A CAF GROUP COMPANY

ENVIRONMENT

Lightsource BP
Prosiect Maen Hir – Central Anglesey
Phase 1 Geo-Environmental Assessment

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Notice

EXECUTIVE SUMMARY

Executive Summary	
Proposed Development	The proposed development is anticipated to comprise solar, battery storage, possibly green hydrogen, and some other alternative technologies.
Current Site Setting	The site largely comprises agricultural land utilised for grazing animals and crops. An exposed rock face was present in the north west of site, potentially associated with historic quarrying. Numerous water courses are present within the site and immediate surrounding area, most of which feed into Llyn Alaw to the south of site.
Site History	The site has remained largely undeveloped over the historical mapping period, predominantly utilised for agricultural purposes, with limited farm buildings present. Numerous small, old quarries and ponds have been identified across the site, with some having possibly been infilled. The surrounding land uses are broadly similar, comprising agricultural land with associated farm buildings. A railway line was present along the eastern boundary. Small quarries and ponds are mapped in the surrounding area, with some possibly now infilled.
Ground Conditions	Ground conditions are anticipated to comprise Devensian Till and localised Alluvium overlying bedrock of the Ordovician Rocks with localised igneous intrusions. Till is locally absent across the site, with localised areas of rock outcrops present at ground level. Localised Made Ground is expected in the vicinity if infilled ponds and quarries. The Till is categorised as an undifferentiated Secondary Aquifer, whilst the Alluvium is categorised as Secondary A Aquifers. All bedrock geologies mapped underlying the site are categorised as Secondary B Aquifers.
Geotechnical Review	Shallow spread foundations are likely to be viable across the majority of the site, however shallow bedrock may need breaking out to facilitate this locally. Foundations may need locally deepening within areas of Alluvium. Earthworks are likely to be required where steep gradients are present.
Environmental Review	Limited sources of contamination have been identified across the site given the lack of historic development. The risk to human health receptors is considered to be low based on the absence of a significant contaminant source. The risk to controlled water receptors is considered to be very low based on the lack of an identified contamination source.
Recommendations	Once the development masterplan is defined, it is recommended that ground investigation is undertaken to quantify the contaminant linkages identified within conceptual site model. It is recommended that intrusive ground investigation is undertaken in areas where Alluvium and bedrock outcrops are known/suspected to be present in order to inform foundation design.
This summary should be read in conjunction with BWB's full report (ref. MSF-BWB-ZZ-XX-RP-YE-0002_Ph1-Central) and reflects an assessment of the site based on information received by BWB at the time of production.	

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1. INTRODUCTION

Instruction

1.1 BWB Consulting (BWB) was instructed by Lightsource BP (the Client) to carry out a Phase 1 Geo-Environmental Assessment for the site at Prosiect Maen Hir – Central, Anglesey. Details of the project brief are included in BWB proposal reference 20230130/2/232062/MB/MB, dated 30th January 2023.

1.2 The proposed development is anticipated to comprise solar, battery storage (BESS), possibly green hydrogen, and some other alternative technologies.

Objectives

1.3 This report has been completed to present pertinent information into the environmental risks and liabilities associated with the site. It has been completed to fulfil the requirements of a preliminary risk assessment in accordance with BS 10175:2011+A2:2017 *'Investigation of potentially contaminated sites, code of practice'* and EA Guidance on Risk Management of Land Contamination https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm.

1.4 The report has also been prepared with reference to land contamination technical guidance available through https://www.gov.uk/government/collections/land-contamination-technical-guidance.

1.5 The objectives of this report are to:

- Assess historical activities at the site with respect to their potential impact on the site environment;
- Characterise the environmental setting of the site, identify migration pathways and vulnerable receptors for contamination originating at the site, focusing on potential soil and groundwater liabilities;
- Assess historical and current surrounding land use in relation to known or potential off-site contamination issues that may impact the site;
- Review existing site investigation and remediation information for the site, where available;
- Develop a preliminary Conceptual Site Model (CSM); and
- Assess potential environmental liabilities associated with the site.

Scope of Work

1.6 The scope of work included:

- A site visit to inspect the current site and immediate surroundings, identify potential hazards associated with ground conditions or contamination and to determine potential constraints with regards to ground investigation (photographs presented as Appendix 1);

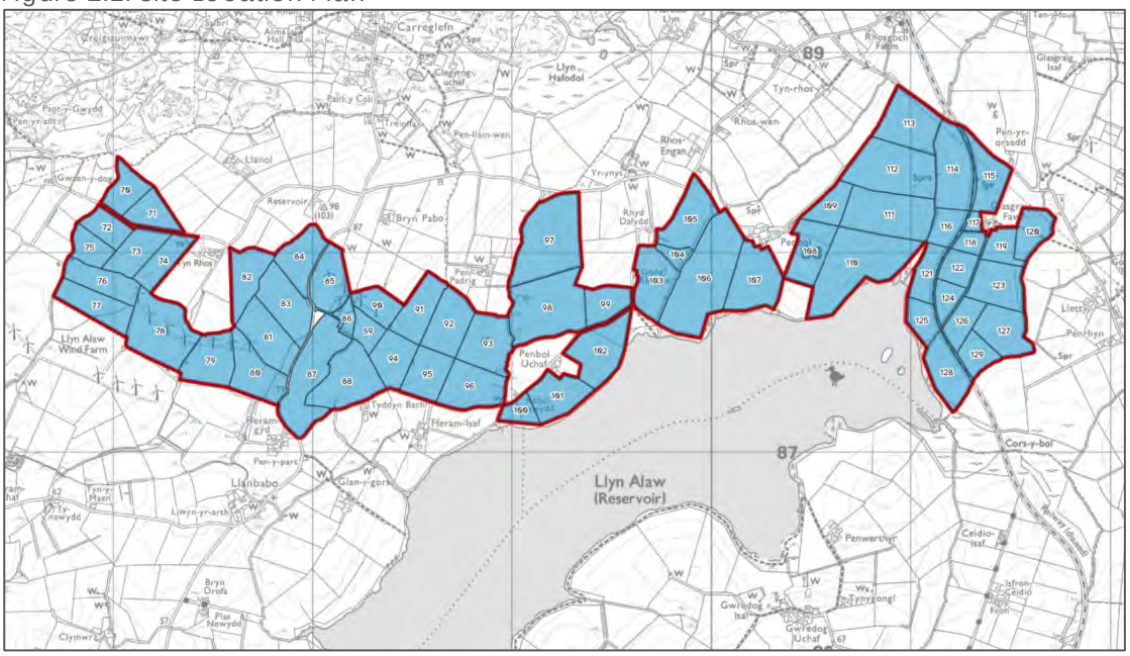
- A review of the following information:
  - Groundsure Report ref. GSIP-2023-13916-14902_1 (Appendix 2);
  - Historical Ordnance Survey Mapping (Appendix 3);
  - Historical aerial photographs (Google Earth) and other imagery (Groundsure Report);
  - British Geological Survey (BGS) 1:50 000 Scale, '*Anglesey*', (Sheets 92, 93, 94, 105 & 106), Drift, (1974);
  - British Geological Survey (BGS) 1:50 000 Scale, '*Anglesey*', (Sheets 92, 92, 94, 105 & 106), Solid, (1980);
  - BGS online geological maps and exploratory hole records (www.bgs.ac.uk);
  - MAGIC website (www.natureonthemap.naturalengland.org.uk/magicmap); and
  - Coal Authority Interactive Map Viewer (http://mapapps2.bgs.ac.uk/coalauthority/home.html);
- A summary of the key hazards or uncertainties that require additional investigation in order to further characterise the associated risks; and
- Production of a Geo-Environmental Assessment (this report), concluding in a qualitative assessment of the risks from contamination and ground-related constraints which may impact on the site.

2. THE SITE

Site Location

2.1 The site comprises numerous field parcels located to the north of Llyn Alaw, in Anglesey, centred at approximate National Grid Reference 239893, 391137. The approximate location of the site is shown below in Figure 2:1.

Figure 2:1: Site Location Plan



Site Description

2.2 The site comprises an irregular shaped parcel of land covering an area of approximately 390 hectares, centred around Llyn Alaw. BWB undertook a site walkover on 15th and 16th August 2023, selected photographs are presented in Appendix 1. A site layout plan is presented within Drawing 1.

2.3 The site predominantly comprised agricultural fields which were undulating in nature and utilised either for growing crops or grazing cattle/sheep.

2.4 Overhead services were present crossing numerous fields. Rock outcrops were identified within three fields in the south east of site and one in the north west. A series of wind turbines were present across fields within the west of the site with more located off site to the west. A stockpile was present at the base of one of the wind turbines, predominantly comprising slate. An exposed rock face, possibly related to historical quarrying activity was located in a field to the north west of Llyn Alaw (Field 96).

2.5 Several water courses cross the site, generally flowing towards Llyn Alaw which is located immediately south of the central areas of site.

2.6 The surrounding areas predominantly comprised agricultural land, similar to those present on site, with farm buildings occasionally with associated (probable water) storage tanks, located adjacent to some of the fields across site.

2.7 A disused railway line runs between the field parcels in the east of the site, orientated north to south. The railway line was locally within cuttings or upon embankments to accommodate the undulating ground levels.

3. ANTICIPATED GROUND CONDITIONS

3.1 The anticipated ground conditions for the site and controlled waters vulnerability is discussed within this Section.

Geology

Made Ground

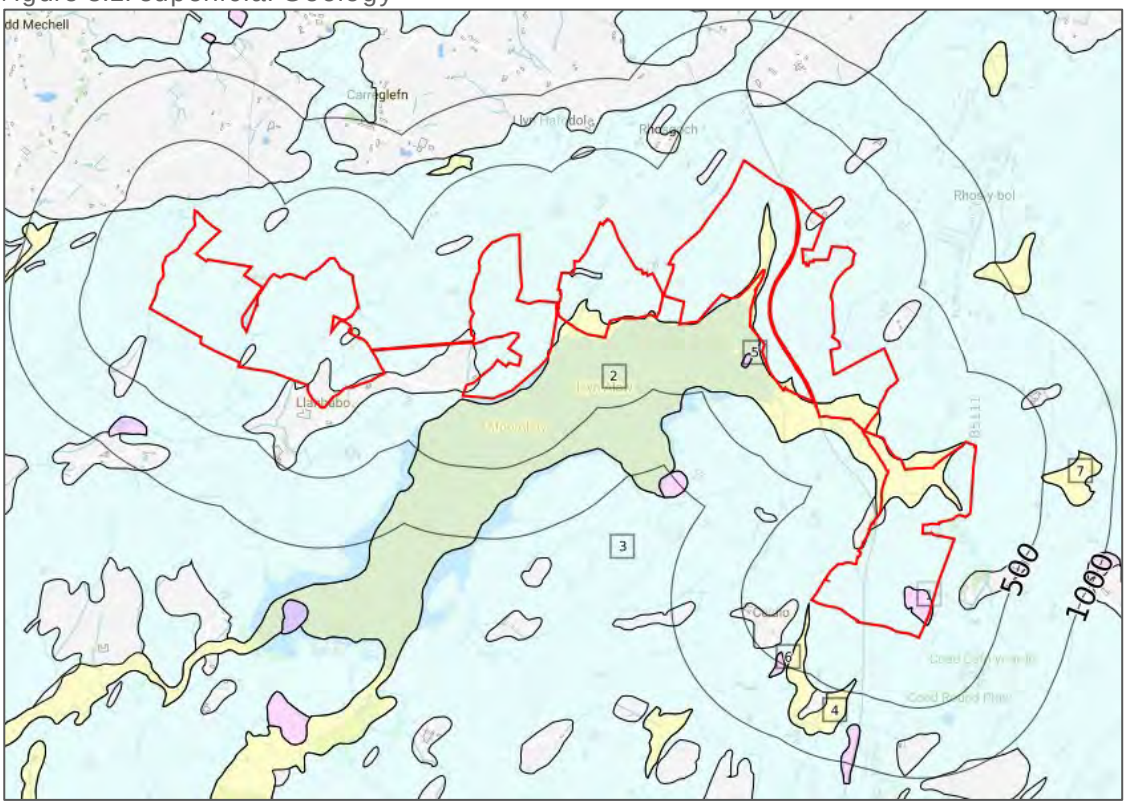
3.2 Made Ground is not mapped on site, however, there are expected to be localised areas of Made Ground around buildings, access tracks, wind turbines and railway embankments.

Superficial Geology

3.3 Information published by the BGS indicates that a large proportion of the site is underlain by Devensian Till superficial deposits, indicated by the pale blue areas on Figure 3:1 below. Localised pockets of Alluvium (clay, silt, sand and gravel) are mapped along the water courses and in close proximity to Llyn Alaw (yellow areas).

3.4 Superficial deposits are locally absent across the site.

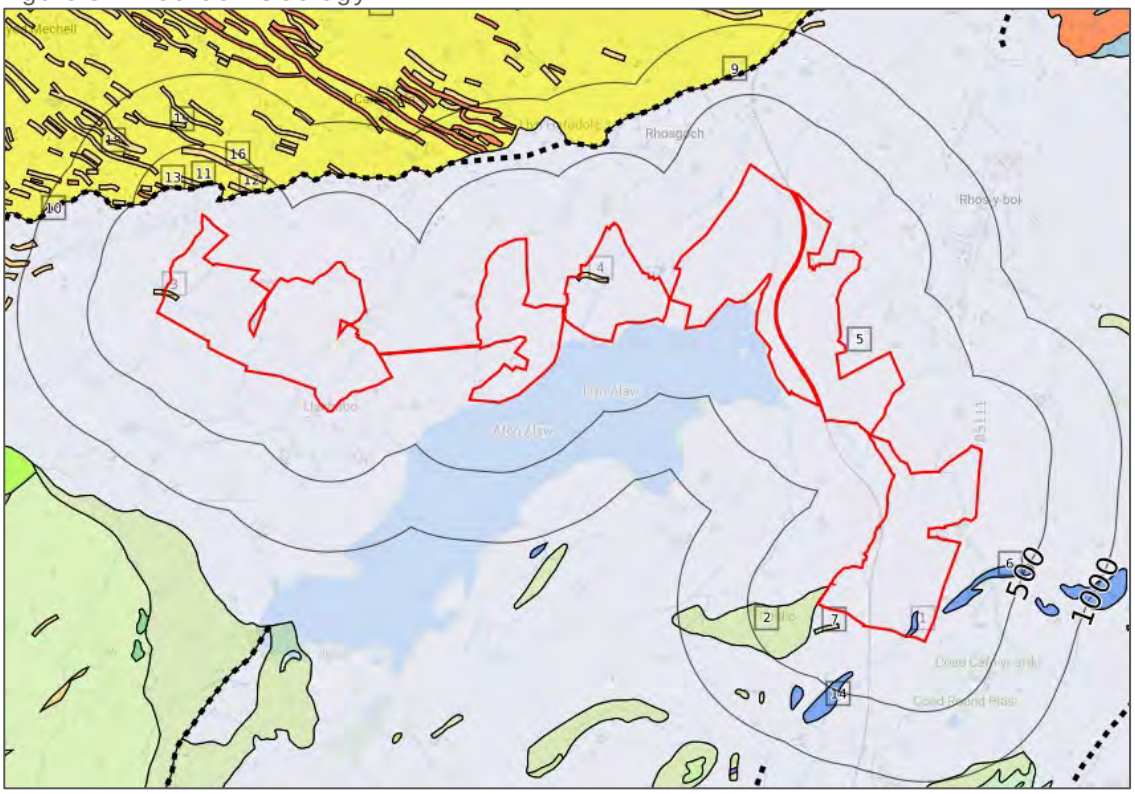
Figure 3:1: Superficial Geology



Bedrock Geology

3.5 The underlying bedrock predominantly comprises Ordovician Rocks (interbedded mudstone and sandstone) across most of the site (pale grey areas on Figure 3:2). Igneous intrusions of gabbro, microgabbro and diorite are mapped in the west (ref. 3) and central (ref. 4) areas.

Figure 3:2: Bedrock Geology



Site Specific Ground Investigation Data

3.6 There are no publicly available BGS boreholes located within the site boundary. Boreholes are mapped along the corridor of the overhead power cables, which cross the north east of the site. However, these are privately owned.

Hydrogeology

3.7 The Till is categorised as an undifferentiated Secondary Aquifer, whilst the Alluvium is categorised as a Secondary A Aquifer. All bedrock geologies mapped underlying the site are categorised as Secondary B Aquifers.

3.8 The site is not indicated to be within, or within close proximity to, a groundwater Source Protection Zone, as designated by Natural Resources Wales.

3.9 There are no current or historical abstraction licences relating to groundwater on site or within 1km.

3.10 There are no active discharge consents relating to groundwater on site; a historical consent is recorded 61m north of the site, relating to 'chlorinated OF'. The consent was revoked in 1994.

Surface Waters

3.11 Numerous water courses are present within the site and immediate surrounding area. Most are small tributaries which feed into Llyn Alaw to the south of site.

3.12 Two springs are mapped in the north east of site, one in the centre of the site, with several more located in the areas surrounding the north eastern field parcels.

3.13 There is a potable surface water abstraction located 1.7km south west of the site.

3.14 There are no surface water discharge consents listed on site. The closest historical discharge consents were located 60m east relating to sewage discharges into an unnamed water course.

3.15 Two Water Framework Directive (WFD) surface water body catchments are mapped on site;

- Alaw – upstream Llyn Alaw, covering most of the site: which had an overall rating of moderate with a 'good' chemical rating and a 'good' ecological rating in 2016; and
- Tan R'Allt, covering the western-most areas of the site: which had an overall rating of moderate with a 'good' chemical rating and a 'moderate' ecological rating in 2016.

Ground Gas and Radon

3.16 Localised Alluvium is present on site which represents a potential source of elevated ground gasses.

3.17 Radon levels across the site are indicated to be below 1% whereby radon protections measures would not be required within buildings.

Mining and Mineral Extraction

3.18 There are no records of significant mining or mineral extraction reported on site. However, the entire site is indicated to be located in an area where sporadic or localised underground mining of restricted extent is possible.

3.19 Several small historical quarries are reported both on and near to the site within the Groundsure Report. These largely correlate to the historical mapping as discussed in Section 4, with most dating back to pre-1880s. The Groundsure Report identifies the quarried materials to be either sandstone or igneous and metamorphic rocks, with the activities reported as having ceased.

Environmental Sensitivity

3.20 The entire island of Anglesey is part of Geomon Global Geopark as designated by UNESCO.

3.21 Llyn Alaw is designated as a site of special scientific interest (SSSI) by Natural Resources Wales.

3.22 Agricultural land classification on site ranges from a grade 5 (very poor quality) to a grade 2 (good quality).

4. SITE HISTORY

4.1 Historical Ordnance Survey (OS) mapping for the site area has been reviewed. These maps and plans date from 1887 to 2023. The historical plans reviewed are provided in Appendix 3. The key points of the historical development of the site and surrounding area are summarised below, with pertinent locations shown on Drawing 1.

On site

4.2 The site has remained relatively undeveloped throughout mapped history and has been utilised predominantly for agricultural purposes. The following site features have been identified on the historical mapping.

- Old Quarries – three small quarries are mapped in the central area of the site from the earliest maps, listed as disused from the 1980s.
- Railway line – the railway line which runs through the east of the site is shown from the earliest maps.
- Farm buildings – Most farm buildings are not included within the site boundary. However, a farm building is present in the north east site area from the earliest mapping, adjacent to Glasgraig Fawr. Further farm buildings are present in the centre of the site, labelled as Cae-Mawr.
- Overhead cables – Overhead cables are shown on mapping crossing the north eastern corner of site from the 1970s.
- Wind Turbines – Wind turbines and an associated access road are shown in the west of the site from 2001 plans.
- Surface water features – A spring is mapped in the north west, centre and north east of site from the earliest plans. Five small ponds are present in the west of the site from the earliest mapping, two of which have been infilled by 2001. Three small ponds are shown in the north east on the earliest plans, which are no longer shown by the 1970s.

Off-site

4.3 The surrounding land areas have seen similar historical land usages, predominantly being utilised for agricultural purposes with associated farm buildings. The following site features have been identified on the historical mapping.

- Marsh land – quite a large area of land to the east of Llyn Alaw, mapped close to the eastern field boundaries land from the earliest plans.
- Railway Line – A railway line has been present throughout historical mapping, passing through the site and immediate surrounding area. The railway line is no longer active.
- Farm Buildings – farm buildings are mapped adjacent to the eastern boundary. A tank is present 100m from the site boundary in the central area, within Penbol Uchaf from 1974 mapping onwards.
- Small quarries/pits – Several small quarries are mapped near to the south east and north east areas of site.

- Wind turbines – Turbines are mapped immediately south west and east of the western parcel from the 2001 plans.
- Llyn Alaw – The lake appears as a marshy area to the south of the site on the earliest mapping. Between 1965 and 1966, the area was developed into a reservoir.
- Surface water features – numerous small ponds and springs are mapped in the areas immediately surrounding the site. A small reservoir is present from the 1970s mapping to the north of the western area.

Operational / Company Records

4.4 No operational records have been made available for review as part of this assessment.

Summary of Site History

4.5 The site has remained largely undeveloped over the historical mapping period, predominantly utilised for agricultural purposes, with limited farm buildings present. Numerous small old quarries and ponds have been identified across the site, with some having possibly been infilled.

4.6 The surrounding land uses are broadly similar, comprising agricultural land with associated farm buildings. A railway line was present along the eastern boundary. Small quarries and ponds are mapped in the surrounding area, with some possibly now infilled.

5. REGULATORY SETTING

Permits Consents and Authorisations

5.1 A full listing of permits, consents and authorisations including discharge consents, pollution incidences and other environmental information, is included in the Groundsure report, presented in Appendix 3.

5.2 No significant features have been identified which are considered likely to have had a detrimental impact on the site.

Landfilling and Waste Management

5.3 A full listing of EA, BGS and Local Authority recorded landfills are provided in the Groundsure report presented in Appendix 3.

5.4 There are no historical landfill sites identified within 500m of the site.

5.5 There are no waste exemption permits listed on site; however, there are numerous identified in the surrounding area. They relate to various small-scale agricultural processes including; deposits of dredging's from water courses, spreading waste on agricultural land to confer benefit, use of waste for a specified purposes, burning of waste as a fuel, burning waste in the open, use of waste in construction, storage of waste in a secure place/containers, anaerobic digestion at premises used for agriculture and burning of resultant biogas, treatment of waste wood and waste plant matter by chipping, shredding, cutting or pulverising, aerobic composting, screening and blending of waste all listed within 100m of the site.

6. GEOTECHNICAL APPRAISAL

6.1 The Groundsure report, site history, current site setting and geology setting have all been considered in order to provide an indication of the potential ground related constraints and opportunities in the context of the proposed development as set out in Table 6:1.

Table 6:1: Ground Related Constraints & Opportunities

Potential Constraint / Opportunity	Explanation	Potential Mitigation Options
Preliminary Foundation Solution	Shallow spread foundations are likely to be viable across the majority of the site, bearing onto the till or bedrock. Where Alluvium is present, foundations may need to be locally deepened to found upon more competent strata.	Ground investigation should be undertaken to confirm ground conditions at the site and allow for in-situ and laboratory testing to inform foundation design.
Rock Outcrops	There are localised areas of the site where visible rock outcrops are present. Additionally, in areas where superficial deposits are absent or thin, hard bedrock deposits may be present at shallow depth.	Shallow hard bedrock may need to be broken out to facilitate the construction of foundations. It is recommended that ground investigation is undertaken in areas where superficial deposits are not mapped to see how deep the competent bedrock is.
Earthworks	Localised earthworks may be required in areas where increased gradients are present to create development plateaus,	Investigation will be required in areas of steep gradients and Made Ground to assess the viability of earthworks.
Topsoil / Made Ground	Topsoil is expected to be present across the majority of the site. Limited Made Ground is expected to be present across much of the site.	There is likely to be a surplus of Topsoil which could be retained on site or potentially sold as a commodity. Made Ground could potentially be reused on site, subject to investigation and chemical analysis.
Ground Subsidence Risks	The Groundsure Report indicates a low to negligible risk on site associated with shrink/swell clays, running sands, collapsible deposits, landslides, compressible deposits and dissolution of soluble rocks across most of the site. A moderate compressibility risk is reported where Alluvium is mapped.	Intrusive investigation is recommended to inform the potential compressibility risk.
Mineral Extraction	Several former small quarries are present on site, some of which may have been infilled. This represents a risk of Made Ground being present in these areas, or shallow bedrock.	Ground investigation should be undertaken to confirm the ground conditions in these areas.

Potential Constraint / Opportunity	Explanation	Potential Mitigation Options
Drainage and Soakaways	Soils on site are likely to have low permeability and soakaway drainage is unlikely to be viable.	Should soakaways be considered as part of the drainage strategy, it is recommended that infiltration testing in accordance with current guidance is undertaken.
UXO	Review of the unexploded ordnance risk maps available online indicates the site to be in an area of low risk from UXO.	No further assessment required.

7. PRELIMINARY ENVIRONMENTAL RISK ASSESSMENT

Introduction

7.1 The risk posed by any contaminants in soil or groundwater will depend on the nature of the hazard, the probability of exposure, the pathway by which exposure occurs, and the likely effects on the receptors. A contaminant is defined as a substance that has the potential to cause harm, while a risk is considered to exist if such a substance is present in sufficient concentration to cause harm and a pathway exists for a receptor to be exposed to the substance.

7.2 Three impact potentials exist for any given site, all of which need to be considered in a risk assessment, which are:

- The site impacting upon itself;
- The site impacting on its surroundings; and
- The surroundings impacting on the site.

7.3 The following sections discuss all the identified potential on and off-site sources, pathways and receptors in the context of the proposed development and plausible contaminant linkages which may represent a risk to identified receptors such as human health and/or controlled waters from the data gained from the desk study.

7.4 The assessment is qualitative and aimed to determine all likely contaminant linkages, with consideration of significance and allowing for uncertainties.

7.5 Sources (S): These are potential or known sources of contamination that may relate to a former land use or present site feature or process (e.g. fuel storage tanks).

7.6 Pathways (P): A pathway is defined as a mechanism or route by which a contaminant comes into contact with, or otherwise affects a receptor. Pathways by which the identified receptors may be impacted upon in the context of the proposed development.

7.7 Receptors (R): Receptors are defined as people, living organisms, ecological systems, controlled waters, atmosphere, structures and utilities that could be adversely affected by contaminant(s).

Conceptual Site Model

7.8 Consideration has been given to the likely sources, pathways and receptors which may be present, based on the information in the previous sections. These are presented in Table 7:1 and

7.9 Table 7:2 and further information about the risk classification scheme is included within Appendix 4, with reference to CIRIA C552 '*Contaminated land risk assessment - a guide to good practice*'.

7.10 A tabulated version of the Preliminary CSM based on the desk study and site observations is presented in Table 7:3.

Table 7:1: Potential Sources of Contamination

Location	Potential Source	Contaminants of Potential Concern (CoPC)
On-site	Possible localised Made Ground associated within railway lines, infilled ponds or quarries.	• Heavy metals • Inorganics, such as cyanides, sulphates and nitrates • pH • Polycyclic Aromatic Hydrocarbons (PAH) • Petroleum hydrocarbons • Methane, carbon dioxide
	Possible elevated ground gasses associated with potentially organic rich Alluvium.	• Methane, carbon dioxide
Off-site	Possible elevated ground gasses associated with potentially organic rich Alluvium.	• Methane, carbon dioxide
	Made Ground and potential contamination associated with neighbouring farm activities, infilled small ponds/quarries and railway infrastructure.	• Heavy metals • Inorganics, such as cyanides, sulphates and nitrates • PAHs • Petroleum hydrocarbons • Methane, carbon dioxide

Table 7:2: Relevant Potential Pathways and Receptors

Receptors	Pathways
Human Health: • Future site users • Intrusive maintenance workers	• Dermal contact with soil or dust • Incidental ingestion of soil and/or dust • Inhalation of dust and/or fibres • Migration and accumulation of ground gas in enclosed spaces leading to inhalation or explosion
Controlled Waters: • Groundwater (Secondary Aquifers) • Surface water features across site.	• Leaching of soil contaminants • Vertical and lateral migration • Surface run-off
Property: • Underground utilities • Building structures	• Direct Contact • Accumulation and explosion of gas

Table 7:3: Preliminary Conceptual Site Model

Source	Pathway	Receptor	Con	Prob	Risk	Potential Mitigation/Investigation Requirements
On-site sources as detailed in Table 7:1	Dermal contact with, and incidental ingestion of soil and/or dust. Inhalation of dust and/or fibres.	Future site users	Mi	Ul	VL	The potential for encountering Made Ground or contaminated soils is restricted to areas adjacent to railway lines and possibly localised areas of infilled ponds/quarries. As part of the proposed development, it is anticipated that limited human interaction with the soils is likely to happen, based on the end use. Where a viable pollutant pathway exists, the provision of a clean capping layer would restrict direct access to potentially contaminated soils. It is recommended that an intrusive ground investigation be completed in order to assess the extent of any potential contamination at the site.
		Intrusive maintenance workers	Mi	Lw	L	The exposure of intrusive maintenance workers can be mitigated by the adoption of suitable working methods, utilising appropriate personal protective equipment (PPE) and maintaining good hygiene. If significant asbestos is recorded, the requirements of the Control of Asbestos Regulations (CAR) 2012 should be complied with.
	Migration and accumulation of ground gases in enclosed spaces leading to asphyxiation (carbon dioxide) or explosion (methane).	Future site users	Md	Ul	L	Localised Alluvium is reported to be present in the centre of the site, which may contain organic material, and could represent a source of ground gas. The proposed development is likely to have limited enclosed spaces that would warrant ground gas protection measures. However, where enclosed spaces are located in the vicinity of Made Ground or Alluvium, ground gas monitoring is recommended to inform the level of mitigation required.
	Leaching and permeation through soil profile.	Groundwater: Underlying Secondary Aquifer	Mi	Ul	VL	No significant source of contamination has been identified at the site that would represent a risk to controlled water receptors. Ground investigation into areas of Made Ground should be undertaken to assess the risk to controlled waters.
	Vertical and lateral migration of contaminants.		Mi	Ul	VL	
	Lateral migration of contaminated groundwater.	On site water courses	Mi	Ul	VL	
	Surface run-off.		Mi	Ul	VL	

Source	Pathway	Receptor	Con	Prob	Risk	Potential Mitigation/Investigation Requirements
	Direct contact.	Water utility pipes	Mi	Ul	VL	No significant source of contamination has been identified at the site that would represent a risk to potable water supply pipes. An investigation and risk assessment should be undertaken to assess the level of protection required to pipework.
		Buried structures/ foundations.	Md	Ul	L	Sulphates and low pH in the ground could accelerate the degradation of buried concrete structures (e.g. foundations). Ground investigation is recommended to inform the concrete design.
Off-site sources as detailed in Table 7:1.	Migration and accumulation of ground gases in enclosed spaces leading to asphyxiation (carbon dioxide) or explosion (methane).	Future site users	Md	Ul	L	No significant source of off site ground gas has been identified, and limited enclosed spaces are anticipated to form part of the proposed development. Where enclosed spaced are located near to off site sources of Made Ground/Alluvium, it is recommended that ground gas monitoring is undertaken.
	Lateral migration of contaminated groundwater.	Groundwater: Underlying Secondary Aquifers	Mi	Ul	VL	No significant off site source of contamination has been identified which could result in a risk to the aquifer quality under the site. Ground investigation is recommended in areas adjacent to possible contamination sources to quantify this.

VH = Very High, H = High, M = Moderate, M/L = Moderate/Low, L = Low, VL = Very Low

KEY: Sv = Severe, Md = Medium, Mi = Mild, Mr = Minor, Hi = High, Li = Likely, Lw = Low Likelihood, Ul = Unlikely

Contaminant Linkage Assessment Summary

When considered in the context of the conceptual site model and the historical activities that have taken place (localised small quarrying activities), the proposed development is considered to pose a LOW risk to human health. It is considered that the main driver for the risk rating for human health is the possibility to encounter hazardous ground gasses generated by potentially organic rich Alluvium or localised Made Ground.

The risk posed to controlled waters is predominantly considered to be VERY LOW due to the absence of a significant contamination source identified on site.

It is recommended that localised ground investigation be undertaken to quantify the identified contaminant linkages and assess likely mitigation measures.

8. CONCLUSION AND RECOMMENDATIONS

Conclusions

8.1 The site largely comprises agricultural land utilised for grazing animals and crops. An exposed rock face was present in the north west of site, potentially associated with historic quarrying. Numerous water courses are present within the site and immediate surrounding area, most of which feed into Llyn Alaw to the south of site.

8.2 The site has remained largely undeveloped over the historical mapping period, predominantly utilised for agricultural purposes, with limited farm buildings present. Numerous small old quarries and ponds have been identified across the site, with some having possibly been infilled. The surrounding land uses are broadly similar, comprising agricultural land with associated farm buildings. A railway line was present along the eastern boundary. Small quarries and ponds are mapped in the surrounding area, with some possibly now infilled.

8.3 Ground conditions are anticipated to comprise Devensian Till and localised Alluvium overlying bedrock of the Ordovician Rocks with localised igneous intrusions. Till is locally absent across the site, with localised areas of rock outcrops present at ground level. Localised Made Ground is expected in the vicinity of infilled ponds and quarries.

8.4 The Till is categorised as an undifferentiated Secondary Aquifer, whilst the Alluvium is categorised as Secondary A Aquifers. All bedrock geologies mapped underlying the site are categorised as Secondary B Aquifers.

8.5 Limited sources of contamination have been identified across the site given the lack of historic development. The risk to human health receptors is considered to be low based on the absence of a significant potential contaminant source. The risk to controlled water receptors is considered to be very low based on the lack of an identified potential contamination source.

8.6 Shallow spread foundations are likely to be viable across the majority of the site, however shallow bedrock may need breaking out to facilitate this locally. Foundations may need locally deepening within areas of Alluvium. Earthworks are likely to be required where steep gradients are present.

Recommendations

8.7 Once the development masterplan is defined, it is recommended that ground investigation is undertaken to quantify the contaminant linkages identified within conceptual site model.

8.8 It is recommended that intrusive ground investigation is undertaken in areas where Alluvium and bedrock outcrops are known/suspected to be present in order to inform foundation design.

9. REFERENCES

1. BS 10175:2011+A2:2017 Investigation of potentially contaminated sites. Code of practice. British Standards Institute, 2017.

2. CIRIA C552 *Contaminated land risk assessment. A guide to good practice*. Rudland, D J, Lancefield, R M, Mayell, P N, 2001.

3. Environmental Protection Act 1990: Part 2A, Contaminated Land Statutory Guidance. Department for Environment Food and Rural Affairs (DEFRA), 2012.

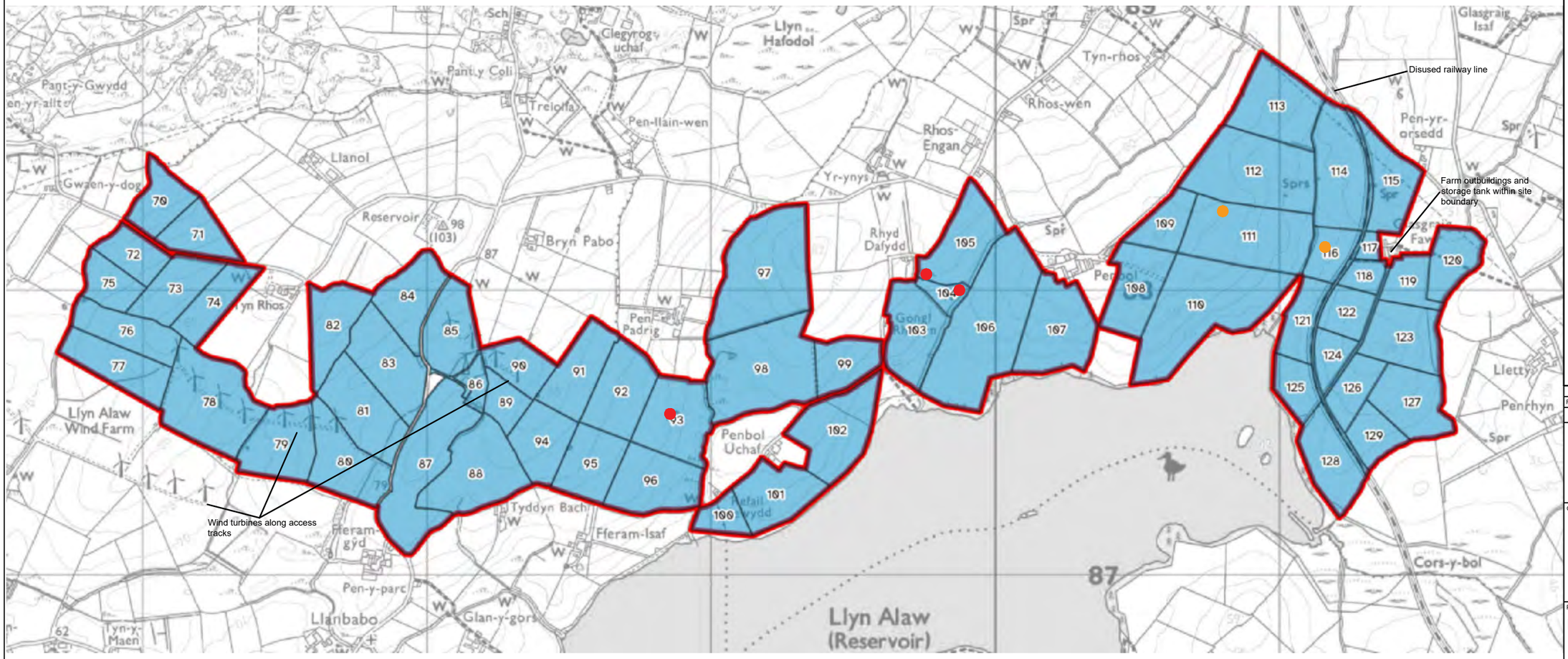
4. Land Contamination Risk Management. Environment Agency, 2020.

5. https://www.gov.uk/government/collections/land-contamination-technical-guidance.

6. The Control of Asbestos Regulations. Health and Safety Executive, 2012.

DRAWINGS

Drawing 1: Site Layout Plan



Notes

1. Do not scale this drawing. All dimensions must be checked/ verified on site. If in doubt ask.
2. This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
3. All dimensions in millimetres unless noted otherwise. All levels in metres unless noted otherwise.
4. Any discrepancies noted on site are to be reported to the engineer immediately.

Key Plan

Legend

- Potentially Infilled Pond
- Former Quarry

Rev	Date	Details of issue / revision	Drw	Rev

Issues & Revisions

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Client

Lightsource BP

Project Title

Prosiect Maen Hir - Central

Drawing Title

Site Layout

Drawn:	CR		Reviewed:	RR	
BWB Ref:	232062	Date:	July 24	Scale@A3:	NTS

Drawing Status

Final

Project - Originator - Zone - Level - Type - Role - Number	Status	Rev
MSF-BWB-ZZ-XX-DR-YE-0001_SL	S2	V1

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APPENDICES

Appendix 1: Site Photographs

Project Number: 232062
Project Name: Prosiect Maen Hir - Llyn Alaw
Site Photographs

Photo 1—Typical field.

Photo 2—Disused rail siding to east of Llyn Alaw.

Project Number: 232062
Project Name: Prosiect Maen Hir - Llyn Alaw
Site Photographs

Photo 3—Typical field with Llyn Alaw in background.

Photo 4—Off site farm building with storage tank to north east of lake.

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Project Name: Prosiect Maen Hir - Llyn Alaw
Site Photographs

Photo 5—Farm buildings adjacent to fields east of Llyn Alaw. Possible asbestos containing materials within building fabric.

Photo 6—Wind Farm within fields to north west of Llyn Alaw.

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Site Photographs

Photo 7—Wind Farm within field to north west of Llyn Alaw.

Photo 8—Stockpile as base of Wind Turbine. Alaw.

Project Number: 232062
Project Name: Prosiect Maen Hir - Llyn Alaw
Site Photographs

Photo 9—Possible remnant of historical quarrying activity north west of Llyn Alaw (Field 96).

Appendix 2: Groundsure Report (Available on Request)

Appendix 3: Historical Mapping (Available on Request)

Appendix 4: Classification of Risk

BWB RISK ASSESSMENT CLASSIFICATION (REFERENCE CIRIA C552, *CONTAMINATED LAND RISK ASSESSMENT: A GUIDE TO GOOD PRACTICE*, 2001)

CIRIA C552, *Contaminated Land Risk Assessment A Guide to Good Practice*, 2001 sets out a methodology for estimating risk. The methodology for risk evaluation is a qualitative method for interpreting the output for the risk estimation stage of the assessment. It involves the classification of the:

- Magnitude of the potential consequence (severity) of risk occurring; and
- Magnitude of the probability (likelihood) of the risk occurring.

The classification of consequence and probability are replicated in **Table 1** and **Table 2**, respectively.

Table 1: Classification of Consequence

Classification	Definition	Examples
Severe (Sv)	Short term (acute) risk to human health likely to result in "significant harm" as defined by the Environment Protection Act 1990, Part IIA. Short term risk of pollution of sensitive water resource. Catastrophic damage to buildings/ property. A short-term risk to a particular ecosystem, or organism forming part of such ecosystem.	High concentrations of cyanide on the surface of an informal recreation area. Major spillage of contaminants from site into controlled water. Explosion, causing building collapse (can also equate to a short-term human health risk if buildings are occupied).
Medium (Md)	Chronic damage to Human Health ("significant harm"). Pollution of sensitive water resources. A significant change in a particular ecosystem, or organism forming part of such ecosystem.	Concentrations of a contaminant from site exceeding the generic or site-specific assessment criteria. Leaching of contaminants from a site to a major or minor aquifer. Death of species within a designated nature reserve.
Mild (Mi)	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services. Damage to sensitive buildings/structures/services or the environment.	Pollution of non-classified groundwater. Damage to building rendering it unsafe to occupy (e.g. foundation damage resulting in instability).
Minor (Mr)	Harm, although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve. Non-permanent health effects to human health (easily prevented by measures such as protective clothing etc.). Easily repairable effects of damage to buildings, structures and services.	The presence of contaminants at such concentration that protective equipment is required during site works. The loss of plants in a landscaping scheme. Discolouration of concrete.

The classification of consequence does not take into account the probability of the consequence being realised. Therefore, there may be more than one consequence for a particular pollutant linkage. Both a severe and medium classification can result in death.

Severe relates to short term (acute) risk while medium relates to long term (chronic) risk. Mild relates to significant harm but to less sensitive receptors. Minor classification relates to harm which is not significant but could have a financial cost.

Table 2: Classification of Probability

Classification	Definition
High likelihood (Hi)	There is a pollutant linkage and an event that either appears very likely in the short term and almost inevitable in the long term, or there is evidence at the receptor of harm or pollution.
Likely (Li)	There is a pollutant linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low likelihood (Lw)	There is a pollutant linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term.
Unlikely (Ul)	There is a pollutant linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

The classification gives a guide as to the severity and consequence of identified risk when compared with other risk presented on the site. It should be noted that if a risk is identified it cannot be classified as "no risk" but as "very low risk". Differing stakeholders may have a different view on the acceptability of a risk.

Once the consequence and probability have been classified these can be compared using a matrix to identify an overall risk category, as shown in **Table 3**. These categories and the actions required are categorised in **Table 4**.

Table 3: Risk Evaluation Matrix

	Consequence	Severe (Sv)	Medium (Md)	Mild (Mi)	Minor (Mr)
Probability	**High likelihood (Hi)**	Very High Risk (VH)	High Risk (H)	Moderate Risk (M)	Mod/Low Risk (M/L)
	Likely (Li)	High Risk (H)	Moderate Risk (M)	Mod/Low Risk (M/L)	Low Risk (L)
	Low likelihood (Lw)	Moderate Risk (M)	Mod/Low Risk (M/L)	Low Risk (L)	Very Low Risk (VL)
	Unlikely (Ul)	Mod/Low Risk (M/L)	Low Risk (L)	Very Low Risk (VL)	Very Low Risk (VL)

Table 4: Risk Categorisations

Very High Risk (VH)	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High Risk (H)	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short-term and are likely over the longer-term.
Moderate Risk (M)	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer-term.
Low Risk (L)	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very Low Risk (VL)	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

Reference:

CIRIA C552 *Contaminated land risk assessment. A guide to good practice*. Rudland, D J, Lancefield, R M, Mayell, P N, 2001.

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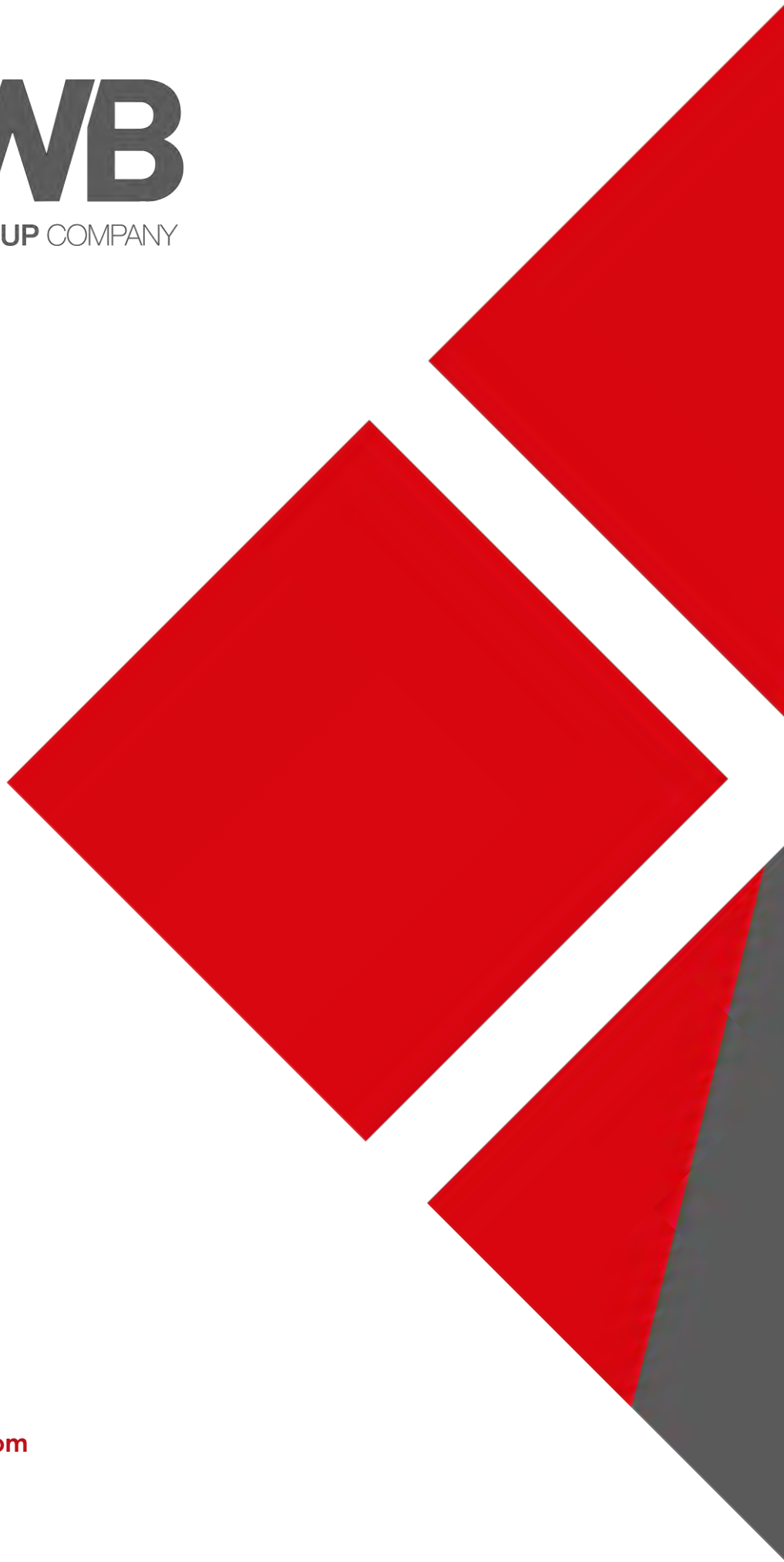

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