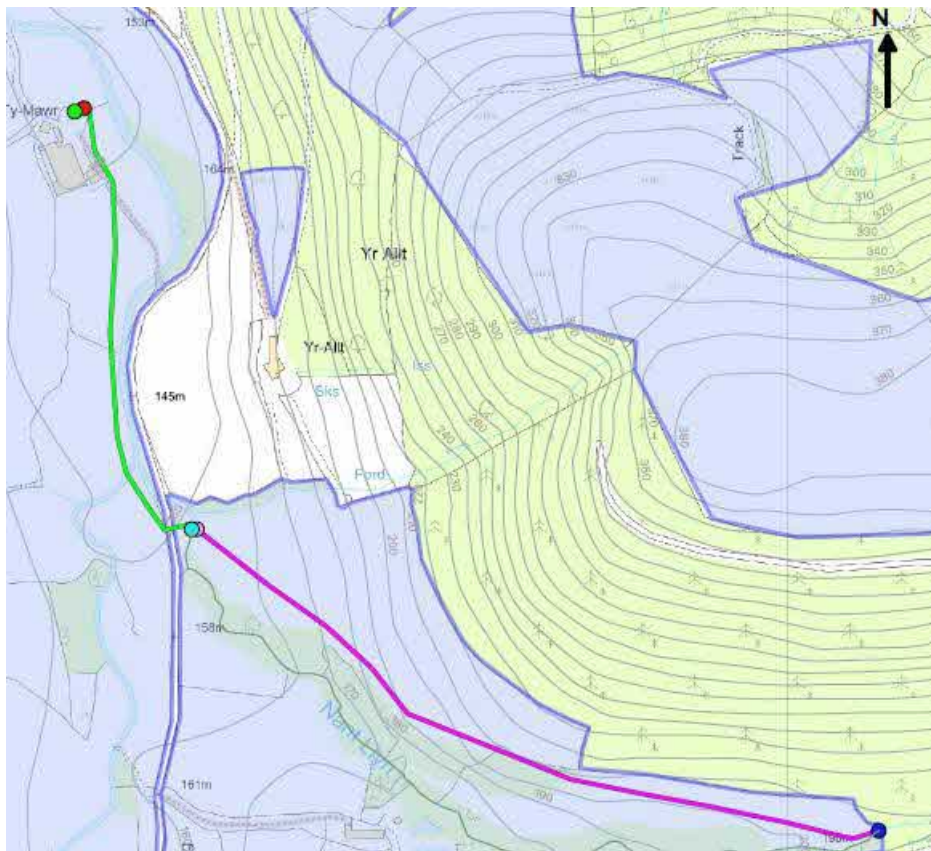


# Phase 1 Geo-Environmental and Geotechnical Desk Study Report

Report E34076 Ty Mawr, Machynlleth

Greenearth Hydro Ltd

Planning reference: 22/0078/PRE



Environmental Management Solutions – EMS Geotech

Report Number: E34076-DS

Revision: 2

Date: 5<sup>th</sup> July 2023

Status: Final

# Phase 1 Geo-Environmental and Geotechnical Desk Study Report

**Ty Mawr, Machynlleth**

**Greenearth Hydro Ltd**

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## Contents Amendment Record

This report has been issued and amended as follows:

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Revision	Description	Date	Report Reference
0	Final	30/03/2023	E34076-DS
1	Final (Including Site Walkover)	08/06/2023	E34076-DS
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Rev: 2 Date 5<sup>th</sup> July 2023

**E34076–Ty Mawr, Machynlleth - Phase 1 Desk Study Report**

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**Appendix D** – Landmark Envirocheck - Environmental Data

## SUMMARY REPORT

SUBJECT	COMMENTS
<b>CURRENT USE &amp; DESCRIPTION</b>	The study area encompasses several agricultural/pastoral fields and crosses a single lane track within a large valley. The study area is linear and follows a proposed shallow cable route approximately 1.25km long.
<b>PROPOSED USE</b>	The site will include the installation of shallow buried cable pipework along a specified route.
<b>HISTORICAL SUMMARY</b>	There have been very little to no changes within 250m of the boundary since 1887.
<b>PUBLISHED GEOLOGY</b>	It is anticipated that the site is underlain by superficial deposits comprising of tills, alluvium and alluvial fan deposits overlying the Nant-Ysgollon Mudstone formation to the east, Dolgau Mudstones formation within the centre of the site boundary and Pysgotwr Grits Formation to the west.
<b>MINERAL EXTRACTION</b>	The site is not situated within an area of coal mining or mineral extraction.
<b>GROUND STABILITY</b>	The risk of landslides across site is deemed moderate.
<b>RADON GAS</b>	The property is an intermediate probability radon area (3 to 5% of homes are estimated to be at or above the Action Level).
<b>HYDROGEOLOGY</b>	The underlying bedrock is designated Secondary B Aquifer. The site is not located within a groundwater Source Protection Zone.
<b>HYDROLOGY</b>	There is a surface water course which follows the direction of the proposed cabling route. There is a high chance of flooding from surface water in low lying areas.
<b>PRELIMINARY RISK ASSESSMENT</b>	
<p>The proposed route should not pass through any identified potential contaminant sources.</p> <p>Potential risks have been highlighted within the immediate surrounding area and within made ground should it be encountered. If Made Ground is present it is recommended that samples are taken to better assess the presence, nature and contamination potential of this site.</p> <p>Trial pitting should be adequate to identify Made Ground. Material should then be assessed for suitability as backfill or off-site disposal.</p>	
<b>PHASE 2 RECOMMENDATIONS</b>	
<p>No further investigation required.</p> <p>Should adverse/unforeseen ground conditions (such as contamination, soil conditions or man-made obstructions) be encountered an Environmental and/or Geotechnical Specialist must be contacted, to reassess risk.</p> <p>It is recommended that this desk study report is passed to the relevant Environmental Health Department for comment as soon as possible.</p>	

# 1. Introduction

## 1.1 General

Environmental Management Solutions Limited (EMS) have been commissioned to undertake a Phase 1 Desk Study for Ty Mawr, Mallwyd, Machynlleth, SY20 9HS. Hereafter, referred to as 'the site'. The works have been commissioned directly by Greenerth Hydro Limited, Siop Newydd, Rhiw, Pwllheli, LL53 8AE (the Client).

It is understood that the client intends to install cables and pipework within the ground along a specified route.

The purpose of this Phase 1 desk study is to assess the likely contamination constraints associated with the proposed utility route to meet with likely planning conditions. The report also provides a preliminary assessment of ground conditions in terms of likely geotechnical constraints that could impact on the proposed utility route.

## 1.2 Scope of Works

The agreed work scope for this Phase 1 Desk Study was:

- Purchasing a Landmark Envirocheck report and historical Ordnance Survey Maps.
- Interpreting the historical, geological, hydrogeological, hydrological and environmental site setting.
- Providing information relating to past and current site uses and those from the surrounding area and the nature of any related hazards and physical constraints.
- Site Walkover, a basic survey of the site to highlight geotechnical and geo-environmental features to refine the site conceptual model.
- Identifying current and likely future receptors, potential contamination sources and likely pathways, and features of immediate concern, including those that could be introduced in future.
- Producing a preliminary conceptual model for the site along with a preliminary contamination risk assessment in accordance with the Environment Agency's Land Contamination Risk Management guidance, dated October 2020.
- Assessing potential geotechnical ground constraints that could impact on the proposed utility route.

This report represents the findings of the first stage of the site investigation process for the works commissioned by the Client. Recommendations for follow-on Phase 2 intrusive investigation works where required are provided within this report. The findings of any Phase 2 investigation works will be reported separately.



### 1.3 Management Limitations

- This report has been prepared under the express instructions and solely for the use of the Client and the Client's agents in performance of EMS's duties under its contract with the Client. Should the Client wish to release this report to a Third Party for that party's reliance, EMS agree to such release provided that EMS assumes no duties, liabilities or obligations to the Third Party, that the Third Party does not acquire any rights whatsoever against EMS, and EMS accepts no responsibility for any loss incurred by the Client through the Client's release of the report to the Third Party.
- Copyright of this report is held by EMS.
- The findings of this report represent the professional opinion of experienced contaminated land consultants. EMS relied on the accuracy of Third Party documentary information contained in the consulted and is in no circumstances responsible for the accuracy of such information or data supplied. When considering this report due regard should be given to the terms and conditions of EMS's contract with the Client under which the report was prepared.
- EMS does not provide legal advice and the advice of legal professionals may also be required. All advice, opinions or recommendations within this report should be read and relied upon only in the context of the report as a whole. The advice within the report is based upon the information made available to EMS within the financial and timeframe constraints imposed.
- All work carried out in preparing this report has utilised and is based upon EMS's current professional knowledge and understanding of current relevant UK standards and codes, technology and legislation. Changes in this legislation and guidance may occur at any time in the future and cause any conclusions to become inappropriate or incorrect. EMS does not accept responsibility for advising the Client or other interested parties of the facts or implications of any such changes.
- All boundary lines depicted on plans included within this report are approximate only and do not imply legal land ownership.
- The recommendations, interpretations and conclusions within this report are based solely on desk study and site walkover information. This report represents the conditions and findings on the date of desk study. Over time, site conditions may alter.
- All observations relating to tree species, asbestos containing materials within structures or invasive weeds, such as Japanese Knotweed, does not constitute a formal survey of such features. The identification of such features is therefore tentative only. The report does not consider whether sensitive ecology or archaeology is present as these require consideration by professionals specialising in these matters. It should be recognised that the collection of desk study information may not be exhaustive and that other information pertinent to the site may be available.
- It is emphasised that a desk study can only indicate the potential for risks relating to on-site contamination, certain types of ground conditions and geotechnical hazards. This study aims to highlight potential pollutant linkages and / or ground related risks in line with current guidance.
- Only through undertaking intrusive investigation works can the plausibility of pollution linkages and other ground related risks be proven. The scope of this investigation excludes a formal slope stability study and any observations made regarding slopes are for information only.

- Following final issue of this report, EMS has no further obligation to advise the Client on any matters such as changes in legislation or codes of practice that may affect the advice contained within the report.



## 2. Land Use and Site Setting

### 2.1 Site Location

The proposal includes burying pipework and cabling along a specified route for the purpose of transporting and storing hydroelectric energy and water.

The proposed route is situated approximately 3km east of the village of Mallwyd at Ty Mawr, Mallwyd, Machynlleth, SY20 9HS. The proposed route runs from the site (south-east) to the most northern area of site (Ty Mawr Farm).

The approximate National Grid Reference (NGR) for the centre of route is 289393 311375. A Site Location Plan is included in Appendix A.

### 2.2 Site Description

The study area spans approximately 3.03Ha. The proposed pipework and cabling are linear features. The proposed pipework and cabling runs between Ty Mawr and Nant Llyn Coch-hwyad Walk 0.5km east of the postcode SY20 9HS. The site is situated within a deep valley which mostly includes agricultural or pastoral land. There is a single-track lane which crosses the site at grid reference 289370 311371 and several small farms and buildings within 250m of the cable/pipework run.

The south-east extent of the study area is topographically highest at approximately ~235m AOD falling towards the northern end of the site some ~90m lower at 145m AOD.

Most of the study area is bound by fences and hedgerows although there may be some stone walls and treeline bounding the site where it crosses the single-track lane.

There are 4 properties within 250m of the site, firstly at Groes Heol, approximately 100m from the southern boundary of the study area. Yr-Allt features some 180m east of the proposed route. Ty Mawr exists on the northern extent of the site within the site boundary and another property some 170m north-east of Ty Mawr.

A plan showing the existing site layout is included in Appendix A.

### 2.3 Site Walkover

A site walkover was completed on the 26<sup>th</sup> May 2023. A walkover plan is presented in Appendix A highlighting areas on the proposed cable route and any potential sources of contamination encountered.

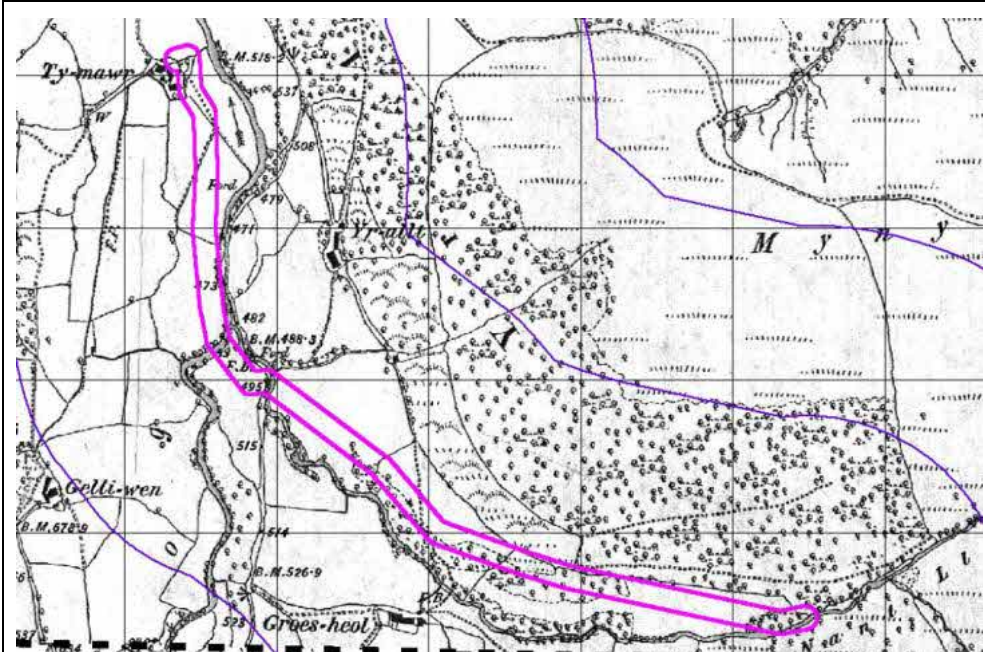
Areas of hardstanding on site include a large proportion of the farmyard, the track leading to Ty Mawr Farm, and the road where the proposed scheme will crossover from the east to the west. Two areas of ash residue from controlled burns existed near the farmyard. One within the northern area of the farmyard and another adjacent to the north flowing river just east of the farmyard.

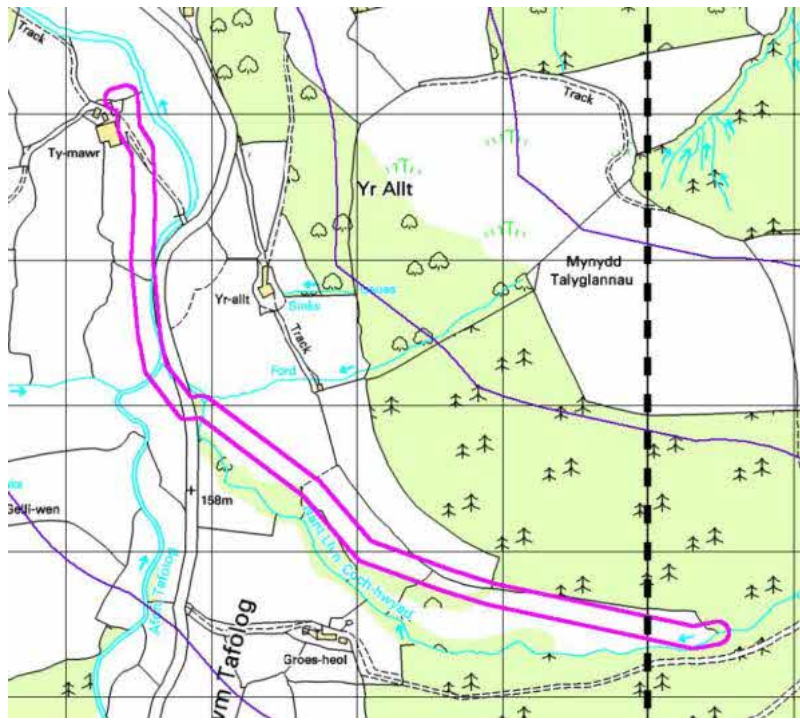
There were no areas of standing surface water present on the proposed route of the scheme, but several free-flowing surface water courses feeding Afon Tafolog. There were two surface water features present at Groes Heol just south of the scheme route. These water bodies also feed the Afon Tafolog just north of Groes Heol.

There were two ASTs on site and shown in the photographic record. Both were made of UPVC and sat on concrete plinths. No visual or olfactory evidence of spills were seen adjacent to these tanks.

## 2.4 Site History

Copies of the historical Ordnance Survey OS Maps contained within the Envirocheck Report, reference 307190281\_1\_1, are included in Appendix B. The maps have been used to determine the historical use of the study area and surrounding area, which is summarised in the following table:

MAPPED HISTORY		
DATE RANGE	ON-SITE	SURROUNDING AREA
1887 (1:10,560)	<p>The site was shown to comprise of agricultural/pastoral fields and single-track lane. The main farm (Ty Mawr) sits at the north extent of the study area so 650m south of the A458.</p> <p>To the south of the study area there is another farmyard including associated buildings and a surface water feature (pond). There is surface water feature (stream/brook) which runs along the centre of the south-east portion of the site boundary.</p>	<p>The surrounding area is primarily agricultural/pastoral land within the T. Mawr valley.</p> <p>There is dense woodland to the south-east / east of site which surrounds Llyn Coch-hwyad reservoir.</p>
		
1887, 1889, 1901 (1:2,500)	<p>There are no significant changes within the study area boundary between these dates.</p>	<p>There are no significant changes within the immediate surrounding area between these dates.</p>

MAPPED HISTORY		
DATE RANGE	ON-SITE	SURROUNDING AREA
	There is a significant lack of 1:2,500 scale mapping post 1901.	
1901 to 1954 (1:10,560)	There are no significant changes within the study area since 1887.	There are no significant changes within the immediate surrounding area since 1887.
1964 (1:10,560)	There are no significant changes within the study area since 1887.	There is potential for a small area infilled pond, marsh, river or stream adjacent to Ty Mawr farm to the north recognised in 1963. Additionally, another small area exists approximately 80m south of the southern site boundary at Groes Heol recognised in 1963.
1983 (1:10,560)	There are no significant changes within the study area since 1887.	There are no significant changes within the immediate surrounding area since 1964.
1989-2000 (1:10,000)	Large steel portal frame buildings erected on Ty Mawr Farm between these dates.	There have been no significant changes within the immediate surrounding area between these dates.
2006 (1:10,000)	There are no significant changes within the study area since 1887.	There have been no significant changes within the immediate surrounding area since 1964.
		

MAPPED HISTORY		
DATE RANGE	ON-SITE	SURROUNDING AREA
2006-2022 (Satellite Imagery)	No obvious or significant changes to the study area or immediate surrounding area within this time frame.	

## 2.5 Proposed Development

The proposal includes burying pipework and cabling along a specified route for the purpose of transporting and storing hydroelectric energy from one end of site (south-east) to the most northern area of site (Ty Mawr Farm).

The proposed route does not pass through any identified potential sources of contamination.

## 2.6 Published Geology

The proposed route crosses several different lithologies and superficial deposits.

Superficial geology includes alluvium, Devensian till, head and alluvial fan deposits with the majority of presumed on site materials made up of alluvium from the riverbed and till from glacier deposits during the last ice age. Head and alluvial fan deposits are featured in the east/south-east of site from solifluction and gelifluction (freeze-thaw movement).

The bedrock geology includes the Pysgotwr Grits Formation on the west of site, comprised of thinly bedded turbidite sandstones and mudstones with abundant thicker beds of argillaceous coarse sandstone. On the centre and central east of site features the Dolgau Mudstones formation, including grey, green and locally purple mudstones. Towards the south-east and east of the site boundary the Nat-Ysgollon Mudstone formation is the recorded geology, described as mudstones.

To the northern extent of site there is a small tract of the Glanyrafon Formation, comprised of interbedded mudstones and sandstones.

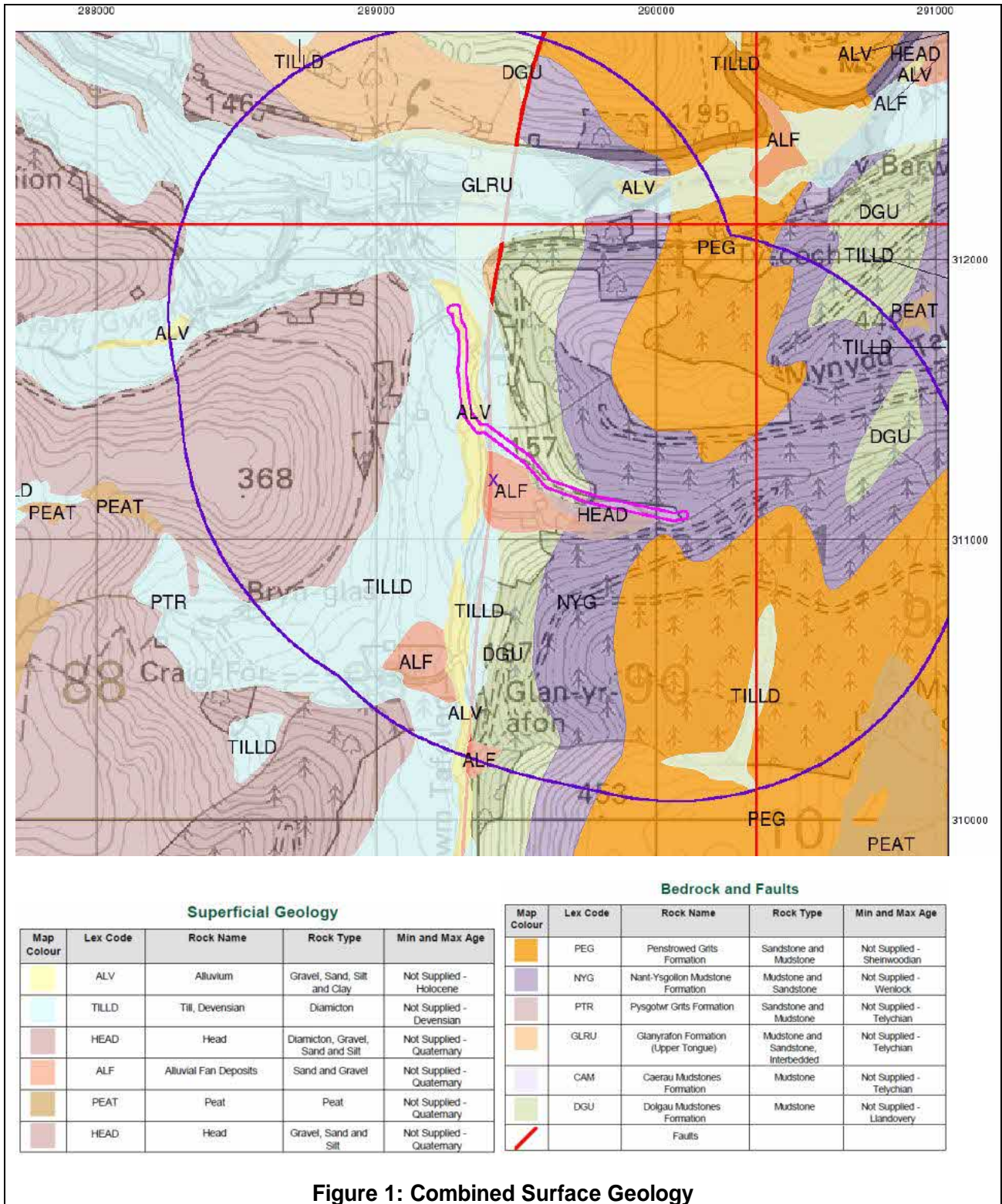
The published British Geological Survey (BGS) geology map Sheet 150, 'Dinas Mawddwy', shows the superficial deposits mentioned previously directly underlying the site. These deposits formed during the most recent ice age where a glacier and subsequent melt would have moved and deposited these materials. The underlying bedrock displayed in map sheet 150 includes the Pysgotwr Grits to the west, Dolgau Mudstones formation central on site and Nant-Ysgollon Mudstone formation to the east. The differing geology is a consequence of the large topographical differences on site and natural weathering processes.

A north to south trending linear feature has been inferred along the middle of the valley and through the centre of the site. The displacement is unknown. There are no other faults described within 250m of the site boundary.

A singular BGS borehole record approximately 725m south of the southern extent of the site. The borehole record indicates that there is a medium grey shale from the surface to a depth of 40.53m where the borehole was terminated. There were no discernible changes in lithology encountered through the entirety of the borehole record.



Information summarising the geology pertinent to the site is presented within the Envirocheck Report, reference 307190281\_1\_1, included in Appendix C. An extract is presented below in Figure 1.



It is unlikely significant made ground will be encountered within the site, however its presence cannot be ruled out.

## 2.7 Hydrogeology

Information summarizing the hydrogeological, hydrological and environmental site setting is contained within the Envirocheck Report, reference 307190281\_1\_1, included in Appendix D.

The site sits within a large valley with the northern flowing Tafolog river gathering water from small streams and headwater from adjacent valleys to the south, east and west. The site boundaries are mostly composed of steep valley sides due to the site position at the base.

Groundwater is likely to be achieved at varying depths across site although there are surface water features within the site boundary.

The underlying bedrock has been classed as Secondary B Aquifer. Secondary B aquifers are mainly lower permeability layers that may store and yield limited amounts of groundwater through characteristics like thin cracks (called fissures) and openings or eroded layers.

The site is not located within a groundwater Source Protection Zone.

## 2.8 Hydrology

The site is situated within a valley with steep slopes. Surface drainage will likely infiltrate through soils and discharge into the base of the valley where there is a surface water course (stream/brook). Most of the site is covered by vegetation and grass and therefore drainage should not be affected by the proposed utility route.

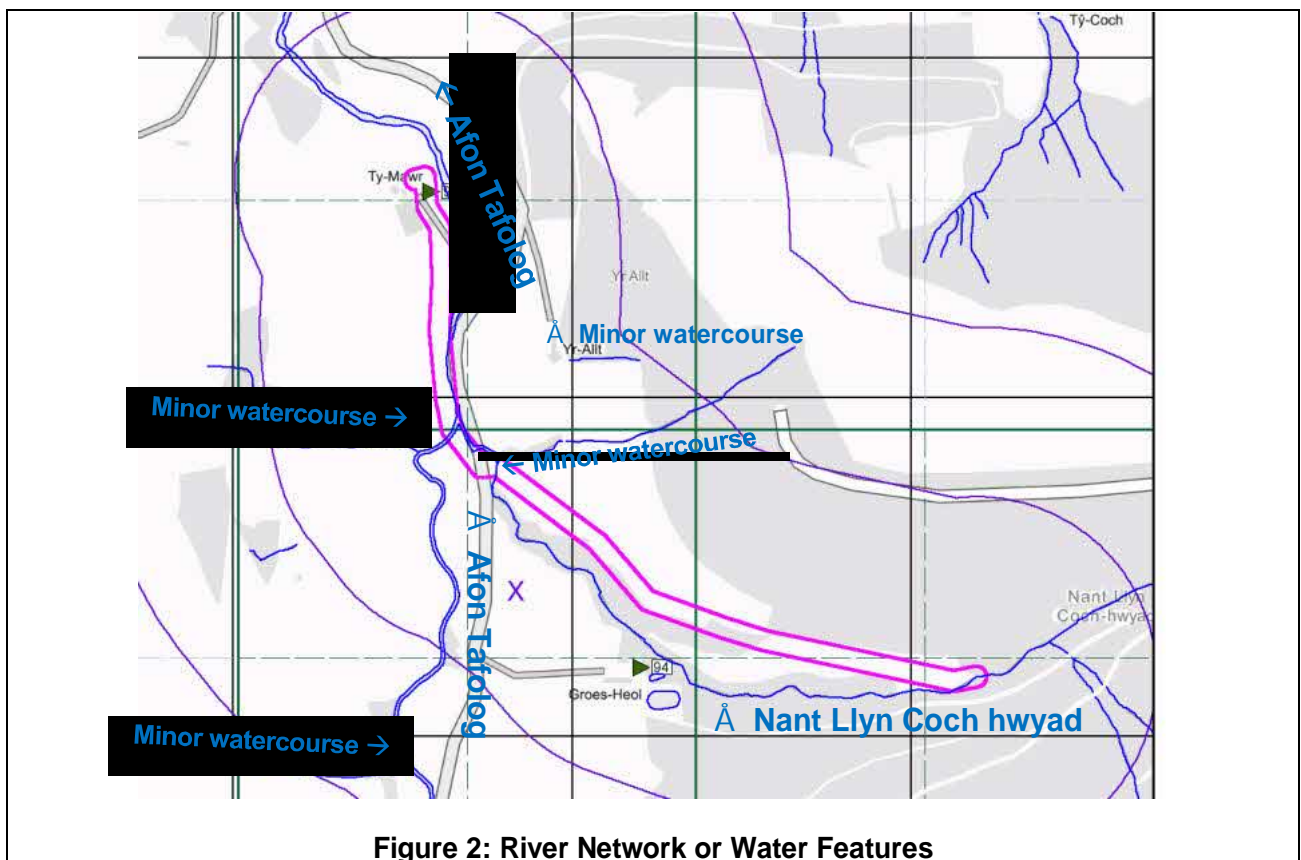


Figure 2: River Network or Water Features

Afon Tafolog river runs northwards through the site. There is a small tributary which feeds this river from the east (Nant Llyn Coch-hwyad). 2 small ponds are also situated 100m south of site at Groes Heol Farm.

There are no licensed discharge consents within 250m of the site.

There are no licensed surface water abstractions within 250m of the site.

Low lying areas of the study area are designated as Flood Risk Zone 2. Which can suffer from extreme flooding of surface water courses without flood defences.

## **2.9 Mining and Mineral Extraction**

The site is not located within an area expected to be at risk from mining.

## **2.10 Ground Stability**

There is a very low hazard for collapsible ground on the northeast and east of site, as well as a very low potential for shrinking or swelling clays. The risk of landslides across site is deemed moderate. There is a low chance of running sands and compressible ground on the west of site. There is no hazard of ground dissolution.

## **2.11 Radon**

The site is situated within an intermediate probability radon area (where between 1%-3% of homes are estimated to be at or above the action Level. Therefore, radon protection measures although not required for the pipe work however may be required in the construction of any future office or maintenance buildings and extensions.

## **2.12 Soil Geochemistry**

The BGS estimated soil chemistry for the site includes concentrations of Arsenic at 15-25mg/kg, Cadmium at <1.8mg/kg, Chromium at 60-90mg/kg, Lead at <100mg/kg and Nickel at 15-30mg/kg. These values are all within accepted guidelines for a conservative land use category (residential with plant uptake).

## **2.13 Landfills and Infilled Land**

There are no known landfills or historical landfills within, or within 250m of the study area.

There is potential for a small area of infilled pond, marsh, river or stream adjacent to Ty Mawr farm to the north recognised in 1963. Additionally, another small area exists approximately 80m south of the southern site boundary at Groes Heol recognised in 1963.

## **2.14 Pollution Incidents to Controlled Waters**

There are no entries for pollution incidents to controlled waters recorded on-site or within 250m of the site.

## **2.15 Registered Hazardous Sites**

There are no entries for registered hazardous sites recorded either on-site or within 250m of the site.



## 2.16 Contemporary Trade Directories and Fuel Sites

There are no recorded contemporary trade directory entries within 250m of the site.

There is an entry for livestock agricultural practices on the north of site and within 250m of the site at Groes Heol.

## 2.17 Unexploded Ordnance

According to the ZeticaUXO website ([www.zeticauxo.com](http://www.zeticauxo.com)), the site is located within an area indicated to be at low risk (15 bombs per 1000 acres or less) from unexploded ordnance.

## 2.18 Ecologically Sensitive Land Uses

Within the site boundary there is an area of semi-natural and ancient woodland which is unnamed. There are several additional areas of unnamed semi-natural, ancient, or restored ancient woodland sites within 250m of the boundary.

None of the following ecologically sensitive land-uses are recorded on-site or within 250m of the site boundary:

Areas of Adopted Green Belt	National Parks
Areas of Unadopted Green Belt	Nitrate Sensitive Areas or vulnerable zones
Areas of Outstanding Natural Beauty	Ramsar Sites
Environmentally Sensitive Areas	Sites of Special Scientific Interest
Forest Parks	Special Areas of Conservation
Local Nature Reserves	Special Protection Areas
Marine Nature Reserves	World Heritage Sites
National Nature Reserves	

## 2.19 Previous Investigations

EMS is not aware of any previous ground investigation works having been undertaken at the site.

## 3. Preliminary Contamination Risk Assessment

The methodology for undertaking the contamination risk assessment is included within the supplementary information at the back of this report.

### 3.1 Potential Contamination Sources

#### 3.1.1 On-site Sources

The proposed route does not pass through any identified potential sources of contamination.

Potential areas of contamination at Ty Mawr Farm identified during the site walkover included:

- Two areas of ash residue from controlled burns existed near the farmyard. One within the northern area of the farmyard (5m west of proposed route) and another adjacent to the north flowing river just east of the farmyard (10m east of the proposed route).
- There were two ASTs on site and shown in the photographic record. Both were made of UPVC and sat on concrete plinths. No visual or olfactory evidence of spills were seen adjacent to these tanks. One being 30m west of the proposed route and another 40m south-west of the proposed route.

A plan within Appendix A shows the approximate locations of the above potential sources along with the proposed route.

Given the historical site use and potential for Made Ground to be present at Ty Mawr Farm's yard, it is considered possible that contaminated shallow soils/ Made Ground may be present on-site. There is likely to be a thin veneer of disturbed ground associated with the development and operation of Ty Mawr farm to the Northwest. Additionally, there is potential for a small area of infilled pond, marsh, river or stream adjacent to Ty Mawr Farm.

The following sources have been identified at Ty Mawr Farmyard.

- Burnt wastes which could include potential household rubbish, rubber tyres, containing plastic, foam or paint.
- Leaks and spills of petroleum hydrocarbons from the storage and use of ASTs and farm vehicles on site.
- Potential Made ground of unknown origin used to level ground. (Potentially including demolition wastes including asbestos containing materials or fibres)
- Potential demolition and weathering of asbestos containing materials within building fabrics.

At Ty Mawr Farm the proposed route does not pass through any identified potential sources of contamination. The risk of contamination to the proposed utility route and/or end users is considered low.

Given the undeveloped nature of the remainder of the route, it is considered unlikely that significant contaminated shallow soils/ Made Ground will be encountered elsewhere. The risk to the proposed utility route and/or end-users within underdeveloped areas is considered very low.

### **3.1.2 Off-site Sources**

Another small potentially filled water feature lies some 80m south of the study area at Groes Heol. Other sources of made ground and unrecorded made ground may be encountered locally.

No significant potential off-site contamination sources have been identified for the surrounding area.

### **3.1.3 Ground Gas**

Due to the potential presence of made ground on site, the possibility of ground gas sources cannot be eliminated.

## **3.2 Potential Receptors**

The proposed work involves the installation of a shallow sub surface cable and drainage pipe running from Ty Mawr Farm and terminating 1km south-east.

The most significant potential receptors with respect to human health are considered likely to be construction workers and maintenance personnel.

### **3.2.1 Human Health**

The most significant potential receptors with respect to human health are considered likely to be construction workers and maintenance personnel. The likely risk posed is very low in undeveloped areas. The likely risk posed at Ty Mawr Farm is considered moderate.

The risks posed to construction works will be reduced through good hygiene practice, wearing appropriate PPE, i.e. gloves, training and putting in place administrative barriers.

### **3.2.2 Controlled Waters**

The site is underlain by a Secondary B Aquifer (Nant-Ysgollon Mudstone Formation, Pysgotwr Grits Formation and Dolgau Mudstones Formation). Due to the topographical differences on site groundwater is expected at different depths.

There are several areas within the site boundary where flooding is likely to occur. Mainly around the periphery of the river Tafolog which runs through the centre of the site along the middle of the valley.

### **3.2.3 Buildings, Buried Structures and Services**

The project includes buried services, which would be susceptible to the presence of soil contamination (sulphate bearing minerals and hydrocarbons) and ground gas.

## **3.3 Potential Pathways**

The most significant potential pathways considered likely to transfer chemicals from contaminant sources to receptors are:

- Ingestion, inhalation, or direct contact with contaminated soils and dust.
- Vertical contaminant leaching to groundwater.
- Horizontal contamination migration on groundwater and / or in surface water.
- Plant uptake.
- Ground gas / vapour migration, ingress and accumulation through buried structures / services, voids and defects into buildings and enclosed spaces.

### 3.4 Preliminary Conceptual Site Models

Two preliminary conceptual site models have been prepared, one for proposed utilities at Ty Mawr Farm and one for the undeveloped fields for the remainder of the proposed utility route.

Given the lack of potentially significant historical or current contamination / ground gas sources associated with undeveloped fields, it is considered that there is negligible risk posed to human health, controlled waters or buildings, buried structures and services along most of the route.

At Ty Mawr Farm Potential sources of contamination have been identified.

The pollutant linkages are best presented in a diagrammatic form and therefore preliminary conceptual site models are presented in Appendix A. The individual pollution linkages as numbered on the preliminary conceptual site model plan are described further in section 3.5.

The preliminary conceptual model has been developed based solely on desk-based research and assessment. The only way to conclusively determine the presence or absence of contamination is with intrusive site investigation.

### 3.5 Preliminary Contamination Risk Assessment

The objective of risk assessment is to identify the nature and magnitude of the potential risks and should be based on a consideration of both:

- The likelihood/probability of an event [taking into account both the presence of the hazard and receptor and the integrity of the pathway].
- The severity of the potential consequence [taking into account both the potential severity of the hazard and the sensitivity of the receptor].

There is a need for a logical, transparent and repeatable system in defining the categories of severity of consequence and likelihood as well as for the risk itself and therefore the following risk rating matrix is employed:

		SEVERITY OF CONSEQUENCE			
		SEVERE	MEDIUM	MILD	MINOR
PROBABILITY	HIGH LIKELIHOOD	Very High Risk	High Risk	Moderate Risk	Moderate/Low Risk
	LIKELY	High Risk	Moderate Risk	Moderate/Low Risk	Low Risk
	LOW LIKELIHOOD	Moderate Risk	Moderate/Low Risk	Low Risk	Very Low Risk
	UNLIKELY	Moderate/Low Risk	Low Risk	Very Low Risk	Very Low Risk

These risk classifications are defined as follows:

- Very High Risk - There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the site without appropriate remediation action.
- High Risk - Harm is likely to arise to a designated receptor from an identified hazard at the site without appropriate remediation action.
- Moderate Risk - It is possible that without appropriate remediation action harm could arise to a designated receptor. It is relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely that such harm would be relatively mild.
- Low Risk - It is possible that harm could arise to a designated receptor from an identified hazard. It is likely that, at worst if any harm was realised any effects would be mild.
- Negligible Risk - The presence of an identified hazard does not give rise to the potential to cause harm to a designated receptor.

This preliminary risk assessment matrix and classification system is based on guidance produced by Department for Environment, Food and Rural Affairs (Defra) and the Environment Agency in connection with contaminated land assessment.

The following **Conceptual Site Model and Qualitative Risk Assessment** tables for Model A, Ty Mawr Farmyard and Potentially Infilled Land and Model B, Open Fields (agricultural and grazing identify the potential risks that exist to the receptors through each of the identified pollutant linkages in the conceptual site model. It should be noted that the numbers referred to for each pathway refers to the numbered pollutant linkages from the diagrammatic conceptual site models presented in Appendix A.

- Preliminary Conceptual Site Model A - (Ty Mawr Farm Yard and Potentially Infilled Land)
- Preliminary Conceptual Site Model B - (Open Fields (Agricultural and Grazing))

Conceptual Site Model and Qualitative Risk Assessment – Model A - (Ty Mawr Farm Yard and Potentially Infilled Land)					
Potential Sources and Contaminants	Pathways (Reference from Model)	Receptors	Hazard Severity	Probability of Occurrence	Potential Risk
<p><b>The proposed route does not pass through any identified potential sources of contamination</b></p> <p><b>Localised Made Ground of Unknown Origin.</b>            Heavy metals.            Non-metallic compounds.            Polycyclic Aromatic Hydrocarbons (PAH).            Petroleum hydrocarbons (TPH).            Acids / Alkalis.            Asbestos.</p>	Ingestion Inhalation Direct Contact (1)	Site end-users.	Human health effects. [Medium]	[Low]	[Moderate / Low] Contaminants potentially present at concentrations or in a form that could cause significant harm to human health.
		Construction Workers.	Human health effects. [Medium]	[Low]	[Moderate / Low] Contaminants potentially present at concentrations or in a form that could cause significant harm to human health.
	Vertical migration (2)	Groundwater.	Secondary B [Medium]	[Low]	[Moderate / Low] Variable permeability and leaching potential of natural soils, potential for shallow groundwater.
	Horizontal migration (3)	Surface water features	Major / Minor watercourses [Medium]	[Low]	[Moderate / Low]
	Direct Contact (4)	Buildings, Buried Structures and Services	Chemical Attack [Medium]	[Low]	[Moderate / Low]

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Conceptual Site Model and Qualitative Risk Assessment – Model A - (Ty Mawr Farm Yard and Potentially Infilled Land)					
Potential Sources and Contaminants	Pathways (Reference from Model)	Receptors	Hazard Severity	Probability of Occurrence	Potential Risk
<p><b>The proposed route does not pass through any identified potential sources of contamination</b></p> <p><b>Localised hydrocarbon fuel use with associated leaks and spills.</b> Petroleum hydrocarbons (TPH).</p>	Ingestion Inhalation Direct Contact (1)	Site end-users.	Human health effects. [Medium]	[Unlikely]	[Low] Contaminants potentially present at concentrations or in a form that could cause significant harm to human health.
		Construction Workers.	Human health effects. [Medium]	[Unlikely]	[Low]
	Vertical migration (2)	Groundwater.	Secondary B [Medium]	[Unlikely]	[Low] Variable permeability and leaching potential of natural soils, potential for shallow groundwater.
	Horizontal migration (3)	Surface water features	Major / Minor watercourses [Medium]	[Unlikely]	[Low] Distance from the site, but potential from flooding.
	Direct Contact (4)	Buildings, Buried Structures and Services	Chemical attack of buried structures and tainted water supplies.	[Unlikely]	[Low] Contaminants potentially present in Made Ground.



Conceptual Site Model and Qualitative Risk Assessment – Model A - (Ty Mawr Farm Yard and Potentially Infilled Land)					
Potential Sources and Contaminants	Pathways (Reference from Model)	Receptors	Hazard Severity	Probability of Occurrence	Potential Risk
			[Medium]		
<p>The proposed route does not pass through any identified potential sources of contamination</p> <p>Potential demolition and weathering of asbestos containing materials within building fabrics.</p> <p>Asbestos.</p>	Ingestion Inhalation Direct Contact (1)	Site end-users.	Human health effects. [Medium]	[Low]	[Moderate / Low] Contaminants potentially present at concentrations or in a form that could cause significant harm to human health.
		Construction Workers.	Human health effects. [Medium]	[Low]	[Moderate / Low]
Ground gas associated with Alluvial Deposits and Made Ground.	Migration, ingress, and accumulation. Inhalation. (5)	Site End-users.	Human Health Effects [Medium]	[Unlikely]	[Low] Potential for Made Ground and natural soils to produce ground gas.
		External Air.	[Minor]	[Unlikely]	[Very Low]
	Migration, ingress, and accumulation. (6)	Buildings.	Risk of structural damage from explosions caused by build up of ground gas. [Medium]	[Unlikely]	[Low] Potential for natural soils to produce ground gas.

Conceptual Site Model and Qualitative Risk Assessment – Model B - (Open Fields (Agricultural and Grazing))					
Potential Sources and contaminants	Pathways (Reference from Model)	Receptors	Hazard Severity	Probability of Occurrence	Potential Risk
<p><b>The proposed route does not pass through any identified potential sources of contamination</b></p> <p><b>Localised Made Ground of unknown origin.</b> Heavy metals. Non-metallic compounds. Polycyclic Aromatic Hydrocarbons (PAH). Petroleum hydrocarbons (TPH). Acids / Alkalis. Asbestos.</p> <p><b>Localised hydrocarbon fuel use with associated leaks and spills.</b> Petroleum hydrocarbons (TPH).</p>	Ingestion Inhalation Direct Contact (1)	Site end-users.	Human health effects. [Medium]	[Unlikely]	[Low] Contaminants potentially present at concentrations or in a form that could cause significant harm to human health.
		Construction Workers.	Human health effects. [Medium]	[Unlikely]	
	Vertical migration (2)	Groundwater.	Secondary B [Medium]	[Unlikely]	[Low] Variable permeability and leaching potential of natural soils, potential for shallow groundwater.
	Horizontal migration (3)	Surface water features	Major / Minor watercourses [Medium]	[Unlikely]	[Low]
	Direct Contact (4)	Buildings, Buried Structures and Services	Chemical attack of buried structures and tainted	[Unlikely]	[Low] Contaminants potentially present in Made Ground.

Conceptual Site Model and Qualitative Risk Assessment – Model B - (Open Fields (Agricultural and Grazing))					
Potential Sources and contaminants	Pathways (Reference from Model)	Receptors	Hazard Severity	Probability of Occurrence	Potential Risk
			water supplies. [Medium]		
Ground gas associated with Alluvial Deposits and Made Ground.	Migration, ingress and accumulation. Inhalation. (5)	Site End-users.	Human Health Effects [Medium]	[Unlikely]	[Low]
		External Air.	[Minor]	[Unlikely]	[Very Low]
		Buildings.	Risk of structural damage from explosions caused by build up of ground gas. [Medium]	[Unlikely]	[Low]

### **3.6 Recommendations**

Potential environmental risks have been highlighted within the surrounding area, particularly within Ty Mawr Farm. The proposed route does not pass through any identified potential sources of contamination.

No further investigation is recommended. If unforeseen contamination or Made Ground is encountered it is recommended that soil samples are taken and tested to better assess the presence, nature and contamination potential of this site.

It is recommended that this desk study report is passed to the relevant Environmental Health Department for comment as soon as possible.

## 4. Preliminary Geotechnical Assessment

Potential geotechnical hazards that are considered likely to have an impact upon the proposed utility route, include:

- Made Ground and soft or compressible natural deposits, can vary in strength and granular and clay soil content, which may complicate the design and construction.
- Changes in ground conditions over short distances, i.e. granular/clay rich soils or weathered soils/bedrock, may complicate foundation design and construction.
- Clay rich soils, have potential to change volumetrically with variations in moisture content that can complicate foundation design and drive them deeper, particularly where existing or proposed trees are nearby.
- Cambering on valley sides with possibility of 'gulls'
- Slope instability risks
- Shallow and/or perched groundwater within granular layers can complicate foundation and sub-structure design and construction.
- Aggressive chemical environment for concrete, e.g. expansive slag or high sulphate soils, may affect sub-surface structure design and construction.

EMS recommend intrusive works are compared against anticipated ground conditions for all projects.

Should adverse/unforeseen ground conditions (such as contamination, soil conditions and man-made obstructions) be encountered an Environmental and/or Geotechnical Specialist must be contacted, to reassess risk.

# **SUPPORTING INFORMATION**

This section provides background details of a generic nature together with specific technical approaches adopted by EMS and details of the guidance documents that are commonly referenced in the report. The section also includes explanations of technical terms to assist non-specialist readers in understanding the Technical Report. It should be noted that not all the information within this section is necessarily applicable to this specific report.

## **SITE CHARACTERISTICS**

*The site characteristics are collated from various information sources, including but not limited to Ordnance Survey, British Geological Survey (BGS), GOV.UK / DATA.GOV.UK websites and local authorities.*

*EMS generally commission the Landmark Information Group to produce an Envirocheck Report for study sites and where employed this is included in the Appendices. It should be noted that some of the data provided in the Envirocheck report is not considered within EMS's interpretation for the site characteristics as it is not relevant, including:*

- *Nitrate Sensitive Zones and Nitrate Vulnerable Zones are ignored as these are only applicable to agricultural activities relating to the application of manure and fertilisers to land.*
- *River Quality is ignored as at this preliminary stage of risk assessment as all surface water bodies are considered equally sensitive to contamination risks.*

*In assessing site characteristics, EMS also consider the area within a surrounding 250m buffer zone extending from the site boundary.*

## **HISTORY**

### *Mapped History*

*The site history summarises the changes in use or layout of the site over time and is largely developed from a study of available Ordnance Survey maps. It should be noted that changes to the site may have occurred between the editions of the maps employed to assess the history of the site. Historical information of relevance within the 250m surrounding the site is also discussed in a separate section. The historical plans referred to in the text are generally included in an Appendix.*

### *Aerial photography*

*As a minimum, current and historical aerial images of the site and surrounding areas are studied from the Google Earth program. Where additional historic aerial photographs have been purchased then these are referenced within the technical report.*

### *Internet Searches*

*A simple search of the internet for relevant material relating to the use or history of the site is made. Information obtained from internet searches has been accepted as fact without validation by EMS except for ensuring the source is reputable. It should be recognised that due to programme and budgetary constraints the search conducted may not have revealed all the information available.*

## **GEOLOGY**

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The geology relating to the site is assessed using information contained within the Envirocheck report and / or reference to the relevant British Geological Survey (BGS) 1:50,000 scale sheet in Bedrock and Superficial (historically Solid and Drift) edition. Many of these geological maps are relatively old with superseded terminology and descriptions. EMS therefore employ the BGS Open Geoscience website to determine current nomenclature of strata and to assist in determining geological boundaries against current topographic features. EMS also employ BGS Regional Geology Guides to assist in understanding the geological context of the site.

### Ground Stability Hazards

Ground stability hazards caused by mining, ground dissolution, landslide potential, collapsible ground and natural cavities are identified by the Envirocheck database search of records held by The Coal Authority, British Geological Survey and studies completed by Ove Arup and Peter Brett Associates.

The Envirocheck database ground stability hazard entries for compressible ground, running sands and shrinking or swelling clays are not discussed directly. This is because these hazards are very common and are considered within the preliminary geotechnical assessment where necessary.

### Radon

Radon is a naturally occurring colourless and odourless gas that is radioactive. It is formed by the radioactive decay of radium which in turn is derived from the radioactive decay of uranium, both of which are minerals that can be found in many soil types. Whilst it is recognised that the air inside every house contains radon, some houses built in certain defined areas of the country might have unacceptably high concentrations and require special precautions to be taken during construction to reduce this risk.

Radon can move through cracks and fissures in the soil into the atmosphere or into dwellings via basements and/or underfloor voids. If radon enters the living space of dwellings its concentration can potentially increase and provide a risk to human health as the inhalation of the radioactive decay products of radon gas can increase the risk of developing lung cancer.

The maps contained within BRE211:2007 'Radon: guidance on protective measures for new buildings' identify areas where no radon protection measures are necessary or where higher concentrations are present that either basic or full radon protection measures are required to be fitted to all new dwellings. However, some local authorities have local bylaws, that EMS may not be aware of, that insist on radon protection to all new dwellings within their area regardless of the recommendations of the BRE211 Radon report.

Basic radon protection measures comprise incorporation of a continuous gas resistant membrane sealed at joints and around service entries into the floor construction and extended across the cavity tray.

Full radon protection measures comprise incorporating a continuous gas resistant membrane into the floor construction together with a ventilated sub-floor void through either the use of suspended floor construction or a 'radon sump'. The membrane is sealed at joints and around service entries into the floor and extended across the cavity tray.

BRE211 should be referred to for detail on the construction of the protective measures.

## **HYDROGEOLOGY**

### Aquifer Designations



*The Environment Agency's Groundwater Protection Policy uses designations that reflect the importance of aquifers in terms of groundwater as a drinking water resource, but also their role in supporting surface water flows and wetland ecosystems.*

*In defining groundwater vulnerability, both the superficial (drift) deposits and bedrock (solid) geology are considered separately with the following aquifer designations:*

- *Principal Aquifers: These are layers of rock or drift deposits 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.*
- *Secondary Aquifers: These include a wide range of rock layers or drift deposits with an equally wide range of water permeability and storage. Secondary aquifers are subdivided into two types:*
  - *Secondary A - 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.*
  - *Secondary B - 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.*
- *Secondary Undifferentiated - has been assigned in cases where it has not been possible to attribute either category A or B to a rock type.*
- *Unproductive Strata: These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.*

### Source Protection Zones

*The Environment Agency (EA) has defined Source Protection Zones for groundwater sources, such as boreholes and springs, that are used for public water supply. The EA uses the zones to target pollution prevention measures and monitor the activities of potential polluters within the affected area. There are three types Source Protection Zone:*

- *Zone 1 (Inner Protection Zone) is the most sensitive area within which pollution could reach the borehole within 50 days. Alternatively it is defined by a minimum 50m radius around the borehole.*
- *Zone 2 (Outer Protection Zone) are defined by the area within which pollution could reach the borehole within 400 days or 25% of the total catchment area.*
- *Zone 3 (Total Catchment) are defined by the total area required to support the removal of water from the borehole.*

## **HYDROLOGY**

### Flooding

*The Environment Agency has zoned England and Wales in respect of the risk from flooding from 'highly unlikely' in Zone 1 to 'likely' in Zone 3. The zones ignore the presence of flood defences or certain other manmade structures and channel improvements.*

*National Planning Policy Framework, Department for Communities and Local Government, dated March 2012 states "A site-specific flood risk assessment is required for proposals of 1 hectare or greater in Flood Zone 1; all proposals for new development (including minor development and change of use) in Flood Zones 2 and 3, or in an area within Flood Zone 1 which has critical drainage problems*

(as notified to the local planning authority by the Environment Agency); and where proposed development or a change of use to a more vulnerable class may be subject to other sources of flooding”.

## **ENVIRONMENTAL ASPECTS**

### Landfill

The database of the Environment Agency of active and historic landfills is searched for all sites. Sometimes additional historic landfill data is available from the British Geological Society and local authorities to identify nearby landfill sites. It should be noted that landfill sites that closed prior to 1974 and unlicensed disposal activities will not necessarily be revealed by this search.

### Pollution Incidents

The Environment Agency ceased recording ‘Pollution Incidents to Controlled Waters’ in 2000, when they commenced the replacement ‘Substantiated Pollution Incident Register’. EMS do not consider any ‘Category 3 – Minor Incident’ on the ‘Pollution Incidents to Controlled Waters’ database as relevant to assessing the site due to the time elapsed and the low level of impact that occurred. Again, due to the time elapsed and the fact that remedial measures would have been undertaken at the time, ‘Category 1 – Major Incident’ and ‘Category 2 – Significant Incident’ are only considered relevant if the impacted controlled water was on or immediately adjacent to the site.

On the ‘Substantiated Pollution Incident Register’, EMS approach to this information in the following manner:

- *Pollution incidents impacting ‘air’ only are not considered relevant.*
- *Pollution incidents to ‘water’ are only considered where the surface water impacted is either on, flows through or is immediately adjacent to the site.*
- *Pollution incidents to ‘land’ are only considered where these are on or immediately adjacent to the site unless there are grounds to consider that the incident had the potential to impact groundwater that may have migrated beneath the site.*
- *Category 4 potential pollutant incidents are recorded, but upon investigation were found to have had no impact and accordingly are not considered relevant.*

### Ecologically Sensitive Land Use

The land uses that are identified as ecologically sensitive are those identified as Sites of Special Scientific Interest (SSSI), Special Areas of Conservation, Special Protection Areas, Ramsar sites, Natural Parks, Natural Nature Reserves, Marine Nature Reserves, Local Nature Reserves, Green Belt, Forest Parks, Environmentally Sensitive Areas, or Areas of Outstanding Natural Beauty.

### Unexploded Ordnance

Guidance in CIRIA C681 ‘Unexploded Ordnance, A Guide for the Construction Industry’ recommends that a preliminary risk assessment, comprising desk-based consideration of factors that affect the potential for unexploded ordnance (UXO) to be present, is undertaken at all sites at an early stage. This assessment ascertains whether specialist advice is required prior to ground disturbing activities. The assessment involves consideration of the site’s location, history and planned investigation activities. The aim of the assessment is principally to avoid loss of life or injury in the rare event that unexploded ordnance is encountered. However, it is also extremely useful to consider this issue at an early stage to avoid costly delays in construction programmes later down the line.

At the date of publication of this CIRIA document there have been no recorded deaths in the UK resulting from UXO in recent decades (although there have been some fatalities in Europe). However, it is estimated that 15,000 items of ordnance (5 % estimated to be live) were removed from UK construction sites between 2006 and 2008.

The following table summarises the risk factors for a site against the potential for UXO to be present:

		LOW	Potential for aerial delivered UXO to be present HIGH		
<i>Indicators of potential aerial delivered UXO hazards</i>					
<b>Data item</b>	<b>Site location</b>	Rural	Small towns	Brownfield sites Large towns	Cities
	<b>Site description and historical land use</b>	Greenfield site or agricultural land only	Near to wartime site of: Previous military use Railway marshalling yard Power station Gas works Port Industrial centre	Adjacent to wartime site of: Previous military use Railway marshalling yard Power station Gas works Port Industrial centre	Site of previous military use: Former wartime Site of previous military use Railway marshalling yard Power station Gas works Port Industrial centre
	<b>History of WWII bombardment</b>	No history of WWII bombing	Near to area of known WWII bombing	Area of known WWII bombing	Area of high intensity WWII bombing
<i>Post-war development and the potential to remove aerial delivered UXO hazards</i>					
<b>Nature of development</b>	Wholesale excavation				
	Significant post-war development				
	Moderate post-war development				
				Minimal post-war development	
	No evidence of post-war development				
<i>Construction activities and the potential to encounter aerial delivered UXO</i>					
<b>Activity</b>	Borehole drilling				
	Shallow trial pits				
	Excavations for services				
	Low density driven piles				
	Shallow excavations over extended area				
	Sheet piling				
	Deep excavations over limited area				
	High density piles				
	Deep excavation over extended area				

Notes: 1. Adapted from CIRIA C681.

Reference to the ZeticaUXO website (<https://zeticauxo.com>) also provides additional information with respect to the risk of unexploded ordnance beneath a site.

## CONTAMINATION ASSESSMENT METHODOLOGY

### UK Policy

*The UK Government's policy in relation to land affected by historic contamination is based on a 'suitable for use' approach. The approach recognises that the risks presented by any given level of contamination will vary greatly according to the use of the land and a wide range of other factors, such as the underlying geology of the site. Contamination risks therefore need to be assessed on a site-by-site basis. The 'suitable for use' approach limits requirements for remediation to the work necessary to prevent unacceptable risks to human health or the environment in relation to either the current use or future use of the land.*

*The three main drivers for contamination assessment and remediation are:*

- *Voluntary action.*
- *Development as part of the planning regime.*
- *Regulatory action to mitigate unacceptable risks e.g. Part 2A of the Environmental Protection Act 1990.*

### Pollutant Linkages

*For a contamination risk to exist there must be a 'pollutant linkage' from the contaminant (source) via a pathway (the route from contaminant to receptor) to a receptor (the entity that could be harmed). The absence of a contaminant, pathway or receptor breaks the pollutant linkage and therefore no contamination risk exists.*

*Contamination is typically present at a site (in the ground and/or in the underlying groundwater) as a result of a historic or current industrial use, usually as a result of leaks, spills or disposal of residues, wastes and excess raw materials from the industrial processes. Contamination may also be present due to:*

- *The deliberate application of chemicals e.g. the spraying of herbicide/pesticide.*
- *Migration of pollutants from adjacent land.*
- *Naturally occurring processes e.g. elevated concentrations of particular heavy metals associated with specific geological strata.*

### Conceptual Site Model

*The conceptual site model can be defined as a textual or graphical representation of the identified pollutant linkages for a given site. The model forms the basis for designing the investigation as the aim will be to target all of the potential pollutant linkages to determine, through the subsequent phases of risk assessment, whether or not they pose an actual risk.*

*It is important that the conceptual site model is updated with new information as the various investigation, risk assessment and remediation works are completed.*

### Technical Guidance

*The technical and legal framework for contamination assessment is complex. The process adopted through this report for assessing contamination risks is in general accordance with the following guidance, as listed below:*

- ‘Investigation of Potentially Contaminated Sites - Code of Practice - BS 10175: 2011+A2:2017’, BSi, 2017.
- Land Contamination Risk Management (LCRM), Environment Agency, 2020, updated 2021.
- ‘Guidance for the safe development of housing on land affected by contamination - R&D66: 2008’, NHBC/Environment Agency, 2008.

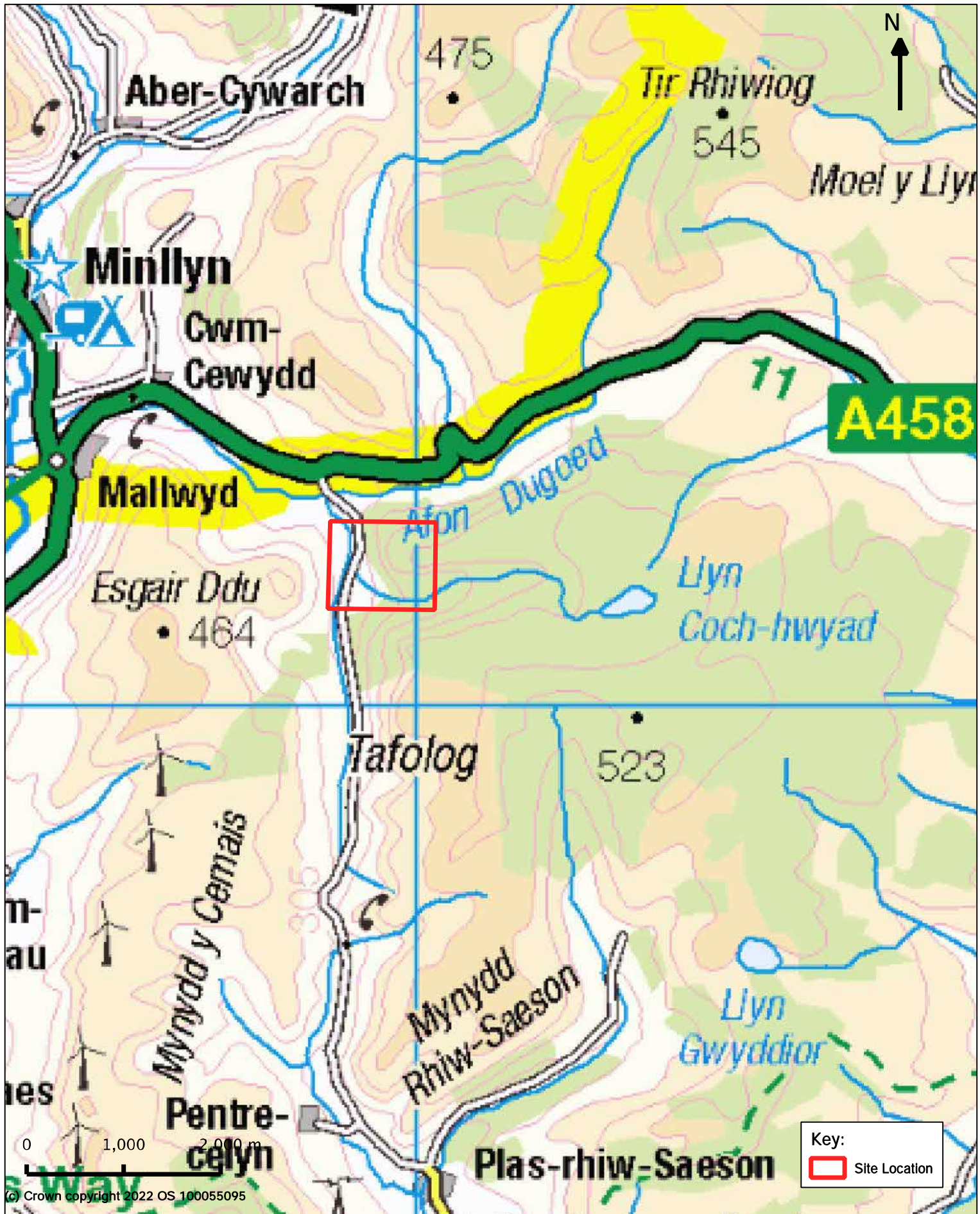
Risk Assessment Methodology

In line with the technical guidance, the contamination risk assessment follows a series of phased stages for each particular site:

<b>PHASE</b>	<b>DESCRIPTION</b>	<b>RISK ASSESSMENT STAGE</b>
<b>PHASE 1</b>	<i>Generally limited to desk based research and a site walkover survey to develop an initial conceptual site model and identify what risks, if any, are likely to be presented by the site.</i>	<i>Hazard Identification and Assessment A preliminary stage of risk assessment concerned with identifying and characterising the hazards that may be associated with a particular site and identifying potential pollutant linkages.</i>
<b>PHASE 2</b>	<i>This phase is concerned with establishing whether contamination is present, usually through intrusive ground investigation, and then evaluating the degree and magnitude of the associated risks.</i>	<i>Risk Estimation A stage concerned with estimating the likelihood that receptors will suffer adverse effects if they come into contact with, or are otherwise affected by, a hazardous substance or agent under defined conditions. Risk Evaluation A stage of risk assessment concerned with evaluating the acceptability of estimated risks, taking account the nature and scale of the risk estimates, any uncertainties associated with the assessment and the broad costs and benefits of taking action to mitigate risks.</i>
<b>PHASE 3</b>	<i>The appraisal and selection of remediation techniques their implementation and verification.</i>	<i>Risk Management The process whereby decisions are made to accept a known or assessed risk and/or the implementation of action to reduce the consequences or probabilities of occurrence.</i>

# **Appendix A – Drawings and Plans**





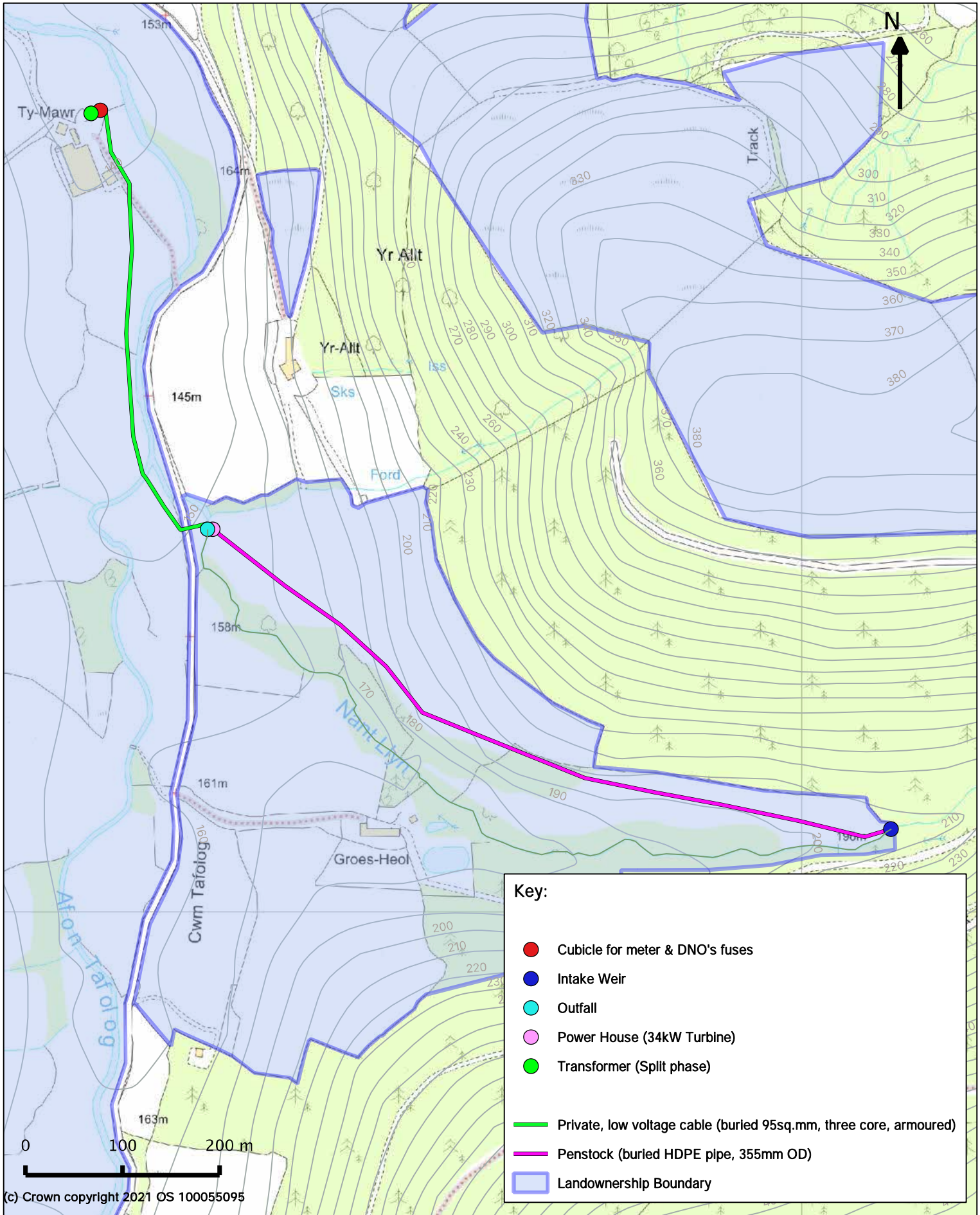
© Crown copyright 2022 OS 100055095

Client: Dylan Jones  
 Installation Address: Ty Mawr, Mallwyd, Machynlleth, SY20 9HS  
 Drawing Title: Site location for hydropower scheme  
 Drawn By: LMB  
 Date: 23rd March 2022  
 Scale @ A4: 1:50,000  
 Dwg No: 220323LB01  
 Version: 1

**Greenearth  
 Hydro**

Greenearth Hydro Limited  
 The Cottage, Rhiw, Pwllheli, LL53 8AE  
 www.greenearthhydro.co.uk  
 Tel: 01691 648 378





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**Key:**

- Cubicle for meter & DNO's fuses
- Intake Weir
- Outfall
- Power House (34kW Turbine)
- Transformer (Split phase)
- Private, low voltage cable (buried 95sq.mm, three core, armoured)
- Penstock (buried HDPE pipe, 355mm OD)
- Landownership Boundary


Client: Dylan Jones  
 Installation Address: Ty Mawr, Mallwyd, Machynlleth, SY20 9HS  
 Drawing Title: Site layout for hydropower scheme  
 Drawn By: LMB  
 Date: 9th September 2021  
 Scale @ A4: 1:5,000  
 Dwg No: 210909LB01  
 Version: 1



Greenearth Hydro Limited  
 The Cottage, Rhiw, Pwllheli, LL53 8AE  
 www.greenearthhydro.co.uk  
 Tel: 01691 648 378



Ty Mawr Identified potential sources of contamination

 Ash or burn piles

 Above ground storage tanks

 Proposed route



Approx 20m

(Not to scale)



# E-34076 Preliminary Conceptual Site Model A (Ty Mawr Farm Yard and Potentially Infilled Land)

WEST

EAST

Proposed route does not pass through any identified potential contaminant sources

Ty Mawr Farm

Potential weathering/demo of asbestos containing materials

Migration, ingress and accumulation. Inhalation. (External Air Only) (5)

Ingestion Inhalation Direct Contact (1)

Direct contact with buried services (4)

Migration, ingress and accumulation. Inhalation. (External Air Only) (5)

Alluvial Deposits

Superficial deposits alongside existing watercourses

Localised hydrocarbon fuel spills/leaks

Bonfires and potential fill from unknown sources

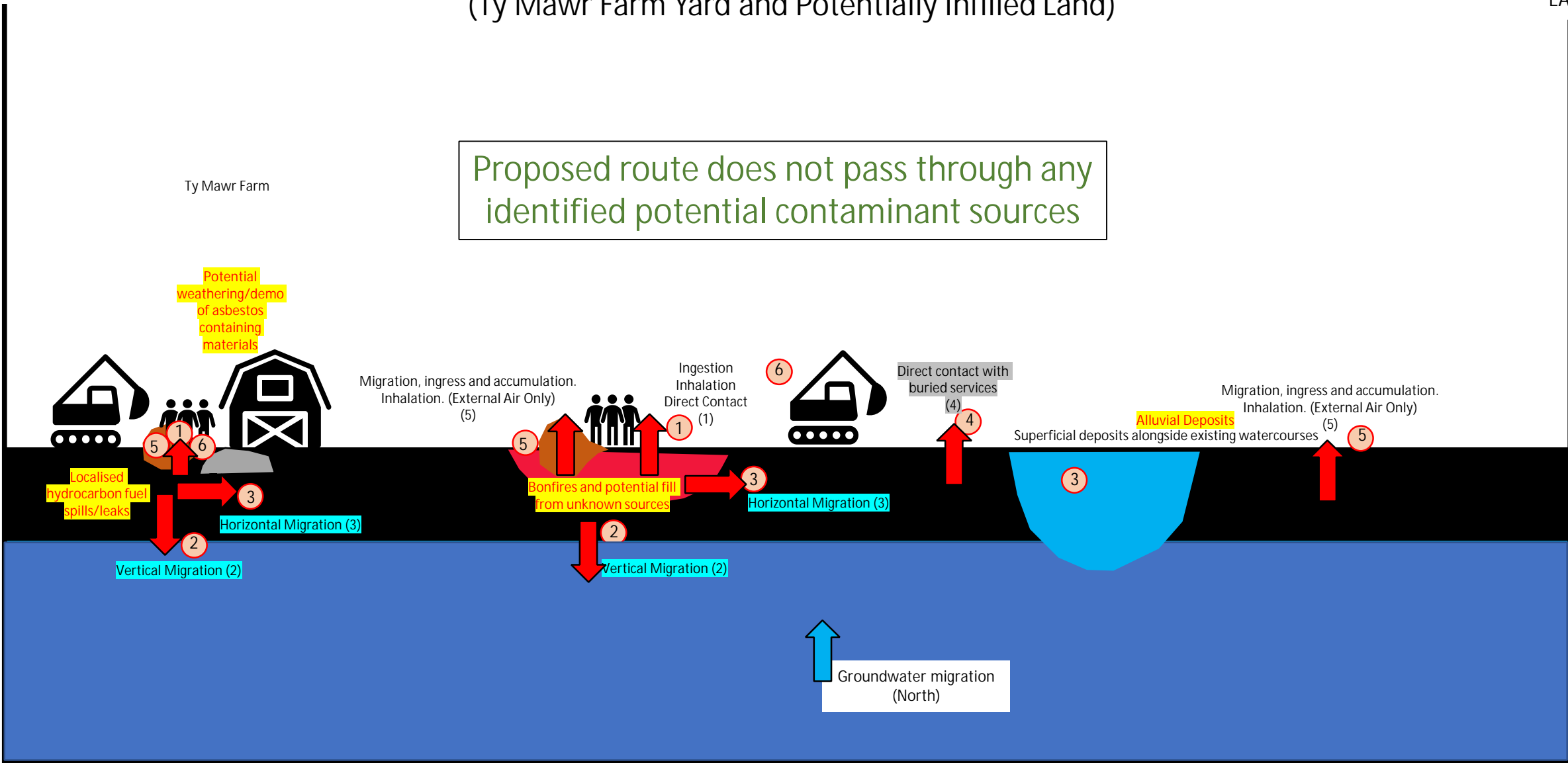
Horizontal Migration (3)

Horizontal Migration (3)

Vertical Migration (2)

Vertical Migration (2)

Groundwater migration (North)



# E-34076 Preliminary Conceptual Site Model B (Open Fields (Agricultural and Grazing))

WEST

EAST

Proposed route does not pass through any identified potential contaminant sources

