOGY

The 1:50,000 scale geological map of the area indicates that the land parcels are underlain by a variable combination of Triassic Period rocks. The majority of the site is underlain by Penarth Group (Marginal Facies) which are generally variable, typically consisting of pale grey or yellowish grey sandstone, calcareous or dolomitic, locally with pebble-sized clasts of limestone or quarzitic sandstone. Penarth Group rocks are also evident comprising grey to black mudstones with subordinate limestones and sandstones. Blue Anchor Formation rocks are indicated beneath the western area of Land Parcel A and within the northern area of Land Parcel B. The formation typically comprises pale green-grey, dolomitic silty mudstones and siltstones. Mercia Mudstone Group rocks are indicated beneath the western corner of Land Parcel A and along the northern boundary and beneath the northeast corner of Land Parcel B. These rocks are predominantly red and less commonly green grey mudstones and siltstones. Thin beds of gypsum are widespread and sandstones are also present. The geological boundary of St Mary's Well Bay Member encroaches across the northeast corner of Land Parcel B. These rocks typically comprise interbedded limestones and mudstones.

A number of faults pass through the two land parcels including a northwest to southeast trending fault passing approximately through the centre of the combined area. Additional fault lines radiated from this central fault to the north and south. A summary of the solid geology and the main fault lines are shown on Figure 4.

The Envirocheck Report discusses the presence of natural cavities in the form of sinkholes within and within close proximity of the site. Three possible recorded features are also indicated on Figure 4. Where multiple cavities are recorded at one location, on site, Envirocheck have confirmed that this reference relates to potential off-site features that fall within a greater reporting area which covers the site.

4.2 GEOLOGY (CONTINUED)

In this area minerals potentially exploitable are mainly limited to limestone, sandstone, sand and gravel and coal. At present the only mineral extraction being carried out is for limestone from the quarries to the south of the site. It is important that limestone and sandstone resources are safeguarded selectively in the LDP. The Aggregate Safeguarding Areas and mineral potential are shown on Figures 6a and 6b.

Superficial deposits of the Quaternary Period are indicated to overlie the solid strata within parts of the site. Devensian Till deposits are indicated within the western area of Land Parcel A and along the northern and eastern edges of Land Parcel B. These deposits are variable in nature and generally comprise poorly sorted sands, clays and gravels. Head deposits are indicated across the northern area of Land Parcel B and with a strip, approximately through the centre of the site and through the eastern area of Land Parcel A. These deposits are also poorly sorted and variable in nature and comprise sand and gravel, locally with lenses of silt, clay or peat and organic material. The Bridgend Thematic maps also indicate an area of sand and gravel within the western area of Land Parcel A. The approximate areas of superficial deposits are summarised on Figure 5.

Localised areas of made ground are anticipated above the in-situ deposits within parts of the sites, but most likely within Land Parcel B. Made ground would be anticipated in the vicinity of Stormy Farm and within the northeast corner due to the historical presence of buildings. Made ground would also be anticipated within the area of the former railway which was subsequently infilled and in the area to the north where stockpiles of materials were evident on the historical maps.

A summary of the anticipated geological succession is given below in Table 1.

4.2 GEOLOGY (CONTINUED)

Table 1: Summary of Anticipated Site Geology

Geological unit	Horizon	Description
Recent	Topsoil or made ground	Various materials
Quaternary	Devensian Till	Variable in nature generally comprising poorly sorted sands, clays and gravels
	Head Deposits	Poorly sorted comprising sand and gravel, locally with lenses of silt, clay or peat and organic material

4.2 GEOLOGY (CONTINUED)

Geological unit	Horizon	Description
	Sand and Gravel	Sand and gravel in a variable matrix
Triassic	Penarth Group (Marginal Facies)	Generally variable, typically consisting of pale grey or yellowish grey sandstone, calcareous or dolomitic, locally with pebble-sized clasts of limestone or quarzitic sandstone
	Penarth Group	Grey to black mudstones with subordinate limestones and sandstones
	Blue Anchor Formation	Pale green-grey, dolomitic silty mudstones and siltstones
	Mercia Mudstone Group	Predominantly red and less commonly green grey mudstones and siltstones. Thin beds of gypsum are widespread and sandstones are also present
	St Mary's Well Bay Member	Interbedded limestones and mudstones

4.3 RADON

Information with regard to Radon Protective Measures is provided within the Envirocheck Report. The land parcels have variable radon protection from lower probability (<1% of homes at or above action level) to intermediate probability (1% to 3% or 5% to 10% of homes at or above action level). The lower probability areas would not require any radon protection and the intermediate probability areas (5% to 10%) would require basic radon protective measures.

It would be prudent to obtain BGS radon report to more accurately determine the areas requiring basic radon protection prior to development.

4.4 MINING

The land parcels do not lie in an area which would be affected by past, present or future underground coal mining.

The Aggregate Safeguarding Areas and mineral potential are shown on Figures 6a and 6b. In general terms it is considered unlikely that the potential minerals on the site area could be efficiently and economically exploited and hence this should not be an impediment to development. There are already similar operations to the south of the site and hence additional operations are not likely to be necessary.

4.5 HYDROLOGY, HYDROGEOLOGY AND FLOOD RISK

The Envirocheck Report indicates that the nearest surface water feature is located on site and within the northwest and northeast areas of Land Parcel B and along the northern boundary. This watercourse is known as the Afon Fach.

The Environment Agency groundwater vulnerability map and aquifer database classifies the bedrock beneath the land parcels. The Penarth Group (Marginal Facies) and St Mary's Well Bay Member are classified as a Secondary 'A' Aquifer. Secondary 'A' Aquifers are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers. The Penarth Group is classified as a Secondary Undifferentiated Aquifer. Secondary Undifferentiated Aquifers are assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type. The Mercia Mudstone Group and Blue Anchor Formation are classified as a Secondary 'B' Aquifer. Secondary 'B' Aquifers are predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.

These rocks are all underlain at a greater depth by Oxwich Head Limestone Formation which is classified as a Principal Aquifer. Principal Aquifers are layers of rock that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.

The Environment Agency groundwater vulnerability map and aquifer database classifies the Devensian Till deposits beneath the land parcels as Unproductive Strata. Unproductive strata are drift deposits with low permeability that have negligible significance for water supply or river base flow. The Head deposits are classified as a Secondary Undifferentiated Aquifer.

A perched water body could be encountered within the made ground. Vertical migration of groundwater is likely to be limited by the high clay content of the superficial deposits.

It is considered possible that any existing site drainage could act as a pathway for potential surface contaminants.

4.5 HYDROLOGY, HYDROGEOLOGY AND FLOOD RISK (CONTINUED)

There are seven discharge consents recorded within 500m of the boundaries of the two land parcels. The nearest two are recorded 180m north of Land Parcel A and they are sewage discharges received by the Afon Fach. Another three discharge consents were recorded 250m northwest of Land Parcel A, two of which are miscellaneous discharges received by a Tributary of the Afon Fach and one is a trade discharge received by the Afon Fach. An unspecified discharge received by the Afon Fach is recorded 280m north of Land Parcel A. Another unspecified discharge is recorded 474m east of Land Parcel B and received by land to underground strata. This authorisation has been revoked.

The Envirocheck Report states that there are no water abstractions within 800m of the land parcels.

Tables 2 and 3 present a summary of the hydrological features and key hydrogeological nature of the site.

Table 2: Summary of Site Hydrology

Feature	Distance from site	Flow	Classification	Abstraction	Discharge
Afon Fach	Northwest, north and Northeast of Land Parcel B	Not known	Not known	No	Not known
Unnamed surface water features	Northwest and Northeast of Land Parcel B	Not known	Not known	No	Afon Fach
Surface run-off	On site	Flows into site drainage	N/A	No	Not known
Site Drainage	On site	Not known	N/A	No	Not known

Table 3: Summary of Site Hydrogeology

Geological Unit	Aquifer Classification	Aquifer Characteristics	Source Protection Zone	Groundwater Abstractions
Topsoil or made ground	Not classified	Highly variable permeability and porosity. Perched water may be present with variable flow directions.	No	None

4.5 HYDROLOGY, HYDROGEOLOGY AND FLOOD RISK (CONTINUED)

Table 3: Summary of Site Hydrogeology

Geological Unit	Aquifer Classification	Aquifer Characteristics	Source Protection Zone	Groundwater Abstractions
Devensian Till	Unproductive Strata	Variable low permeability and porosity with intergranular flow possible. High clay content likely to restrict flow.	No	None
Head Deposits	Secondary Undifferentiated Aquifer	Variable permeability and porosity with intergranular flow possible. High clay content likely to restrict flow.	No	None
Penarth Group (Marginal Facies) St Mary's Well Bay Member	Secondary A Aquifer	Variable moderate permeability sandstones and limestones or limestones and mudstones	No	None
Penarth Group	Secondary Undifferentiated Aquifer	Variable permeability sandstones, limestones and mudstones	No	None
Mercia Mudstone Group and Blue Anchor Formation	Secondary B Aquifer	Variable low to moderate permeability mudstones and siltstones	No	None
Oxwich Head Limestone Formation (at greater depths)	Principal Aquifer	High permeability limestones	No	None

4.5 HYDROLOGY, HYDROGEOLOGY AND FLOOD RISK (CONTINUED)

The soils within the northern area of Land Parcel B have been classified as having a low leaching potential. Soils of low leaching potential are unlikely to penetrate the soil layer because either water movement is largely horizontal, or they have the ability to attenuate diffuse pollutants. Lateral flow from these soils may contribute to groundwater recharge elsewhere in the catchment. Some of the soils in this area and along the eastern boundary and within the western area of Land Parcel A, have been classified as a non-aquifer (negligibly permeable). The soils within the central area (either side of the A48) and southeast areas of both land parcels, are classified as having a high leaching potential (H3). Soils of high leaching potential are coarse textured or moderately shallow soils which readily transmit non-absorbed pollutants and liquid discharges but which have some ability to attenuate absorbed pollutants because of their large clay or organic matter content.

The Environment Agency Flood Risk Map as presented within the Envirocheck Report indicates that the northern edge of Land Parcel B has potential for extreme flooding from rivers or sea without defences. The BGS Flood GFS Data map indicates that the majority of Land Parcel A, with the exception of the southwest corner, has limited potential for groundwater flooding to occur. The northwest corner is indicated to have potential for groundwater flooding of property situated below ground level. The majority of Land Parcel B has limited potential for groundwater flooding to occur. The northern and northeast area has potential for groundwater flooding to occur at the surface and the northwest area has potential for groundwater flooding of property situated below ground level.

4.6 LANDFILL SITES

The Envirocheck Report indicates that there is one historical landfill located 403m south of the land parcels at Stormy Down Quarry where deposited waste included industrial and household waste.

A Licensed Waste Management Facility is recorded within the northern area of Land Parcel B in the vicinity of the former railway line. The site was categorised as a landfill taking non-biodegradable wastes (not construction). The site is now closed. This area is also a Local Authority Recorded Landfill Site.

There are other Licensed Waste Management Facilities located within Village Farm Industrial Estate between 145m to 321m to the north of the land parcels and 450m 592m to the south at Stormy Down.

4.6 LANDFILL SITES (CONTINUED)

There are records of potentially infilled land (non-water) within 250m of the site boundary with one area indicated 4m to the southwest of Land Parcel A within the area of a former quarry as indicated on the historical map. Another area of potentially infilled land (non-water) was indicated 71m to the east of Land Parcel B, also at the location of a former quarry.

4.7 POTENTIAL CONTAMINATION

Previous Uses

The various activities in the vicinity of the land parcels which may have resulted in ground or water resource contamination on this site are listed below in Tables 4 and 5. A summary of the potential contaminants can be found in the tables.

Table 4: Potential Contaminants

Land Use: Farmland with associate farm buildings until the present day

Material/Process	Contamination/Hazard	Evidence
Undeveloped fields	No potential contaminants	Historical maps
Railway line passing across Land Parcel B and disturbed ground in the vicinity	Metals, semi metals, non-metals, PAH, asbestos and possible localised petroleum hydrocarbons	Historical maps
Buildings forming Stormy Farm and subsequent reconfiguration over the years	Metals, semi metals, non-metals, PAH, asbestos	Historical maps
Buildings present within the northeast area of Land Parcel B, subsequently demolished by 1900	Metals, semi metals, non-metals, PAH, asbestos	Historical maps
Dismantling of the railway line by the 1970's/1980's and subsequent infilling by 1990's/2000's	Metals, semi metals, non-metals, PAH, asbestos	Historical maps
Possible above or below ground fuel tanks in the vicinity of the farm buildings	Petroleum Hydrocarbons	Anecdotal

Existing Uses

Both land parcels are currently utilised as farmland and remain largely as undeveloped fields. The buildings associated with Stormy Farm are located on the eastern boundary of Land Parcel B.

4.7 POTENTIAL CONTAMINATION (CONTINUED)

Adjacent Site Uses

Table 5: Potential Contaminants: Adjacent Site Uses		
Potential Contamination Source	**Boundary**	**Associated Contaminants and Hazards**
Undeveloped farmland	South western (Land Parcel A) and eastern (Land Parcel B)	No Potential Contaminants
Railway line with industrial estate beyond	Northern (Land Parcel B)	No Potential Contaminants
M4	Southern (Land Parcel B)	No Potential Contaminants
Existing farm with associated land and A4229	Western (Land Parcel A)	No Potential Contaminants
A48	In between the two land parcels	No Potential Contaminants

4.8 OTHER ENVIRONMENTAL ISSUES

A Site of Special Scientific Interest has been identified adjacent to the southeast corner of Land Parcel B at Stormy Down and another 19m northeast at Cefn Cribwr. A Special Area of Conservation is also indicated at this location at Cefn Cribwr Grasslands. Frog Pond Wood is a local nature reserve located 11m north of Land Parcel B.

The Envirocheck Report indicates that there have been no pollution incidents to controlled waters recorded on site but twenty-six within 250m of the boundary of the land parcels. The nearest incident was recorded 19m to the northeast of Land Parcel B and was a Category 3-Minor Incident involving light oil. A number or other minor incidents were recorded but the nearest Category 2-Significant Incident was recorded 117m north of Land Parcel B involving coal solids.

A Local Authority Pollution and Prevention Control is in place 133m north of Land Parcel B for quarry processes including roadstone plants and the size reduction of bricks, tiles and concrete.

4.8 OTHER ENVIRONMENTAL ISSUES (CONTINUED)

There have been two prosecutions relating to authorised processes recorded within 250m of the boundary of Land Parcel B. One was recorded 83m to the north and a guilty verdict was reached for operating an illegal waste transfer station. Another guilty verdict was reached at a location 88m north for depositing and burning waste paper.

The ecology report indicated that stands of Japanese Knotweed are known to be present on Stormy Down close to the boundary. Himalayan Balsam, which is another invasive species, was found in pockets throughout the land parcels.

There are a number of contemporary trade directory entries to the north of the sites due to the location of Village Farm Industrial Estate.

5.0 PRELIMINARY CONCEPTUAL SITE MODEL

5.1 RISK ASSESSMENT FRAMEWORK

In order to be consistent with current UK government policies and legislation, it is necessary to identify, make decisions on, and take appropriate action to deal with land contamination, in accordance with the procedures specified in the Environment Agency document 'Model Procedures for the Management of Land Contamination CLR-11' (Environment Agency 2004).

The risk assessment process is designed to provide a reasoned, structured and pragmatic mechanism for the identification of any potential human health and controlled waters risks associated with land contamination and where necessary to develop a robust remediation strategy to ensure protection of the sensitive receptors (human health of future residents, controlled waters, etc).

In accordance with the CLR-11 framework, risk is defined as:

'a combination of the probability, or frequency, of occurrence of a defined hazard and the magnitude of the consequence of the occurrence'.

The three essential elements to any risk are defined by CLR-11 as follows:

- A contaminant, or hazard, which is in, on, or under the land and has the potential to cause harm (Source)
- A means by which a receptor can be exposed to, or affected by a contaminant or hazard (Pathway)
- A receptor, i.e. something which could be adversely affected by a contaminant or hazard, such as human health or groundwater (Receptor).

In order for there to be a potential risk, all three of the above elements must be present. If there is a source of contamination and a receptor (for example a resident or site user), then there is only a potential risk if there is a pathway linking the two. Such an active pathway is known as a relevant pollutant linkage. It is possible for the same contaminant to be linked to a receptor via a number of pathways, and hence it is important that all relevant pollutant linkages, to both human health and controlled waters, are separately identified on a site in order that a comprehensive conceptual model can be formed and ultimately a robust remediation strategy designed.

5.1 RISK ASSESSMENT FRAMEWORK (CONTINUED)

Current practice during Generic Quantitative Risk Assessment of land affected by contamination is to use generic soil screening values based on the appropriate proposed end use. These usually comprise risk-based Soil Guideline Values (SGVs) or Generic Assessment Criteria (GACs) derived by the Environment Agency's Contaminated Land Exposure Assessment Model (CLEA). The SGVs and the supporting technical guidance were developed in order to assist in the assessment of long-term risk to human health from the exposure to contaminated soils.

Revised Statutory Guidance, published in 2012, to support Part 2A of the Environmental Protection Act 1990, introduced a new four category system for classifying land under Part 2A. Category 1 includes land where the level of risk is clearly unacceptable and Category 4 includes land where the level of risk posed is considered to be acceptably low. Under Part 2A, land would be determined as contaminated if it falls within Categories 1 or 2.

The revised Part 2A Statutory Guidance was accompanied by an Impact Assessment that identified a role for new 'Category 4 Screening Levels' (C4SLs) that would provide a simple test for determining when land is suitable for use and definitely not contaminated land. A Policy Companion Document including the C4SLs was published in March 2014 (England) and May 2014 (Wales).

The C4SLs have been based on the CLEA methodology and derived using the CLEA model, with modified toxicological and exposure parameters. To date, C4SLs have been released for six substances (arsenic, cadmium, chromium (VI), lead, benzo(a)pyrene and benzene).

The C4SLs have been derived on the assumption that where they exist, they will be used as generic screening criteria within generic quantitative risk assessment.

Following publication of the C4SLs, Land Quality Management (LQM), in conjunction with the Chartered Institute for Environmental Health (CIEH) released Suitable 4 Use Levels (S4ULs) in January 2015.

The S4ULs have been derived in accordance with UK legislation, and using a modified version of the Environment Agency's CLEA software. As such, the S4ULs are based on the concept of minimal or tolerable risk as described in Human Health Toxicological Assessment of Contaminants in Soil (Science Report SR2, Environment Agency 2009a).

S4ULs have been derived for a wider number of substances.

5.1 RISK ASSESSMENT FRAMEWORK (CONTINUED)

In addition to the existing SGVs, C4SLs and S4ULs, Atkins ATRISK^{soil} also provide a set of Soil Screening Values. These are currently intended to be used in conjunction with SGVs, although they intend to update these values in line with the C4SLs in due course.

We have reviewed all sets of values and intend to use the most appropriate assessment criteria as Tier 1 screening values in the first instance. Where a published S4UL is available, and considered appropriate, this will be used in the first instance.

5.2 CONCEPTUAL MODEL FRAMEWORK

The preliminary stage of the risk assessment process is to develop and define a conceptual site model, based on the desk study and any existing site investigation data. This is used to establish any potential contaminant sources, identify existing and future receptors and assess if there are any potentially active pathways by which a potential risk may be present.

The preliminary conceptual site model will be developed and refined as site specific data is gathered, such as actual ground conditions and chemical data, resulting in a more robust conceptual understanding of the site.

5.3 CRITICAL SENSITIVE RECEPTOR – HUMAN HEALTH

The likely proposed development of the site would be for a residential end use. Therefore, the critical sensitive receptor from a human health perspective is an on-site residential receptor.

In accordance with C4SL and CLEA guidance for a standard residential scenario, the critical sensitive receptor for a residential end use risk assessment is a female child, with exposure from 0 to 6 years.

The standard residential end-use conceptual model defined by C4SL and CLEA is assumed to be suitable for the purposes of this assessment.

5.4 CRITICAL SENSITIVE RECEPTOR – CONTROLLED WATERS

Based on the proposed redevelopment of the site for a residential end use, and the findings of the desk study, the critical sensitive receptor from a controlled water perspective is groundwater within the Secondary ‘A’ Aquifer of the Penarth Group (Marginal Facies) and the St Mary’s Well Bay Member.

5.4 CRITICAL SENSITIVE RECEPTOR – CONTROLLED WATERS (CONTINUED)

By considering groundwater as the critical sensitive receptor for controlled waters, the groundwater/hydrogeological risk assessment will also be protective of the Afon Fach which flows across Land Parcel B and any other on site or nearby surface water features.

5.5 POTENTIAL CONTAMINANT SOURCES

As identified in the desk study the land parcels have been utilised as farmland and remained largely undeveloped. Stormy Farm has always been located on the eastern boundary of Land Parcel B. The historical maps indicated that a railway passed through Land Parcel B until it was dismantled and infilled by the late 1990's/early 2000's. Made ground would be anticipated within these areas and possibly localised to other areas of the sites.

The potential types of contaminants of concern are listed below:

- Metals, semi-metals, and inorganics within the shallow made ground/shallow groundwater;
- Polyaromatic hydrocarbons (PAH) within the shallow made ground/shallow groundwater;
- Localised Petroleum Hydrocarbons (VPH/EPH) within the shallow made ground/shallow groundwater near any fuel tanks if present on the farm; and
- Asbestos within the shallow made ground.

5.6 POTENTIAL EXPOSURE PATHWAYS

Potential exposure pathways for the critical receptors (both human health and controlled waters) are listed below:

- Dermal contact with soil and/or soil derived dust;
- Ingestion of soil and/or soil attached to home-grown produce;
- Ingestion of home-grown produce;
- Inhalation of soil derived dust;
- Inhalation of vapours – indoor and outdoor air;
- Leaching of contaminants from made ground to groundwater; and
- Transportation of contaminants within groundwater.

5.6 POTENTIAL EXPOSURE PATHWAYS (CONTINUED)

In addition, the following exposure pathways have also been considered:

- Ground gas generation and migration; and
- Building materials durability.

5.7 SUMMARY OF CONCEPTUAL EXPOSURE MODEL

A preliminary conceptual exposure model has been developed for the two land parcels. This is based on the findings of the desk study and historical review and includes all potential sources, pathways and receptors that may be present on site. Those that have been identified as being potentially active require further investigation in the form of sampling and testing of soils and groundwater, followed by appropriate risk assessment.

The preliminary conceptual exposure model will be reviewed and refined following the completion of any future site works and laboratory testing.

The preliminary conceptual exposure model is presented below in Table 6.

Table 6: Preliminary Conceptual Exposure Model

Source		Receptor	Pathway	Potentially Active Pathway?
Origin	Contaminant			
Made Ground of unknown origin and historical land uses	Metals, semi-metals, non-metals, PAH, asbestos	Resident – human health	Dermal Contact with made ground/dust	✓
			Ingestion of soil and/or soil attached to home-grown produce	✓
			Ingestion of home-grown produce	✓
			Inhalation of dust	✓
			Inhalation of vapours – indoor/outdoor	✓
	Metals, semi-metals, inorganics, PAH	Groundwater quality	Leaching from made ground	✓
	Metals, semi-metals, inorganics, PAH	Surface water quality	Transportation within groundwater	✓
Made Ground of unknown origin and natural ground	pH and water-soluble sulphate	Building Materials Durability	Direct contact	✓

5.7 SUMMARY OF CONCEPTUAL EXPOSURE MODEL (CONTINUED)

Source		Receptor	Pathway	Potentially Active Pathway?
Origin	Contaminant			
Ground Gas – organic, gas producing materials present within site or adjacent to the site	Methane, carbon dioxide	Human health	Accumulation of gases in confined spaces, and/or migration off site, leading to asphyxiation, or risk of explosion	✓
Localised fuel spills in the vicinity of any fuel tanks associated with the farm	Total Petroleum Hydrocarbons	Resident – human health	Dermal Contact with made ground/dust	✓
			Ingestion of soil and/or soil attached to home-grown produce	✓
			Ingestion of home-grown produce	✓
			Inhalation of dust	✓
			Inhalation of vapours – indoor/outdoor	✓
	Total Petroleum Hydrocarbons	Groundwater quality	Leaching from made ground	✓
	Total Petroleum Hydrocarbons	Surface water quality	Transportation within groundwater	✓

6.0 ANTICIPATED GROUND CONDITIONS

Based on the geological map data, historical records and available site investigation data, the following general succession of superficial deposits and underlying solid geology beneath the site is anticipated:

Recent	Topsoil and localised area of made ground comprising variable materials
Quaternary	Devensian Till and Head deposits comprising variable and poorly sorted sands, clays and gravels
Triassic	Penarth Group (Marginal Facies), Penarth Group, Mercia Mudstone Group, Blue Anchor Formation and St Mary's Well Bay Member each stratum comprising variable compositions of mudstones, siltstones, limestones and sandstones

No superficial deposits are indicated to overlie the solid strata within the southern areas of the two land parcels. The superficial deposits within the northern area of Land Parcel B would be anticipated to be poorer due to the potential high-water table which would naturally soften the deposits in this area. The historical maps also indicated marshy ground to the north of Stormy Farm which could also prove to have poorer quality ground conditions.

The approximate areas of superficial deposits are summarised on Figure 5.

7.0 SITE ASSESSMENT

7.1 ENVIRONMENTAL RISK ASSESSMENT

This assessment takes due regard of Contaminated Land Guidance issued by DEFRA and RICS. The methods used follow a risk-based approach with the potential environmental risk assessed qualitatively using the 'source-pathway-receptor' pollutant linkage concept set out in the Environment Protection Act 1990.

Although the risk presented in the following tables and above is descriptive, it is correlated to a numerical chance of occurrence. Therefore, the range and percentage chance of occurrence is given in order that the reader may assess the datum for the risk level. Although the percentage chance is quoted, this is still a subjective evaluation and is not prepared by probabilistic determination. Therefore, the chance of occurrence is a value judgement and not a numerical calculation. The evaluation is a simple qualitative risk assessment, which cannot make a judgement on the probability of occurrence or level of contamination. The latter two aspects require site specific information.

Reference to risk classifications is made according to the following definitions.

Low Risk	It is unlikely that the issue will arise as a liability/cost.
Medium Risk	It is possible that the issue could arise as a liability/cost. Further work is needed to clarify the risk and consequences.
High Risk	It is likely that the issue will arise as a liability/cost.

In consideration of the information gathered and presented in this report the following risk appraisal is considered appropriate.

Table 7: Environmental Risk Assessment

Issue	Risk Category	Comments
Site sensitivity		
Sensitivity of site location	Low to medium	• Site is not within a 'groundwater source protection zone' a 'nitrate vulnerable zone', or an 'area of outstanding natural beauty'. Surface water features on site
Environmental sensitivity of adjacent land uses	Low	• Site situated in a mainly undeveloped area apart from the industrial estate to the north

7.1 ENVIRONMENTAL RISK ASSESSMENT (CONTINUED)

Contamination potential		
Potential for significant on-site contamination	Low/medium	• Site historically has remained largely undeveloped • Potential for localised contaminated made ground associated with past developments, the farm or the former railway • Potential for contamination associated with building fabric (asbestos)
Potential for contaminants migrating off from the site	Low	
Potential for contaminants migrating onto the site	Low	
Potential for other environmental issues to give rise to liabilities	Low	
Environmental Consequences		
Risk of pollution of controlled waters	Low	• Any made ground encountered beneath the site is not anticipated to be significant
Risk of damage to future property	Low	
Risk of harm to human health	Low	
Business Consequences		
Risk of liability for owner	Low/medium	• Previous and current land use not likely to produce significant contaminants
Likelihood of designation as Contaminated Land under EPA 1990	Low	
Risk of site value and/or saleability being affected	Low/medium	
Overall Risk	Low/medium	

7.2 GEOTECHNICAL HAZARDS AND CONSTRAINTS

A summary of commonly occurring geotechnical hazards is given in Table 8, together with an assessment of whether the site may be affected by each of the stated hazards. This information would be required should any future construction works be proposed.

7.2 GEOTECHNICAL HAZARDS AND CONSTRAINTS (CONTINUED)

Table 8: Summary of Potential Geotechnical Hazards

Issue (excluding contamination issues)	**Hazard Status**			**Engineering considerations**
	Likely to be present on site	Could be present on site	Unlikely to be present and/or affect the site	
Shrinkable clays	✓			Special requirements for foundation and floor design
Filled and made ground	✓			Likely to affect ground engineering and foundation design and construction.
Highly compressible and low bearing capacity soils including peat and soft clay	✓			
Silt rich soils susceptible to rapid loss of strength in wet conditions	✓			Particularly within the northern area of Land Parcel B
Adverse ground chemistry (including expansive slags, weathering of sulphides to sulphates)			✓	
Combustibility potential			✓	
Solution features		✓		Natural cavities indicated within the Envirocheck Report
Evaporite dissolution features and subsidence			✓	
Ground subject to peri-glacial valley cambering with gulls present			✓	
Sudden lateral changes in ground conditions	✓			
Existing sub structures (e.g. foundations and pits)	✓			Farm buildings located within Land Parcel B
Ground subject to vibration		✓		Railway line to the north of Land Parcel B and M4 to the south
Underground mining (shallow)			✓	
Mine entries (shafts and adits, bell pits)			✓	

7.2 GEOTECHNICAL HAZARDS AND CONSTRAINTS (CONTINUED)

Table 8: Summary of Potential Geotechnical Hazards

Issue (excluding contamination issues)	**Hazard Status**			**Engineering considerations**
	Likely to be present on site	Could be present on site	Unlikely to be present and/or affect the site	
Ground subject to or at risk of coastal or river erosion			✓	
Ground subject to, or at risk from landslips			✓	
High water table (including waterlogged ground)	✓			Envirocheck Report stated that the northern area of Land Parcel B is at risk from flooding. The historical maps also show marshy ground in this area
Rising groundwater table due to diminishing abstraction in urban areas or cessation of deep mining			✓	
Culverted water courses		✓		Surface water features on site, culverts cannot be ruled out

A former landfill is shown in the infilled cutting. This is reported to be non-biodegradable waste and hence is not considered a significant constraint on development. This and any other areas of made ground will be investigated and appropriate remedial measures designed to protect the residential site and the environment. Based on the desk study, the risk of encountering contaminated soils and water is considered to be low to medium.

A discussion of the key geotechnical and geo-environmental aspect of the site follows.

7.3 SITE PREPARATION

Subject to the proposed development layout, it will be necessary to remove all existing hardstanding, buried foundations, walls, and slabs present on the site. Demolition materials should be processed and screened, and, subject to satisfactory testing, will probably be reusable in the works. Any shortfall will be need to be made up with imported, clean, inert materials.

7.3 SITE PREPARATION (CONTINUED)

Contamination and Hotspots

During the construction works, if 'hot spots/areas' are encountered then the occurrences should be reported to an Engineer and appropriate remedial measures designed and implemented prior to continuing with the works. On completion of the grubbing out of foundations etc the formations should be checked for contamination and integrity. This may/will require analytical testing and some in-situ testing.

The potential contamination risks at the site are generally considered low to medium and generally limited to some discrete areas only. Therefore, whilst such areas need to be specifically considered and assessed they would not be regarded as impediments to development. Therefore, contamination remediation may be required in such areas to facilitate development. The full scale of works that might be required would need to be determined by collection of site-specific data.

Topsoil materials will require stripping from building areas and stockpiled for re-use.

Japanese Knotweed

Japanese Knotweed infests various areas of the site and is also present in smaller stands across the site. A full survey will be required by a suitably qualified contractor to identify and treat the weeds. Japanese Knotweed must be eradicated prior to the earthworks commencing or isolated to areas of the development where continued control measures may be implemented.

Excavations and Earthworks

Based on our experience of similar areas we anticipate that foundation/service trench excavations will remain stable in the short term.

It should be noted that shallow bedrock may be encountered locally onsite, which may require the use of breaking equipment to loosen the deposit prior to excavation.

Pollution protection and management

During the site clearance and subsequent operations airborne nuisance caused by dust from the site must be controlled on account of the health and safety of site operatives and the general public who are occupying properties adjacent to the site.

Temporary surface water management lagoons will be required to ensure that transport of sediment is minimised into existing watercourses and over existing site boundaries to adjoining land.

7.4 FOUNDATIONS AND FLOOR SLABS

The anticipated shallow ground conditions are thought to be suitable for the types of residential development envisaged at this stage of the site appraisal. Some precautionary measures are likely where variable subgrades are encountered and where there are influences from occurrences of made ground associated with the historical farm yard use and the infilled cutting.

Depending on the results of the geophysical surveys some localised investigation and treatment may be required for solution type features. Foundation strengthening may be required throughout to protect against variations in the rockhead and character of the bedrock strata.

It is considered that in general in this area convention mass concrete strip/ trench fill foundations could be utilised, although depending upon the ultimate layout, reinforced concrete raft foundations/ floor slabs may be required in some areas, particularly if ground conditions vary a lot or the concerns about solution features need to be addressed. Final foundation design will depend on the findings of the site investigation.

There are many semi-mature and mature trees/hedges within and around the site. Where it becomes necessary to remove any of these existing trees or hedges, then the stumps should be appropriately 'grubbed out'. Allowances should be made for the removal of any associated roots that may become exposed in the proposed earthworks and foundation excavations. Any such works should be conducted in accordance with the code of practice recommended by the National House Building Council (NHBC).

7.5 ACCESS ROADS

The exposed formations within the in-situ materials will be potentially susceptible to damage, softening and deterioration by wet weather and site traffic. They will need to be protected by blinding concrete, or a 200mm think layer of hardcore immediately after exposure.

7.6 DRAINAGE

The underlying geology suggests that drainage through soakaway may be possible as the site is underlain by limestone bedrock. Soakaway tests will be required to calculate the rate of inflow.

7.6 DRAINAGE (CONTINUED)

However, this unit is a major aquifer and soakaway drainage may not be permitted and would be subject to detailed design and agreement with the NRW. Also, the area is recorded as prone to groundwater flooding (see Figure 8) and hence this suggests that shallow infiltration systems or attenuation systems may be compromised at times of extreme water levels. Such matters will need to be considered for any drainage strategy for the site.

Infiltration systems may also not be suitable if a widespread solution risk is confirmed by geotechnical investigations, because such drainage systems can exacerbate any risk of solution feature development and hence the form and location need careful consideration.

8.0 SITE INVESTIGATION PROPOSALS

Prior to development of the land parcels, a comprehensive intrusive site investigation would be required, over the entire area, in order to facilitate a detailed technical and financial appraisal. This would enable the foundation and hardstanding design for any proposed development to be developed using specific data on the ground conditions and enable more accurate costings to be made.

Investigation works should give consideration to the following:

- Foundation design
- Excavation stability design
- Remediation requirements
- Groundwater control

In particular, the principal geoenvironmental and geotechnical issues to be addressed are:

- Foundation strata - level, strength, compressibility, and chemical characteristics;
- Presence or absence of shrinkable clays;
- The extent of any ground contamination, including potential asbestos in the ground;
- The potential for ground gas to be present beneath the site.

Investigation techniques to be adopted should include:

- Windowless sampling/or trial pits could be used to examine the shallow ground conditions;
- Laboratory chemical testing to determine soil chemistry to include a range of organic and inorganic contaminants, and also screening for asbestos;
- Laboratory geotechnical testing to determine soil plasticities; and
- Gas monitoring to assess risk of possible land gases if significant made ground is encountered across the site.

A comprehensive geophysical investigation will be required in order to fully assess the presence of natural cavities formed by solution features. If competent ground conditions are not encountered at shallow depths deeper boreholes may also become a requirement.

APPENDIX A

AVAILABLE SITE INVESTIGATION DATA

APPENDIX B

ENVIROCHECK REPORT

FIGURES