MR J & MRS J PARRY

DEVELOPMENT AT TALPONCIAU FARM, ACREFAIR, WREXHAM, LL14 1TU

STAGE 1 - PHASE 1 – DESK STUDY AND PRELIMINARY GROUND CONTAMINATION RISK ASSESSMENT

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Client : **MR J & MRS J PARRY**

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1. INTRODUCTION

1.1 Terms of Reference

1.1.1 In January 2016 e-geo Solutions Ltd were commissioned by Mr & Mrs J Parry to undertake a desk based ground contamination study and risk assessment at a proposed development site at Talponciau Farm in Acrefair, Wrexham in North Wales. A planning application has been submitted to redevelop land at the site with a residential property and in response the Local Authority have attached a contaminated land condition to the planning approval. To address the planning condition a contaminated land study has been undertaken.

1.1.2 The objective of the study was to collate and assess information on the sites history, the environmental (contamination), geological, and hydro-geological characteristics of the site, to undertake a preliminary hazard assessment in terms of potential contamination, and develop a Preliminary Conceptual Model to indicate potential contamination risks associated with the site and its redevelopment.

1.1.3 The study has been undertaken with reference to guidance in the 'Model Procedures for the Management of Land Contamination' (CLR11) and the BSI Publication 'Investigation of Potentially Contaminated Sites' – Code of Practice (BS10175). This report presents the findings of the preliminary site assessment, detailing the particular site characteristics and identifying potential contamination, environmental and geo-environmental factors which could impact upon the redevelopment proposals.

1.1.4 This report has been prepared for the sole use of the Client, for the purposes described and no extended duty of care applies to other parties. Any other party using this report for any purpose whatsoever do so at their own risk and any duty of care to that party is specifically excluded.

1.1.5 The comments given, and opinions expressed, in this report are based on the information available at the time the report was compiled, however there may be additional information and data which becomes available at a later date which has an impact on the report content. Where data supplied by others has been used it has been assumed that the information is correct. No responsibility can be accepted by e-geo Solutions Ltd for inaccuracies within the data supplied by others.

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1.2 Report Contents

1.2.1 The report includes sections on:-

- Sources of Information
- Current and historical land use, including site inspection observations
- The sites geological, hydro-geological, hydrological and environmental setting
- Potential contaminants, receptors and pathways and the significance of pollutant linkages
- Risk assessment and recommendations for further quantification of risk and collection of additional data

1.3 Information Sources

1.3.1 Information on the site and its immediate surroundings has been collected from a range of sources including:-

- British Geological Survey Map No. 121 1:50,000 Solid and Drift Edition
- BGS Memoirs
- Historical Ordnance Survey Maps
- Aerial photographs and Google Earth

- Information held by the Environment Agency on landfill sites, regulated industries, water abstractions and discharges, water quality, source protection zones, flood risk and incidents
- Information provided by Wrexham County Borough Council
- Geoenvironmental Report by Terraconsult (Ref 2464LR02-1/NHF) on adjacent land
- The Environment Agency Groundwater Vulnerability Maps
- GroundSure EnviroInsight Report, Reference HMD – 165 – 2716214
- GroundSure GeoInsight Report HMD – 165 – 2716215
- A site inspection and walkover survey.

2. SITE CHARACTERISTICS AND HISTORY

2.1 Site Location

2.1.1 The proposed development site (the site) is situated within the farmstead of Talponciau Farm which is located 1km northeast of the village of Acrefair, near Wrexham, as shown on Figure 1. The site is centred at Grid Reference 328070, 343911 and covers a small area to the west of the existing farm buildings as shown on Figure 2.

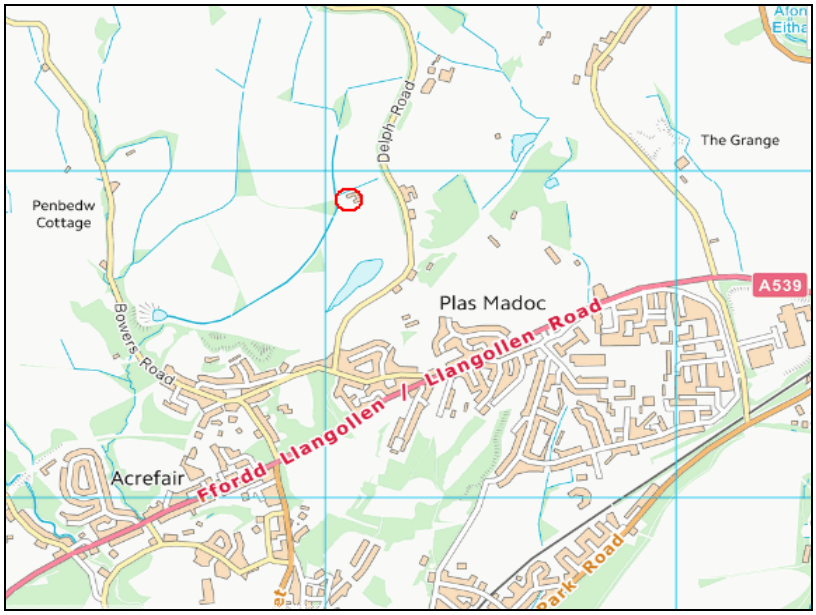

Figure 1 – Talponciau Farm Location

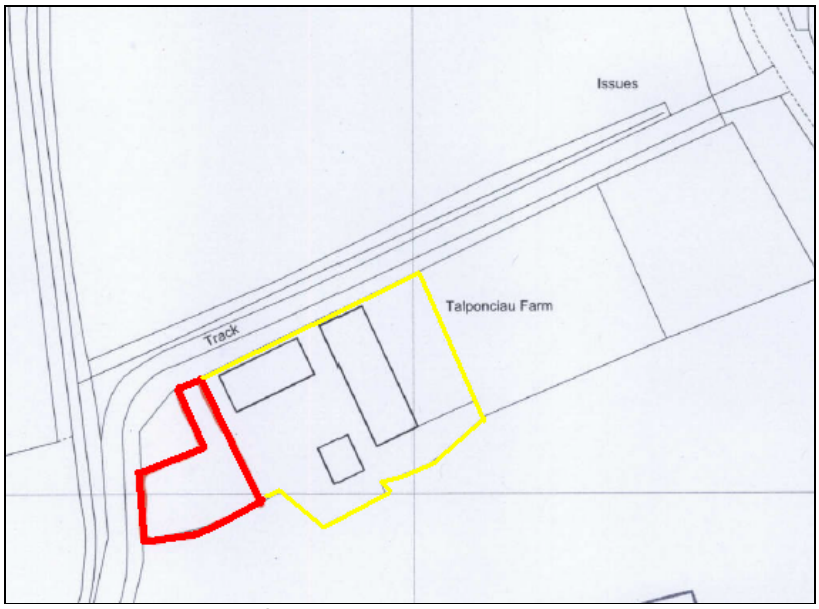

Figure 2 – Development Site Extent (red)

2.2 General Site Description, Use and Topography

2.2.1 The small development site comprises an area of gravel surfaced hard standing to the west of the

existing farm buildings and is presently occupied by a caravan/mobile home. The main farm buildings comprising barns are immediately to the east. The whole site is generally flat and level and at an elevation similar to the surrounding land.

2.2.2 To the east of the farm buildings and surrounding the site on all other sides is flat and gently sloping agricultural land used for grazing.

2.2.3 The site area is bordered on the west and north by a hedge and farm lane. To the east are farm buildings and southern boundary is marked by a fence and then agricultural land. An aerial photograph of the site is presented as Figure 3 and site photographs are presented in Appendix 1.

Figure 3 – Aerial Photograph and Site Context

2.3 Site Walkover and Inspection

2.3.1 An inspection of the site and surrounding land was undertaken in March 2016. Site photographs are presented in Appendix 1. The following features and aspects were noted:

Site Area

- The site is a flat are of compacted hardcore gravel.
- The only structure on the site is a mobile home/caravan used as accommodation surrounded by large flower pots.
- The ground surrounding the site comprises a farm yard of compacted hardcore gravel.
- There is no evidence of wastes, spillages or fuel-oil staining.

Agricultural Land

- The site is surrounded by agricultural land used for grazing to the south and a farm lane and then agricultural land to the north and west.
- To the east is a farm yard with a gravel surface and two barn type buildings.

2.4 Site History

2.4.1 An examination of old Ordnance Survey maps dating from 1875 has been undertaken. Selected map extracts are presented in Appendix 2.

2.4.2 The following site development history has been compiled from the old Ordnance Survey maps:

1875 - Grid Ref:* 328070, 343911 *County Series 1:2,500
On-Site
The site area is shown as undeveloped agricultural land but surrounded by features associated with coal mining. A colliery spoil tip to the north and east encroaches onto the extreme northwest portion of the site.
Surrounding Land
The land surrounding the site on all sides and up to within 50m is affected by coal mining with mining waste tips. There is an 'old coal shaft' 20m northeast of the development site. The land between 100m and 200m west shows extensive mining features with 'old' shafts and mining waste tips and heaps.

1899 - Grid Ref:* 328070, 343911 *County Series 1:2,500
On-Site
The site is as in 1875.
Surrounding Land
The surrounding land is as in 1875.

1912 - Grid Ref:* 328070, 343911 *County Series 1:2,500
On-Site
The site remains as in 1899.
Surrounding Land
The surrounding land is as in 1899. The Delph Brick and Tile Works is 200m south .

1962 - Grid Ref:* 328070, 343911 *National Grid 1:2,500
On-Site
The site is as in 1912.
Surrounding Land
The surrounding land is as in 1912.

1974 - Grid Ref:* 328070, 343911 *National Series 1:2,500
On-Site
The site is as in 1962.
Surrounding Land
The surrounding land remains as in 1962.

1974 - Grid Ref: 328070, 343911 National Series 1:10,000
On-Site
The site is in an area of 'opencast workings'.
Surrounding Land
The whole area extending 200m from the site s shown to be 'opencast workings'

1982 - Grid Ref:* 328070, 343911 *National Series 1:2,500
On-Site
The site is in an area of 'opencast workings'.
Surrounding Land
The whole area extending 200m from the site s shown to be 'opencast workings'

1994 - Grid Ref: 328070, 343911 National Series 1:10,000
On-Site
The site is in an area of reclaimed land that has been returned to agricultural land.
Surrounding Land
The whole area surrounding the site is reclaimed/restored land and used as agricultural land

2.4.3 The site is located is an area which has been subjected to extensive mining from pre 1875 to the 1970s and the historical maps shown extensive mining artefacts. In the early 1970s the whole area below and surrounding the site was subjected to a scheme of opencast mining and all the historical mining features were removed. In the late 1980s and early 1990s the area was restored and returned to agriculture.

3. GEOLOGY, GROUND STABILITY AND ENVIRONMENTAL SETTING

3.1 Geology

3.1.1 The British Geological Survey Map No. No.121 indicates that the drift deposits below the site and extending for 100m to the north, east and south is boulder clay (Glacial Till). The solid geology comprises siltstone from the Pennine Lower and Middle Coal Measures Formation.

3.1.2 The glacial till deposits will comprise clay and silt with some sand and gravel in varying proportions with cobbles and boulders of locally derived bedrock and will be of low to high permeability depending on the clay content. The site is located at the western edge of the area of glacial till which terminates approximately 101m west and north of the site and therefore is likely to be relatively shallow, typically 8 to 10 m thick.

3.1.3 A BGS borehole record from a point approximately 100m north of the site indicates drift deposits to a depth of 9.0m.

3.1.4 The underlying bedrock below the site will comprise siltstone and mudstone with some coal seams. The rock will be of moderate to low permeability with groundwater movement governed by the fracture condition of the bedrock.

3.1.5 There is no indication of made ground at the site from the geological maps and data. However from historical information and coal mining history the area below and surrounding the site has been subjected to opencast mining activities and a considerable depth of reworked natural soils and rock are likely to be present below the area.

3.1.6 There is a fault on site associated with a coal seam.

3.2 Mining, Mineral Extraction and Ground Workings

3.2.1 Historical Ordnance Survey maps indicate that there are numerous historical surface ground working features comprising ‘unspecified heaps’ immediately to the northeast of the site extending up to the northern boundary of the site. All these features are pre 1960. There are numerous (more than 80 Nr) similar features to the west of the site and within 250m.

3.2.2 There are three historical underground working features which are either a ‘coal shaft’ or ‘unspecified shaft’ within 30m of the site, and more than 70 similar features within 320m of the site.

3.2.3 The site is in a coal mining area where extensive mining has taken place and directly above a deep coal mine known as the ‘Delph’ mine. Within 300m of the site there were numerous other deep mines known as Delph House, Delph Cottages, West Cottages and Sycamore Cottages.

3.2.4 There are no ‘railway’ features associated with historical mining on the site. The nearest ‘historical sidings’ is 19m northwest.

3.2.5 Information from abandoned mine plans and the Coal Authority report (Appendix 4) for the site indicate that there are three is 1 coal seam below the site. The seam is present at depths of 50m to 60m and at depths unlikely to affect the ground surface. The seams were last worked in 1950 and all ground movement should have stopped.

3.2.6 The site is not in an area that could be affected by any present mining activity or in an area that could be affected by any future mining activity.

3.2.7 There is 1 recorded mine entries within 20m of the site but there are no records or information on any mine treatment.

3.2.8 The Coal Authority report confirms that the site is within the boundary of an opencast site from which coal has been removed by opencast methods.

3.2.9 There are no records of mine gas emissions within the boundary of the site.

3.3 Natural Ground Subsidence and Movement

3.3.1 There is a very low overall risk of ground subsidence from natural hazards within the site boundary. There is a negligible risk of ground movement due to landslides.

3.3.2 There is a negligible risk of shrinkage or swelling of the ground strata as the strata is of low plasticity. There is a negligible risk from compressible deposits being present below the site. There is a very low risk of running sand deposits being present below the site. There is a very low risk of collapsible strata below the site.

3.4 Hydrogeology

3.4.1 There are no records of productive strata within the superficial (drift) deposits at or in near proximity to the site. The Glacial Till is classed as an 'unproductive' aquifer which is low permeable layers which do not support water supply for river base flow.

3.4.2 The bedrock below the site is classed as a 'Secondary 'A'' aquifer. This designation is given to 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.

3.4.3 There are no records of Groundwater Abstraction Licences within 500m of the site or surface water abstraction point within 1500m of the site. The nearest groundwater abstraction point is 865m north and is a historical abstraction for general farming and domestic use. The nearest surface water abstraction point is 1619m northwest and is an active abstraction for potable water for Dee Valley plc. There are no source protection zones within 500m of the site.

3.4.4 According to the Environment Agency the groundwater vulnerability and soil leaching potential is classed as HU. This designation is based on soil information for restored mineral workings which are assumed to be permeable in the absence of site specific information.

3.5 Hydrology

3.5.1 There is a tertiary river 9m northwest (at the field boundary to the northwest) and a secondary river 11m west. The watercourses are not named and there is no chemical or biological information for the rivers. The nearest water course for which there is biological and chemical data is the Tref-y-nant Brook 1277m south of the site.

3.6 Sensitive Land Uses

3.6.1 There are no Site of Special Scientific Interest, National Nature Reserves, Special Areas of Conservation, Ramsar sites or World Heritage Sites within 2000m of the site.

3.7 Landfill and Landfill Gas

3.7.1 The nearest record of a landfill site is 454m west of the site and is identified from a 1960 historical map. There are two Environment Agency historic landfill sites with 500m of the site. The Delph landfill, Acrefair which operated from 1981 to 1986 and the Monsanto Chemical Dump which was 491m northwest an operated in July 1974.

3.7.2 It is known that drums of chemical waste were deposited on the clay floor of the Monsanto tip but the location is at least 500m northwest of the site and at a depth of 37m below ground level. It is reported that gas works waste were deposited in the northeast corner of the landfill in the location of a proposed lake but the location is at least 250m northeast of the site.

3.8 Flood Risk

3.8.1 The site is not within 250m of a Zone 2 or Zone 3 floodplain area as defined by the Environment

Agency. A Zone 2 floodplain is one where the annual probability of flooding is 0.1% (one in one thousand) or greater from rivers and the sea but less than 1.0% from rivers or 0.5% from the sea.

3.8.2 The risk of groundwater flooding is medium according to the British Geological Survey.

3.9 Radon

3.9.1 The site is within a radon affected areas with between 3% and 5% of properties above the Action Level as defined by the Health Protection Agency. Basic radon protection measures will be necessary.

4. ENVIRONMENTAL DATA SEARCHES

4.1 Registered Waste Treatment and Disposal Sites

4.1.1 There are no waste sites within 1000m of the site.

4.2 Regulated Industries

4.2.1 The are no IPC Authorisation sites within 500m. There are no sites subject to hazardous substances consents, or sites regulated by the Health and Safety Executive for storing dangerous substances within 500m.

4.3 Radioactive Sources

4.3.1 There are no Radioactive Source Authorisations or records of Category 3 or 4 Radioactive Substances within 500m of the site.

4.4 Emissions to Air

4.4.1 There are no known sites subject to local air pollution control under Part I of the Environmental Protection Act 1990 within 500m of the site.

4.5 Pollution Incidents

4.5.1 There are no records of an Environment Agency pollution incident at or within 500m of the site.

4.6 Licenced Discharges

4.6.1 There are no records of licenced discharge consents within 500m of the site.

5. CONCEPTUAL SITE MODEL AND PRELIMINARY RISK ASSESSMENT

5.1 Introduction

5.1.1 In accordance with current guidance the information collated during the preliminary site assessment has been reviewed to establish the conceptual model for the site. The conceptual model is based upon the identification and assessment of potential 'hazards', identified or suspected from the results of the preliminary assessment; the potential 'receptors' that may be affected; and the anticipated 'pathways' to those receptors.

5.1.2 The 'Conceptual Model' takes into consideration the proposed development of the site for residential purposes, historical and present uses of the site and the sites environmental setting.

5.2 On-Site Contamination Sources and Hazards

5.2.1 The main data source for the hazard identification is information on the sites previous and present use and information collected during the site inspection. From the assessment of this data the potential source, type and location of any contamination hazard has been identified.

5.2.2 The information indicates that the site is in an area where extensive coal mining was carried out until the 1970s when the whole area was mined by opencast methods and subsequently restored to agricultural land. Farm buildings (barns) were erected in early 2000s and the site area formed part of the 'farm yard'.

5.2.3 There are very limited potential on-site sources of contamination but there may be:

- Made up ground of granular materials and sub-base for hardstand areas

5.3 Off-Site Contamination Sources and Hazards

5.3.1 Across the whole of the surrounding land historical coal mining activities were carried out with numerous 'shafts' and 'heaps'. These mining features would have been removed when the area was subjected to open cast activities and the land restored for agricultural use. Historical landfills where chemicals and toxic wastes were placed have been identified on land to the northeast and northwest, but at 250m to 500m from the site area and buried at considerable depth.

5.3.2 There are very limited potential sources of off-site contamination but there may be:

- Off-site buried chemical wastes

5.4 Potential Contamination

5.4.1 The identified main sources of contamination could result in the following contaminants being present in near surface materials.

Source	Location	Metals	Organics	Inorganics	Others	Likelihood Presence
Made up ground of granular and sub-base materials	Across the site area	As,Cd,Cr, Cu,Ni,Zn, ,Hg,Pb,Se		S, SO4	Asbestos	Very unlikely
Off-site buried chemical wastes	250m to 500m northwest and northeast	As,Cd,Cr, Cu,Ni,Zn, ,Hg,Pb,Se	TPH PAH	S, SO4		Unlikely

5.5 Potential Receptors

5.5.1 The site is to be redeveloped for residential purposes. The principal receptors to any contamination hazard will be:

Receptor Type	Target	Presence (Y/N)	Comment
Humans on site	Future site users, occupiers	Y	The site is to be redeveloped for residential purposes with a single dwelling
Humans on site	Site construction workers	Y	Use of PPE for protection will prevent contact
Humans off site	Adjacent site users, occupiers	N	Surrounding areas is agricultural land
Buildings and construction materials	New buildings, buried concrete and services	Y	Potential contact for buried services and foundations
Flora and fauna	Crops and livestock	N	Non will be present on site
Ecosystems	Ecological system or organism	N	Non will present on site
Controlled waters	Surface Water	Y	Watercourses within 10m
Controlled waters	Shallow Ground Water	N	Non aquifer
Controlled waters	Deep Ground Water	Y	Aquifer in bedrock

5.6 Potential Pathways

5.6.1 The following potential pathways, if contamination is present, during and following site redevelopment have been identified and assessed:

Human Exposure Pathways

Exposure Pathway	Likelihood	Comment
Humans – Ingestion of soil	Unlikely	Residential property with garden but contamination unlikely
Humans – Ingestion of vegetables	Unlikely	Residential property with garden but contamination unlikely
Humans – Ingestion of soil on vegetables	Unlikely	Residential property with garden but contamination unlikely
Humans – Ingestion of dust	Unlikely	Residential property with garden but contamination unlikely
Humans – Dermal contact with soil	Unlikely	Residential property with garden but contamination unlikely
Humans – Dermal contact with dust	Unlikely	Residential property with garden but contamination unlikely
Humans – Inhalation of dust	Unlikely	Residential property with garden but contamination unlikely

Environmental Exposure Pathways

Receptor	Pathway	Likelihood	Comment
Buildings and construction materials	Materials contact	Possible	Foundations/services in the ground.
Flora and fauna	Root uptake	None	No crops or livestock will be on site but gardens proposed
	Leaf contact	None	
	Ingestion	None	
	Inhalation	None	
	Dermal contact	None	
Ecosystems	Ingestion	None	No sensitive ecosystems on site
	Dermal contact	None	
	Inhalation	None	
Controlled water -Surface waters	Surface runoff	Unlikely	Water course within 10m but no direct drainage
	Flow via drains	Unlikely	
	Migration in groundwater	None	
Controlled Water – Shallow Ground water	Leaching and migration	None	Non aquifer in drift deposits
	Flow via drains	None	
Controlled Water – Deep Ground water	Leaching and migration	Unlikely to None	Minor aquifer in bedrock but at significant depth
	Flow via drains	None	

5.7 Preliminary Risk Assessment

5.7.1 The Conceptual Model involves the identification of risks associated with the site. In order for there to be any risk to exist, a "Source - Pathway - Receptor" linkage must be established. This linkage requires:

- A source of contamination in, or under the ground which has the potential to cause harm or to cause pollution of controlled waters.
- A pathway is one or more routes or means by, or through which a receptor is being exposed to or affected by a contaminant or, could be so exposed or affected by a contaminant
- A receptor that could be a living organism, a group of living organisms, an ecological system or property

5.7.2 The identification of each of these three elements is linked to the identification of the others. A pathway can only be identified if it is capable of exposing an identified receptor to an identified contaminant. That particular contaminant should likewise be capable of harming or, in the case of controlled waters, be capable of polluting that particular receptor.

5.7.3 If a pollutant source, pathway and receptor are found to be present then there is a risk to the identified receptor. If there is an absence of any part of the source, pathway or receptor process, there is no risk.

5.7.4 At the site limited potential sources of contamination have been identified. Possible pathways to receptors may exist during and following site redevelopment if elevated concentrations of contaminants are present. The potential risks are discussed below:

Damage to Buildings, Services and Construction Materials

5.7.5 Any risks to the proposed building foundations and services derive from the potential presence of sulphates which could cause deterioration of concrete. The impact can be reduced or prevented by altering concrete design.

Harm to Flora and Fauna

5.7.6 The current site and the proposed development will not include areas where crops are to be grown.

There is no risk to flora and fauna from the site.

Harm to Ecosystems

5.7.7 There are no sensitive ecosystems near the site and therefore there is no risk.

Pollution of Controlled Waters

5.7.8 The site is above a minor aquifer within the bedrock at depth below a considerable thickness of unproductive low permeability drift deposits. In addition there are no identified potential contaminants on site that are mobile or could be leached. There is therefore no risk to controlled waters.

Harm to Human Health

5.7.9 The risks to human health relate to the presence of contamination in the shallow ground strata. However the ground at the site below any thin layer of sub-base gravel will comprise reworked and compacted natural clay and rock and the likelihood of any contaminants being present is extremely small. The site is to be redeveloped with a residential property and therefore potential pollutant pathways could exist if contaminants are present, but with any contamination likely to be at very low concentrations the risk is low.

5.7.10 An assessment of the 'Source – Pathway – Receptor' linkages is presented in the table below:

Receptor	Pathway	Linkage Probability	Consequence	RISK
Humans	Ingestion of soil	Unlikely	Minor	Low
Humans	Ingestion of vegetables	Unlikely	Minor	Low
Humans	Ingestion of soil on vegetables	Unlikely	Minor	Low
Humans	Ingestion of dust	Unlikely	Minor	Low
Humans	Dermal contact with soil	Unlikely	Minor	Low
Humans	Dermal contact with dust	Unlikely	Minor	Low
Humans	Inhalation of dust	Unlikely	Minor	Low
Buildings and construction materials	Materials contact	Unlikely	Minor	Low
Flora and fauna	Root uptake	None	Minor	None
	Leaf contact	None	None	None
	Ingestion	None	None	None
	Inhalation	None	None	None
	Dermal contact	None	None	None
Ecosystems	Ingestion	None	None	None
	Dermal contact	None	None	None
	Inhalation	None	None	None
Controlled water -Surface waters	Surface runoff	None	None	None
	Flow via drains	None	None	None
	Migration in groundwater	None	None	None
Controlled water – Shallow Ground water	Leaching and migration	None	None	None
	Flow via drains	None	None	None
Controlled water – Deep Ground water	Leaching and migration	Unlikely to None	Minor	Very low to none
	Flow via drains	Unlikely to None	Minor	Very low to none

Preliminary Risk Assessment

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

6.1.1 The information collected has allowed an assessment of the geological, hydro geological, hydrological and potential contamination status of the land at the development area and on surrounding land to be made.

6.1.2 The assessment has identified that the likelihood of contaminants being present is very small as only reworked natural soils and rock will be present below the site and the presence of any off site contaminants is very questionable and if present will be at considerable depth.

6.1.3 Whilst the whole area has been subjected to extensive historical mining the area has subsequently been reclaimed and natural ground materials used to restore the current landscape.

6.1.4 The proposed development involves the construction of a residential property and although humans will be present any contamination risk is considered to be very low.

6.1.5 The site is within a radon affected areas with between 3% and 5% of properties above the Action Level and basic radon protection measures will have to be incorporated in the floor slab construction.

Appendix 1 - Site Photographs

General view of the proposed development area from north to south

General view of the proposed development area from south to north

Land to north and surrounding the site area

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Talponciau Farm, Acrefair - Site Photographs