Llanmaes Flood Alleviation Scheme

Phase 1 Geo-environmental Desk Study

Vale of Glamorgan Council

Project reference: 60160078-ACM-RP-ENV-001-1
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The methodology adopted and the sources of information used by AECOM in providing its services are outlined in this Report. The work described in this Report was undertaken between **11th March 2021** and **07th April 2021** and is based on the conditions encountered and the information available during the said period of time. The scope of this Report and the services are accordingly factually limited by these circumstances. AECOM disclaim any undertaking or obligation to advise any person of any change in any matter affecting the Report, which may come or be brought to AECOM's attention after the date of the Report.

The site reconnaissance consisted of a general external inspection of the site aimed at identifying any obvious signs of geotechnical hazards and potential sources of ground contamination affecting the site. The site visit excluded detailed consideration of the ecological or archaeological aspects of the site, and if such are believed to be of potential significance then it is recommended that specialist advice is sought.

Any risks identified in this Report are perceived risks, based on the information reviewed during the desk study and therefore partially based on conjecture from available information. The study is limited by the non-intrusive nature of the work and actual risks can only be assessed following a physical investigation of the site.

The opinions expressed in this report and the comments and recommendations given are based on a desk assessment of readily available information and an initial site reconnaissance by an AECOM Engineer. At this stage intrusive investigations have yet to be undertaken at site to establish actual ground and groundwater conditions and to provide data for an assessment of the geo-environmental status of the site.

Unless otherwise stated in this Report, the assessments made assume that the sites and facilities will continue to be used for their current purpose without significant changes.

Reference to historical Ordnance Survey (OS) maps and/or data provides invaluable information regarding the land use history of a site. However, it should be noted that historical evidence will be incomplete for the period pre-dating the first edition and between the release of successive maps and/or data.

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1. Introduction

1.1. Terms of Appointment

On behalf of Vale of Glamorgan Council, AECOM Limited (AECOM) has carried out a Phase 1 Geo-environmental Desk Study of a site to the north of Llanmaes village.

The work has been carried out in accordance with the AECOM fee proposal dated 04/09/2020, reference 60160078-FASF0001. The Client's instruction was confirmed within a design meeting dated 09/01/2020.

1.2. Background and Proposed Development

The report has been produced on the assumption that the Site will be redeveloped with a series of flood alleviation features.

It is understood that the development is likely to require the following stages:

- Excavation of four (4) ditches, with culverts and erosion protection;
- Construction of four (4) flood bunds, and one (1) overspill bund, using material excavated from ditches, constructed with 1:3 slopes with a minimum height of 1.5m;
- Reprofiling of North road and West road.

Detailed plans of the proposed development are included within Appendix A.

1.3. Report Objectives

The primary objective of this report is to:

- Determine whether potentially contaminative uses have taken place within, or in close proximity to, the Site which could have led to the contamination of underlying soils or groundwater to identity whether potential geo-environmental constraints to the proposed development exist.

This Phase 1 report has been prepared to support an outline planning application under the requirements of Town and County Planning Act 1990 (as amended), the Planning Policy Wales (11) (2021) and considers the potential implications of Part 2A of the Environmental Protection Act 1990 and the associated Contaminated Land (Wales) Regulations 2006 and Contaminated Land Statutory Guidance for Wales (2012).

This report has been prepared in general accordance with the technical guidance and procedures described in the UK Government guidance Land Contamination: Risk Management (2020), and BS 10175:2017 (as amended) Investigation of Potentially Contaminated Sites – Code of Practice (BSI), to:

- Describe the geology, hydrogeology and shallow mining potential;
- Describe the environmental setting / sensitivity and current / historical land use of the Site and surrounding area;
- Describe the findings of a site reconnaissance visit;
- Summarise the history of the Site;
- Summarise the underlying geology and hydrogeology;
- Summarise the findings of any historical ground investigation work;
- Provide an initial Conceptual Model (iCM) for the prevailing ground conditions;
- Using the source-pathway-receptor model present a preliminary qualitative risk assessment of potential land contamination risks to human (chronic), environmental, or controlled water receptors from contamination sources on or in the vicinity of the site, via transport pathways;

The report concludes with a series of recommendations for undertaking further investigative work (if required), in order to substantiate the findings of the preliminary risk assessment, thereby refining the Conceptual Model.

1.4. Sources of Information

This report has been prepared using a combination of published records (e.g. British Geological Survey (BGS), Natural Resources Wales, Environment Agency, Defra) and site derived data.

The main source of information includes statutory records and historical mapping supplied within a Groundsure Report, published geological and hydrogeological mapping, historical borehole records, and observations made during the site walkover. The Groundsure Report is included in Appendix B.

Specific information sources are referenced throughout the document and a reference list is included in Section 13 of the report.

2. Site Setting

2.1. Location

The Site is located to the north of Llanmaes village, in the Vale of Glamorgan, South Wales. It is centred on Ordnance Survey (OS) National Grid Reference 297856, 169884. A site location plan is provided as Figure 1.

2.2. Description and Setting

The Site covers an area of approximately 12.45 hectares (ha) and is defined by the red line boundary shown in Figure 2 and in the plans included as Appendix A.

The Site is predominantly agricultural land, with the proposed ditch 1 and ditch 3 located along West Road, in close proximity to residential properties within Llanmaes village.

OS mapping indicates that the south of the Site along West Road is relatively flat, at an approximate elevation of 55m above ordnance datum (m AOD), with ground gradually increasing in elevation to 65m AOD in the north of the Site and the proposed location of Flood Bund 1.

Relevant features immediately surrounding the Site are summarised in Table 2.1.

Given the complex geometry shown in Figure 2, the Site has been split into three sections for description purposes within this report:

- **Section A:** Land to the west of North Road and north of West Road, which will comprise the development of the proposed Ditch 1 and Overspill Bund 1. It is currently open agricultural land.
- **Section B:** Land to the east of North Road and north of West Road, which will comprise development of Flood Bunds 1, 2, and 3, and proposed Ditch 2. It is currently open agricultural land.
- **Section C:** Land adjacent and parallel to West Road, which will comprise development of the proposed Village Green Ditch 1, proposed Ditch 3, and Flood Bund 4. The village green ditch planned to be excavated within the current village green, with the areas of proposed ditch 3 and flood bund 1 currently open agricultural land.

Figure 2.1 below shows the layout of Sections A, B and C, used for description purposes throughout the report.

Figure 2.1. Site Layout Showing Site Sections for Report Description Purposes

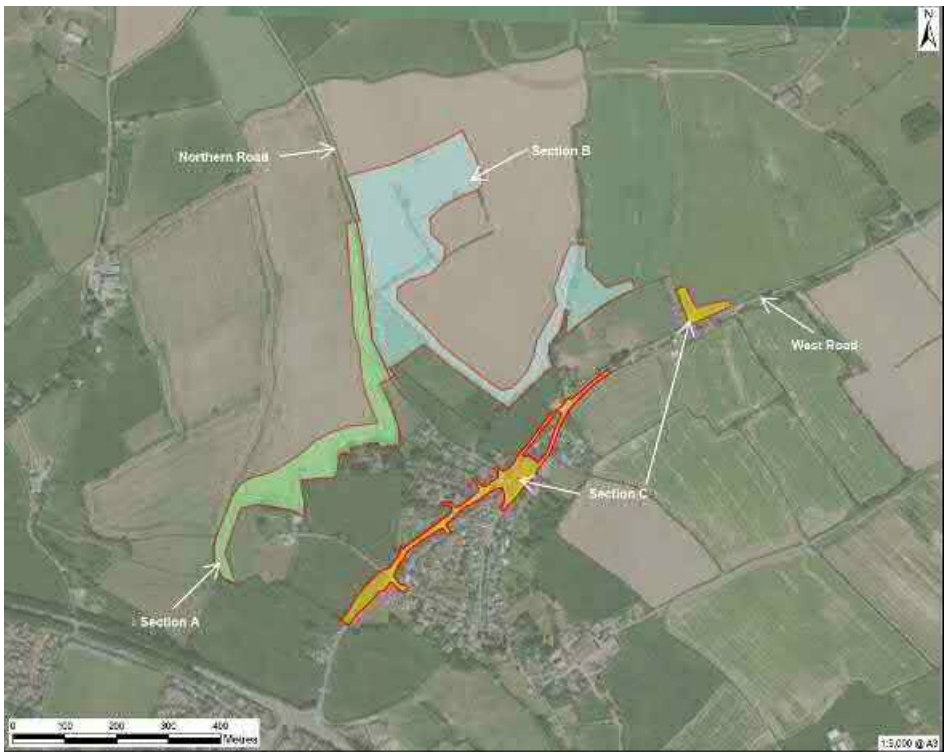

Table 2.1 Features Surrounding the Site (Section A)

Direction	Summary
North	Agricultural fields.
South	Agricultural fields, with Llanmaes Village to the south and southeast.
East	Northern Road is to the east of Section A with agricultural fields beyond, and the area of the proposed flood alleviation features of Section B.
West	Agricultural fields.

Table 2.2 Features Surrounding the Site (Section B)

Direction	Summary
North	Agricultural fields.
South	Llanmaes Village to the south and southwest.
East	Agricultural fields.
West	Northern Road is to the west of Section B, with agricultural fields beyond, and the area of the proposed flood alleviation features of Section A.

Table 2.3 Features Surrounding the Site (Section C)

Direction	Summary
North	Residential and commercial properties within Llanmaes Village and agricultural fields beyond, and the area of the proposed flood alleviation features of Section A and B.
South	Agricultural fields and Llanmaes Village.
East	Agricultural fields.
West	Agricultural fields, with Llanmaes Brook to the south and west of Proposed Ditch 3, located in the west of Section C.

3. Geological and Environmental Setting

3.1. Introduction

The environmental setting including the topography, geology, hydrogeology and hydrology are the key factors that influence the way in which contaminants in the soil or groundwater can be transported on or off-site, and also the way in which contamination can affect applicable receptors including controlled waters and users of the Site.

The environmental setting of the Site has been assessed by making reference to the information sources details in Section 1.4.

3.2. Geology and Soils

3.2.1 Published Geology and Exploratory Hole Records

AECOM has reviewed publicly available information. The published 1:50,000 scale geological map of the area produced by the BGS (Sheet 262, Bridgend, 1990) indicates that the Site is underlain by the geological succession summarised in Table 3.1. Extracts of the superficial deposit and bedrock maps are included in the Groundsure Report (Appendix B).

Table 3.1 Geological Succession from Published Mapping

Age	Parent Unit	Geological Stratum	Stratum	Description	Anticipated Thickness (m)
Quaternary	Mass movement deposits	Head Deposits*	Superficial	Clay, silt, sand and gravel	Unknown
Hettangian – Sinemurian (Jurassic)	Blue Lias Formation	Porthkerry Member	Bedrock	Interbedded Limestone and Mudstone	>120m

**Head deposits appear to be constrained to the approximate location of Llanmaes Brook, adjacent to the southwest of Sections A and C.*

The BGS maintains an archive of historical exploratory holes throughout the UK. AECOM has searched the database, with the nearest known borehole approximately 700m south of the Site. This has been deemed too far from the Site to provide representative ground conditions, and therefore has not been included as part of this report.

3.2.2 Soils and Soil Chemistry

Information obtained from Soilscapes describes the soils within the vicinity of the Site (Soilscape 7) as slightly acidic but base-rich soils with a loamy texture, typically freely draining to groundwater.

The Groundsure report suggests the Agricultural Land Use Classification to be primarily Grade 2 (good quality agricultural land) and Grade 3b (moderate quality) in Section A and B of the Site respectively. The land towards the residential developments of Llanmaes Village (Section C) is primarily classified as urban, with relatively little potential for return to agricultural use. Soil in the southeast of Section A and C is deemed to be Grade 5 (very poor quality).

The BGS Soil Chemistry datasets provide indicative information on regional concentrations of five potentially harmful elements (PHEs): arsenic (As), cadmium (Cd), chromium (Cr), nickel (Ni) and lead (Pb) in soil, as presented within the Groundsure Report.

Elevated concentrations of these PHEs can exist because of natural geological conditions or possible anthropogenic contamination. The following BGS estimated soil chemistry levels are attributed to the vicinity of the site based on the geometric mean concentrations of available data (presented in Table 3.2).

Table 3.2 Estimated Soil Chemistry

Potentially Harmful Element (PHE)	Estimated geometric mean concentration (mg/kg)
Arsenic	15
Cadmium	1.8
Chromium	20 – 60
Lead	100
Nickel	15 - 30

3.2.3 Ground Stability Records

Table 3.3 shows the variable risk of ground stability hazards across the Site, taken from the Groundsure GeoInsight Report:

Table 3.3 Ground Stability Records

Hazards Type	Hazard Potential
Collapsible Ground Stability	Very low
Compressible Ground Stability	Negligible
Ground Dissolution Stability	Very low to low. Low hazard areas are constrained to the southwest of Section A and C, in areas with underlying superficial head deposits.
Landslide Ground Stability	Very low to low. The low hazard area is constrained to the southwest of Section A, southwest of proposed ditch 1.
Running Sand Ground Stability	Negligible to very low. Very low hazard areas are constrained to the southwest of Section A and C, in areas with underlying superficial head deposits
Shrinking or Swelling Clay Ground Stability	Negligible to very low. Very low hazard areas are constrained to the southwest of Section A and C, in areas with underlying superficial head deposits

3.2.4 Aggregate/Mineral Quarrying and Mining

The Groundsure report suggests that there are no known past and present mining operations which have taken place within 250m of the Site. Four surface ground workings (ponds) were identified on-site. Two were located to the north within Section B, within close proximity to flood bund 1, and the other two in the north of Llanmaes village, within Section C, close to proposed village green ditch. These surface features are potentially leading to an increased incidence of flooding in the area.

3.2.5 Coal Mining

The Groundsure report states that there are no known areas on-site which could be affected by past, current or future coal mining.

3.2.6 Radon

The Groundsure report states that between 1% and 3% of dwellings exceed the Radon Action Level, with no Radon Protection Measures required. As the flood alleviation scheme does not include any enclosed spaces this is not considered relevant but is included here for completeness of assessment.

3.3. Hydrogeology

3.3.1 Aquifer Classification

The Environment Agency's Groundwater Protection Policy adopts aquifer designations that are consistent with the Water Framework Directive, and has been adopted by Natural Resources Wales. Definitions of the various aquifer types can be found on the Environment Agency section of the gov.uk website. According to this system, the

superficial head deposits located in the southwest of the Site is classified as a Secondary Undifferentiated aquifer. The underlying Porthkerry Member bedrock is classified as a Secondary A aquifer.

3.3.2 Groundwater Vulnerability

The Groundwater Vulnerability Map of the area presented within the Groundsure report shows that the Secondary Undifferentiated aquifer (superficial deposits) have a high vulnerability to pollution. The bedrock is classified as a Secondary A aquifer, suggested to have a high vulnerability to pollution. All associated terminology / definitions can be found within the Groundsure report.

3.3.3 Source Protection Zones

In terms of identifying the risk of contamination from potential polluting activities in a given area to groundwater sources (wells, boreholes and springs) used for supplying public drinking water, the Environment Agency identifies Source Protection Zones (SPZ). These show the extent of a groundwater source catchment and are divided into three zones, can be found on the Environment Agency section of the gov.uk website. These designations have been adopted by Natural Resources Wales.

According to the Groundsure report, the Site does not lie within an SPZ, with no records listed within 500m of the Site.

3.3.4 Licensed Groundwater Abstractions

No Licensed Groundwater Abstractions have been identified within 1km of the Site in the Groundsure report. It is noted that additional abstraction license information has been requested from VoGC but has not been received to date.

3.3.5 Risk of Flooding from Groundwater

The Groundsure report suggests that there is a negligible to low risk of groundwater flooding occurring at the Site.

3.4. Hydrology

3.4.1 Surface Water Courses and Drainage

The nearest Water Framework Directive-relevant surface watercourse/feature to the Site is Llanmaes Brook, located along the southwest boundary of Section A and C of the Site, flowing in a south-easterly direction.

In addition, the hydrology map contained within the Groundsure report shows a surface water feature narrower than 5m flowing in a south-westerly direction through Llanmaes Village, on-site at the proposed village green ditch 1. This watercourse flows into Llanmaes Brook approximately 150m southeast of proposed ditch 3 within Section C of the Site. This is a tributary of Llanmaes Brook and provides the primary conveyance route for the residential area and surrounding agricultural land. The site walkover confirmed the presence of this feature, with sections of the watercourse culverted beneath the surface. Further details gathered during this site walkover are included within Section 4.

3.4.2 Licensed Surface Water Abstractions

No licensed surface water abstractions have been identified within 1km of the Site. It is noted that additional abstraction license information has been requested from VoGC but has not been received to date.

3.4.3 Risk of Flooding from Rivers

The Risk of Flooding from Rivers and Sea (RoFRaS) map contained within the Groundsure report suggests a low to high flood risk associated with the Llanmaes Brook. The immediate area surrounding the Llanmaes Brook is within a Flood Zone 2 and 3. However, within the Site boundary it appears that the Site will only be susceptible to flooding from surface water in the southwest of Section C at the location of the proposed ditch 3, where the risk is deemed to be medium / low.

3.4.4 Risk of Flooding from Surface Water

The Site is at high risk of surface water flooding as a result of extreme rainfall events due to the land being naturally vulnerable to surface water ponding or flooding. Key areas within the Site include Llanmaes village in Section C, the southern tips of Section A and Section C (associated with the Llanmaes Brook) and parts of the northern and north-eastern areas of Section B.

Based on the Flood Consequence Assessment undertaken for the Site (AECOM, 2019), Llanmaes village is known to have a history of flood events caused by surface water runoff from the surrounding fields. It is understood, once surface runoff reaches Llanmaes village, the unnamed watercourse does not have the capacity to convey the water away resulting in flooding to highways and properties.

4. Site Reconnaissance

An external inspection of the Site was completed by two suitably qualified and experienced AECOM Engineers on 19th March 2021. The aim of the visit was to identify the range of activities carried out on the Site and any obvious potential sources of ground contamination.

Figure 3 is a map showing the location and direction of principle observations made during the visit, of which a summary is presented below. A photographic record of the visit is included as Appendix C.

The land proposed for the various flood alleviation features to the north of Llanmaes Village (Sections A and B) appears to be open and undeveloped agricultural fields, with access being granted by landowners for the purposes of the walkover survey. Evidence of potential flooding was visible within Section C, with water pooling in the corner of the field of the proposed flood bund 4 (photograph 016), adjacent to West Road. Flood defences were also visible at residential properties within Llanmaes Village (photograph 019).

Llanmaes Brook was visible to the west of the Site, flowing in a south-easterly direction, with small streams flowing through Llanmaes Village towards Llanmaes Brook. The small streams appeared to flow both above and below ground, with a small culverted section visible at the village green.

The only potential evidence of contamination encountered was small scale burning within a farmer's field, approximately 50m south of the proposed ditch 1 location, just outside of the redline boundary. Given the extent of limited burning, , this location is not considered to pose a contamination risk to the Site.

5. Historical and Planned Development

5.1. Historical Ordnance Survey Mapping and Aerial Photographs

Historical Ordnance Survey (OS) maps of the Site and the wider environs were provided in the Groundsure report (scales 1:2,500, 1:10,560, 1:10,000), reviewed below. Copies of these maps are presented within Appendix B.

The historical OS maps date between 1877 and 2021.

Table 5.1 presents a summary of the main features present on and within approximately 250m radius of the Site boundary. AECOM notes that only indicative map scales are provided. Where dates are stated, these refer to the dates of maps on which the features are present, have changed use or are no longer annotated, and do not necessarily refer to the exact dates of existence of a particular feature. Development that may have occurred between map editions is recorded as occurring on the latter published map, hence there are some limitations to the accuracy of the date of development unless supplementary evidence is available.

Table 5.1 Summary of Historical Mapping

Year (Scale)	Key Features on-site	Key Features off-site
1879 – 1880 (1:2,500) 1877 – 1878 (1:10,560)	The Site appears to be primarily open agricultural fields. Several buildings located on Section C of the site, at the location of the proposed village green ditch 1.	Blacksmith 'Smithy' located adjacent on the eastern boundary of Section C Gadlas Farm (renamed later as Gadlys Farm) approximately. 20m south of Section C. A well located adjacent to the Site, within 50 m northwest of the Smithy. Residential properties to the south and southeast of Section C associated with Llanmaes Village. Rectory adjacent east of Section A with a well located within its grounds.
1914 (1:10,560)	No significant changes in layout noted.	Water Works (Frampton Well) located approximately 150m northwest of Section A. Well no longer shown.
1964 (1:10,560)	No significant changes in layout noted.	Water Works no longer visible.
1970 (1:2,500) 1972 – 1974 (1:10,000)	No significant changes in layout noted	Brook Farm and associated building present adjacent (east) of Section C, to the north (80 m) of the smithy. Concrete Block Works approximately 220m east of Section C within Llanmaes Village. Electricity substation approximately 145m southeast of Section C.
1982 (1:10,000) 1978 – 1979 (1:2,500)	No significant changes in layout noted.	Increased residential development within Llanmaes Village. Concrete Block Works no longer shown.
1983 (1:2,500)	No significant changes in layout noted.	The Well within the Rectory Grounds is no longer shown.
2003 (1:1,250)	No significant changes in layout noted.	Smithy works still present adjacent to Section C.

No significant changes to the Site or surrounding and land use was noted on the 2003 to 2021 map extracts.

5.2. Unexploded Ordnance Risk

A Preliminary Unexploded Ordnance (UXO) Threat Assessment was undertaken for the Site by 6 Alpha Associates, satisfying the requirements CIRIA C681. A full copy of this report is included within Appendix D.

The report stated that the Site is situated within an area with less than 15 bombs per 100 hectares, with Cowbridge Rural District recording two High Explosive (HE) bomb strikes per 100 hectares. However, further research of high-level written historical records undertaken by 6Alpha Associates suggested that Llanmaes Village was subjected to bomb-strikes, and it was noted to be likely that some bomb strikes impacted on or in close proximity to the Site.

Given these details, the potential for a UXO hazard to occur at the Site was assessed as being likely. 6 Alpha Associates recommended that a Detailed UXO Threat and Risk Assessment should be undertaken as the next stage of the CIRIA C681 risk management framework.

6. Review of Previous Ground Investigations

A ground investigation was undertaken between 8th and 10th September 2020, aiming to facilitate the design of the proposed flood bunds and ditches within the Site, outlined within the Llanmaes Village Flood Bund Technical Note (AECOM, 2020).

The investigation comprised a total of 24 trial pits, excavated within the areas of proposed ditch 1, proposed ditch 3, and overspill bund 1, to a maximum depth of 1.85m bgl.

A map of the exploratory hole locations and trial pit logs are included within Appendix E.

Table 6.1 provides a summary of the encountered ground conditions:

Table 6.1 Ground Summary

Strata	Description	Depth from (m)	Depth to (m)
Topsoil	Dark brown clayey topsoil	0	0.25
Weathered Blue Lias (Subsoil)	Brown slightly gravelly slightly sandy clay	0.15	1.55
Porthkerry Member (Blue Lias)	Limestone with clay	0.55	1.85

Groundwater was not encountered during excavations.

No geochemical testing or assessment was undertaken as part of this investigation.

7. Regulated Activities and Statutory Consultation

7.1. Introduction

The key relevant features that characterise the Site and surrounding area are summarised in this section, along with an indication of the risk to the land quality of the Site.

Information on groundwater and surface water abstractions is detailed in Section 3.3.4 and 3.4.2 and is not duplicated here.

Generally, any regulated activities could, depending upon their nature, represent potential off-site sources of contamination. Whilst a 1km search area was generally adopted, this section places emphasis on those activities present within 250m.

7.2. Regulated Processes

Table 7.1 summarises information on regulated processes contained in the Groundsure report (Appendix B). The report collates data from a variety of sources including the Environment Agency and the BGS. All data suppliers are referenced in the Groundsure report.

Table 7.1 Summary of Regulatory Information

Subject	Number present				Details
	On site	0 – 250m	250 – 500m	500 – 1000m	
Agency & Hydrological					
Pollution Incidents	1	1	2	-	Two pollution incidents listed within 250m of the Site; - One listed as being on-site (Section C, near the proposed village green ditch 1), occurring on 01/06/2005, pollutant listed as agricultural materials and wastes, described as slurry and dilute slurry. Water Impact: Category 2 (Significant) Land Impact: Category 3 (Minor) Air Impact: Category 4 (No Impact) - 247m southeast (Section C), occurring on 18/12/2013. No further details provided.
Hazardous Substances					
N/A					

Source: Groundsure Report

No other regulated processes (either Environment Agency permitted / regulated activities, hydrological activities , or Hazardous Substances) were identified within 1km of the Site.

7.3. Licensed Waste Management Facilities

An attempt has been made to identify any landfilling operations, past and present that have taken place in the vicinity of the Site.

There are no recorded licensed waste management facilities (including historic landfills) within 250m of the Site.

7.4. Industrial Land Use

According to the Groundsure report, there are no current potentially contaminative industrial sites, current or recent petrol stations, electricity cables or gas pipelines within 250m of the Site.

7.5. Sensitive Land Uses

The Groundsure report identifies adjacent sensitive land use based upon factors such as Sites of Special Interest (SSSI), Environmentally Sensitive Areas, Areas of Outstanding Natural Beauty, World Heritage sites, Nature Reserves, National Parks, Nitrate Sensitivity Areas / Vulnerability Zones, and Special Protection Areas.

The report suggests that the south of the Site within Section C is located within a conservation area, specifically within the area of the proposed village green ditch 1. No other sensitive land uses were listed within the Groundsure report.

8. Preliminary Ground Model

Based on the review of published geological information and the previous ground investigation outlined in Section 5, the ground conditions within the Site are considered to comprise the following sequence presented in Table 8.1.

Table 8.1 Preliminary Ground Model

Stratum	Typical Description	Anticipated Thickness (m)
Topsoil	Dark brown clayey topsoil	0.25
Head Deposits	Clay, silt, sand and gravel (far southwest of the Site, in the area of Llanmaes Brook)	Unproven
Weathered Blue Lias (Subsoil)	Brown slightly gravelly slightly sandy clay	1.40
Porthkerry Member (Blue Lias)	Limestone with clay	Unproven

The depth to groundwater is uncertain, as it was not proven during the previous ground investigation. In the areas adjacent to Llanmaes Brook, it can be inferred that groundwater level is likely to be in continuity with the surface water level of the Llanmaes Brook.

9. Initial Conceptual Model

9.1. Introduction

This section is aimed at identifying the possible risks, if any, arising from substances used or deposited on-site, or from other sources of land contamination. Both past and current potentially contaminative land uses have been considered. It is based on the proposed site redevelopment which will comprise the creation of flood bunds and ditches for the purpose of flood alleviation, as identified in Section 1.2 and within Appendix A .

9.2. Assessment Framework

The Site, in terms of potential land contamination, will be regulated by the Local Authority (Vale of Glamorgan Council) under the Town and Country Planning Act 1990 (as amended), taking account of the Planning Policy Wales (11) 2021, Planning (Wales) Act 2015, and Well-being of Future Generations (Wales) Act 2015, with Natural Resources Wales acting as a potential statutory consultee.

Environmental liabilities can arise through provisions contained within statutory legislation including Part 2A of the EPA 1990, the Environmental Damage (Prevention and Remediation) Regulations 2009, the Water Resources Act 1991, the Groundwater Regulations 2009 and the Water Act 2003.

Current best practice recommends that the determination of health hazards due to contaminated land is based on the principle of risk assessment, as outlined in the Statutory Guidance to Part 2A (2012) and Land Contamination: Risk Management (LCRM).

The “suitable for use” approach is adopted for the assessment of contaminated land where remedial measures are undertaken where unacceptable risks to human health or the environment are realised taking into account the use (or proposed use) of the land in question and the environmental setting. The proposed end-use for the Site is a series of ditches and bunds for flood alleviation.

The risk assessment process for environmental contaminants is based on a source-pathway-receptor analysis. These terms can be defined as follows:

- **Source:** hazardous substance that has the potential to cause adverse impacts; and
- **Pathway:** route whereby a hazardous substance may come into contact with the receptor: examples include ingestion of contaminated soil and leaching of contaminants from soil into watercourses; and
- **Receptor:** target that may be affected by contamination: examples include human occupants/ users of site, water resources (surface waters or groundwater), or structures.

For a risk to be present, there must be a relevant/ viable contaminant linkage; i.e. a mechanism whereby a source impacts on a sensitive receptor via a pathway.

The following sections details the initial Conceptual Model (iCM) which has been developed for the Site with a view to assessing the potential risks/ liabilities and constraints associated with the Site in its current condition prior to any proposed redevelopment. Risks associated with the proposed redevelopment have also been assessed based on a flood alleviation future land use scenario, including any potential sources of contamination, potential receptors and potential contaminant pathways identified during this desk-based assessment. There is assumed to be no buildings and/or infrastructure proposed at the Site and future users will be infrequent and transient users associated with the adjacent roads and pathways.

9.3. Sources of Potential Contamination

9.3.1 On-site

On the basis of the information collected as part of this desk study, a conceptual understanding of the Site has been derived at this stage. It is assumed that the following sources of contaminants of potential concern (CoPC) may be present at the Site:

- Hydrocarbon-based fuel potentially released to the ground following small scale spillages from agricultural machinery and equipment.

- Pesticides and/or herbicides used on agricultural land.

9.3.2 Off-site

The review of archived historical mapping summarised within Table 4.1 identified an electricity sub-station and a former concrete works approximately 145m and 220m southeast of the Site (Section C) respectively. These features are both down assumed hydraulic gradient from the Site. Therefore, they have been discounted as potential sources of contamination which may impact the Site.

The following is considered a potentially relevant an off-site source:

- Former Blacksmith located adjacent to the eastern boundary of the proposed village green ditch 1, potential, primarily for heavy metal contamination within soils. Other contaminants could include oils, hydrocarbons.

9.3.3 Summary of potential sources

Table 9.1 provides a summary of the potential contaminants that may be associated with the current land use.

Table 9.1 Potential Sources of Contamination

Source Reference	Location	Potential Sources	Associated Contaminants of Potential Concern (CoPC)
S1	On site	Fuel spillages from agricultural machinery	Hydrocarbons
S2	On site	Agricultural processes (use of pesticides / herbicides)	Organochlorine, organophosphate, carbamates
S3	Off-site	Former Blacksmith (1879 – 2003)	Heavy metals (hydrocarbons).

Ground gas is not anticipated to be generated at the Site. There is anticipated to be minimal Made Ground and the natural soil stratum is not anticipated to contain organic degradable material (such as peat deposits). Therefore, there is not considered to be a viable source of ground gas to include this as a potential source.

9.4. Potential Receptors

9.4.1 On-site Receptors

In terms of human health, potential on-site receptors include future site visitors and construction workers associated with the proposed development. Controlled waters receptors include the underlying superficial Secondary Undifferentiated aquifer / Secondary A bedrock aquifer. Future users a likely to be infrequent pedestrians using adjacent pathways and roadways.

9.4.2 Off-site Receptors

Plausible off-site receptors include adjacent site users and the adjacent Llanmaes Brook which is designated under the Water Framework Directive.

9.4.3 Summary of Potential Receptors

Potential receptors associated with the development are shown in Table 9.2.

Table 9.2 Potential Receptors

Receptor Reference	Receptor	Description
R1	Human Health: Acute	Construction and maintenance workers
R2	Human Health: Acute	Adjacent site users during development
R3	Human Health: Chronic	Future site users
R4	Water Environment: Superficial aquifer	Secondary Undifferentiated aquifer within Head Deposits

Receptor Reference	Receptor	Description
R5	Water Environment: Bedrock aquifer	Secondary A aquifer within Porthkerry Member (Blue Lias Formation)
R6	Water Environment: Off-site surface waters	Llanmaes Brook

There are no buildings or related Infrastructure present or proposed to be constructed at the Site. The Site also does not lie within a SSSI.

Ecological constraints do not form part of this assessment. A separate Preliminary Ecological Risk Assessment has been undertaken by AECOM (March 2021). It was noted that the Site has potential to support reptiles, great crested newts, breeding birds, dormouse, commuting and foraging bats, roosting bats, commuting and foraging otters and commuting and foraging badgers. Invasive Non-Native Species (INNS) Japanese knotweed Reynoutria japonica and montbretia Crocosmia x crocosmiiflora are present but isolated to two locations. Only one location is noted within the Site boundary, within Section A.

Further information on the ecological constraints and mitigation measures proposed associated with the proposed works (including construction constraints) are contained within the AECOM Preliminary Ecological Risk Assessment report.

9.5. Potential Pathways

Potential pathways associated with the proposed development are shown in Table 9.3.

Table 9.3 Potential Pathways

Pathway Reference	Receptor	Description
P1	Human Health	Direct contact, dermal absorption or ingestion of soil.
P2	Human Health	Inhalation of soil particulates derived from sites soils
P3	Water Environment: Surface water	Direct Pathway: Spillage / loss and direct run-off from site to receiving waters (Llanmaes Brook)
P4	Water Environment: Groundwater	Indirect Pathway: Leaching of contaminants and vertical migration via permeable unsaturated strata to shallow groundwater
P5	Water Environment: Surface water	Indirect Pathway: Lateral migration of impacted shallow groundwater / surface water to surface water receptor (Llanmaes Brook)
P6	Water Environment: Groundwater	Indirect Pathway: Vertical migration of shallow impacted groundwater to deeper groundwater

10. Environmental Risk Assessment

10.1. Risk Assessment Principles

Current best practice recommends that the determination of hazards due to contaminated land is based on the principle of risk assessment, as outlined in the Environment Agency guidance on Land Contamination: Risk Management (LCRM). LCRM was formally adopted by Natural Resources Wales in March 2021.

For a risk to be present, there must be a viable contaminant linkage; i.e. a mechanism whereby a source impacts on a sensitive receptor via a pathway.

Assessments of risks associated with each of these contaminant linkages are discussed in the following sections.

Using criteria broadly based on those presented in the National House Building Council/Environment Agency/Chartered Institute of Environmental Health publication R&D 66 (NHBC/EA/CIEH, 2008), the magnitude of the risk associated with potential contamination at the Site has been assessed. To do this an estimate is made of:

- The magnitude of the potential consequence (i.e. severity);
- The magnitude of probability (i.e. likelihood).

The severity of the risk is classified according to the criteria in Table 10.1.

10.2. Risk Assessment Framework

Table 10.1 Description of Severity of Risk

Term	*Description*
Severe	– Highly elevated concentrations likely to result in significant harm to human health. – Catastrophic damage to crops, buildings or property (e.g. by explosion). – Equivalent to EA Category 1 pollution incident including persistent and/or extensive effects of water quality. – Major damage to aquatic or other ecosystems.
Medium	– Elevated concentrations which could result in significant harm to human health. – Significant damage to crops, buildings or property (e.g. damage to building rendering it unsafe). – Equivalent to EA Category 2 pollution incident including significant effect on water quality. – Significant damage to aquatic or other ecosystems.
Mild	– Exposure to human health unlikely to lead to significant harm. – Minor damage to crops, buildings or property (e.g. surface spalling to concrete). – Equivalent to EA Category 3 pollution incident including minimal or short-lived effect on water quality. – Minor or short-lived damage to aquatic or other ecosystems.
Minor	– No measurable effect on humans. – Repairable effects of damage to buildings, structures and services. – Equivalent to insubstantial pollution incident with no observed effect on water quality of ecosystems.

The probability of the risk occurring is classified according to the criteria in Table 10.2

Table 10.2 Likelihood of Risk Occurrence

Likelihood	*Explanation*
High	Contaminant linkage may be present that appears very likely in the short-term and risk is almost certain to occur in the long term, or there is evidence of harm to the receptor.
Likely	Contaminant linkage may be present, and it is probable that the risk will occur over the long term.
Low	Contaminant linkage may be present and there is a possibility of the risk occurring, although there is no certainty that it will do so.
Unlikely	Contaminant linkage may be present but the circumstances under which harm would occur even in the long-term are improbable.

An evaluation of the level of risk is gained from a comparison of the severity and probability, as shown in Table 10.3.

Table 10.3 Risk based on Comparison of Likelihood and Severity

		Severity			
		SEVERE	**MEDIUM**	**MILD**	**MINOR**
Likelihood	**HIGH**	Very High	High	Moderate	Low
	LIKELY	High	Moderate	Moderate/Low	Low
	LOW	Moderate	Moderate/Low	Low	Very Low
	UNLIKELY	Moderate/Low	Low	Very Low	Very Low

10.3. LCRM Assessment of Risk

In 2019, the UK government issued new guidance on the evaluation and management of contaminated land, LCRM. Current contaminated land guidance in LCRM (Environment Agency, 2020) categorises risk at Stage 1 Tier 1 (i.e. PRA) as follows:

- Acceptable;
- Unacceptable.

However, no framework for assessing the risk has been published to accompany the guidance, so the CIEH & NHBC R&D 66 assessment framework constitutes best practice in this regard. To align the risk rankings in Section 10.2 with the LCRM rankings and with the Part 2A definitions, the following matrix has been utilised. This conversion is demonstrated in Table 10.4 below:

Table 10.4 Conversion to LCRM Risk Categories

	Acceptable	Unacceptable
Very Low		
Low		
Moderate/Low		
Moderate*		
High		
Very High		

* *This risk category spans both acceptable and unacceptable. This is intentional as it is this risk band that tends to have the greatest level of uncertainty associated with it. Acceptability will dependent on site-specific circumstances and level of confidence in the available evidence*
For a risk to be unacceptable, the contaminant linkage should be associated with at least a "medium" severity as defined in Table A4.3 in Annex 4 of R&D66 and the probability should (in the majority of cases) be at least "likely" as defined in Table A4.4 of R&D66

These risk categories represent the level of risk as it is currently understood from the information available at this time.

10.4. Preliminary Risk Assessment

An iCM illustrating plausible contaminant linkages has been formulated for this site. The qualitative preliminary risk assessment of the possible linkages of the above sources (S1 to S3), transport pathways (P1 to P6) and receptors (R1 to R6) is provided in the Table 10.5.

The level of risk is determined based on the current condition of the Site (i.e. the effects of mitigation measures are not included).

The preliminary risk assessment assumes that there will be some associated maintenance works and or construction/earthworks required as part of the proposed construction and maintenance of the flood alleviation scheme.

Table 10.5 Potential Sources, Pathways and Receptors

Source	Pathway	Receptor	Potential Severity	Likelihood of Occurrence	Potential Risk (R&D 66)	Potential Risk LCRM	Linkage Reference	Justification
COPC related to past and present land uses on-site / off-site (S1-S3)	P1: Direct contact, dermal absorption or ingestion of site soil	R1: Construction and maintenance workers	Mild	Likely	Moderate / Low	Acceptable	S1/2/3 – P1 – R1	Localised potential sources of contamination could be present on-site; however widespread contamination is deemed unlikely. Risks can be managed through the use of PPE and appropriate risk assessment which will reduce the potential risk to **LOW**. Construction workers may come into contact with soil during the excavation of the ditch areas / regrading of roadways.
		R3: Future site users	Mild	Unlikely	Very low	Acceptable	S1/2/3 – P1 – R3	Localised potential sources of contamination could be present on-site; however widespread contamination is deemed unlikely. Unlikely to pose an unacceptable risk. Exposure will be limited / negligible due to transient use of the site by pedestrians.
	P2: Inhalation of soil particles derived from site soils	R1: Construction and maintenance workers	Mild	Likely	Moderate / Low	Acceptable	S1/2/3 – P2 – R1	Localised potential sources of contamination could be present on-site, with the potential for dust generation during construction. Risks can be managed through the use of PPE and appropriate risk assessment which will reduce the potential risk to **LOW**. Construction workers may come into contact with soil during the excavation of the ditch areas / regrading of roadways.
		R2: Adjacent site users	Mild	Unlikely	Very low	Acceptable	S1/2/3 – P2 – R2	Localised potential sources of contamination could be present on-site, with the potential for dust generation to impact adjacent site users during construction works. However, it is unlikely to pose an unacceptable risk.
	P3: Spillage / loss and direct run-off from site to receiving waters	R6: Llanmaes Brook	Mild	Low	Low	Acceptable	S1/2/3 – P3 – R6	Localised potential sources of contamination could be present on-site, potential for run-off into surface waters off site. This could also include run off in to streams and proposed ditches which could act as preferential pathway for migration of contaminants into the Llanmaes Brook.
	P4: Leaching of contaminants and vertical migration via permeable	R4: Secondary Undifferentiated aquifer (superficials)	Mild	Low	Low	Acceptable	S1/2/3 – P4 – R4	Localised potential sources of contamination could be present on-site, with the potential for leaching into permeable Head Deposits (Secondary Undifferentiated aquifer) underlying the southwest of the Site. The classification of this aquifer suggests

Source	Pathway	Receptor	Potential Severity	Likelihood of Occurrence	Potential Risk (R&D 66)	Potential Risk LCRM	Linkage Reference	Justification
	strata to shallow groundwater							there is unlikely to be an unacceptable risk. The Site is not within an SPZ and there are no abstractions (potable or otherwise) within the 1 km of the Site.
	P5: Lateral migration of impacted shallow groundwater / surface water to surface water receptors	R6: Llanmaes Brook	Mild	Low	Low	Acceptable	S1/2/3 – P5 – R6	Localised potential sources of contamination could be present on-site, with the potential for leaching into permeable Head Deposits (Secondary Undifferentiated aquifer) underlying the southwest of the Site. This aquifer may form the base flow for Llanmaes Brook. Therefore, there is the potential for lateral migration of potential contaminants (in particular the land around ditch 3) into this surface water course. The proposed ditches could act as preferential pathway for migration of contaminants into the Llanmaes Brook if these are proposed to flow into the Llanmaes Brook.
	P6: Vertical migration	R5: Secondary A aquifer (bedrock)	Mild	Low	Low	Acceptable	S1/2/3 – P6 – R5	Localised potential sources of contamination could be present on-site. However, the concentrations are unlikely to be such that a significant impact to groundwater would occur.

10.5. Discussion of Acute Risk to Future Construction Workers and Off-Site Receptors

AECOM understands that the proposed development works will be undertaken in compliance with Construction Design and Management (CDM) 2015 regulations.

Prior to work commencing, a health and safety risk assessment should be carried out by the appointed Principal Contractor / developed in accordance with current health and safety regulations. This assessment should cover potential risks to construction staff, permanent site staff and the local population. Based on the findings of this risk assessment, appropriate mitigation measures should be implemented during the construction period.

Asbestos is unlikely to be present within the near surface soils at the site. However, should any be encountered, Control of Asbestos Regulation 2012 will be required to be included within health and safety information for the site.

The greatest potential for generation of dust will be during the Site works and therefore dust generation should be kept to a minimum in accordance with general best practice, as outlined in, for example, 'Environmental Good Practice on Site', CIRIA Publication C692 to reduce this risk.

The risk to construction workers during the excavation and construction phases in terms of potential exposure to high concentrations of contaminants is considered to be low given the limited historic and current land uses identified at the Site. This is provided appropriate health and safety risk assessments are undertaken in accordance with current health and safety regulations. Should gross contamination be identified during the construction phase, then this may pose a potential acute risk to construction works. It is likely to be able to be effectively managed through good health and safety practices and protocols. Adoption of appropriate dust suppression techniques would also mitigate the degree of potential particulate migration off-site.

11. Conclusions

The Site is located to the north of Llanmaes village, in the Vale of Glamorgan, South Wales, and covers an area of approximately 12.45 Ha. The Site comprises open and undeveloped agricultural land.

The anticipated geology is topsoil overlying weathered Blue Lias (subsoil) overlying Porthkerry Member bedrock (Blue Lias Formation). The bedrock is a Secondary A Aquifer. Published BGS mapping suggests that superficial Head Deposits are found overlying bedrock units only within the southwestern most points of the Site. These are associated with the Llanmaes Brook on the southwest boundary of the Site. These are classified as a Secondary Undifferentiated Aquifer.

Based on a review of historical maps, the Site has primarily been used as agricultural land since the first published mapping in 1877, with the only notable industry being adjacent to the site, a blacksmith which has been present since 1879. Potential heavy metal contamination associated with the land use maybe present in the immediate surrounding soils. The risk of encountering ground contamination at the Site is considered to be low and is anticipated to be limited to localised spillages associated with road / farms use and potential pesticides/herbicides used for agricultural use.

A Preliminary Unexploded Ordnance (UXO) Threat Assessment was undertaken for the Site by 6 Alpha Associates. Llanmaes Village was subjected to bomb-strikes, and it was noted to be likely that some bomb strikes impacted on or in close proximity to the Site. Therefore, the potential for a UXO hazard to occur at the Site was assessed as being likely.

Table 11.1 presents a summary of potential residual contaminant linkages greater than low risk.

Table 11.1 Summary of Potential Contaminant Linkages Greater than Low Risk

Receptor	Pathway	Potential Risk
R1: Construction and maintenance workers	P1: Direct contact, dermal absorption or ingestion of site soils	Moderate / Low
R1: Construction and maintenance workers	P4: Inhalation of soil particles derived from site soils	Moderate / Low

The main risks identified with regard to the proposed development are to construction workers during the excavation works of the ditches and reprofiling works (if this requires disturbance of soils). The risks should be mitigated through the implementation appropriate mitigation measures based on a health and safety risk assessment carried out by the appointed Principal Contractor which should be in accordance with current health and safety regulations.

Should gross contamination be identified during the construction phase, then this may pose a potential acute risk to construction works. It is likely to be able to be effectively managed through good health and safety practices and protocols.

12. Recommendations

12.1. Contaminated Land Risks

The Risk Assessment above does not indicate plausible risks to the identified receptors, therefore under current guidance (LCRM) the risk assessment process may be concluded. Based on the findings described herein AECOM do not consider a site investigation is warranted to further quantify the potential risk. Should unexpected contamination be observed during development works however, the risk assessment would need to be revisited. It is recommended therefore that a procedure for dealing with unforeseen contamination is developed prior to development works and submitted under Planning with the aim of reducing programme delays should contamination be encountered.

12.2. Additional Considerations for Construction

It is understood that the aim of the project is to use excavated materials from ditches to construct the flood bunds. However, there is likely to be a surplus of material. It is noted that natural uncontaminated material used in construction on the site from which it is generated is exempt from the Waste Framework Directive and as such can be reused within the development. Site investigation to date has indicated natural materials from surface in the areas investigated, however It is recommended that a site investigation is undertaken to confirm the nature of the soils within this context. This would also allow an indicative preliminary waste classification assessment to be undertaken should there be the possibility of soils being disposed of as waste during construction.

The investigation should be designed with due consideration of the requirements of BS10175:2017.

It is also recommended that a Detailed UXO Threat and Risk Assessment should be undertaken as per the recommendation from 6 Alpha due to the Llanmaes Village known to have been subjected to bomb-strikes. This is in line with CIRIA C681 (2009) “Unexploded Ordnance (UXO) A guide for the Construction Industry” which provides good practice recommendations for assessing and mitigating potential risks

Prior to work commencing, a health and safety risk assessment should be carried out by the appointed Principal Contractor / developed in accordance with current health and safety regulations. This assessment should cover potential risks to construction staff, permanent site staff and the local population. Based on the findings of this risk assessment, appropriate mitigation measures should be implemented during the construction period. The risk to construction workers from soil contamination would then be anticipated reduced to low.

13. References

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Figures

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Checked: BB
Drawn: BM
Revision: 1

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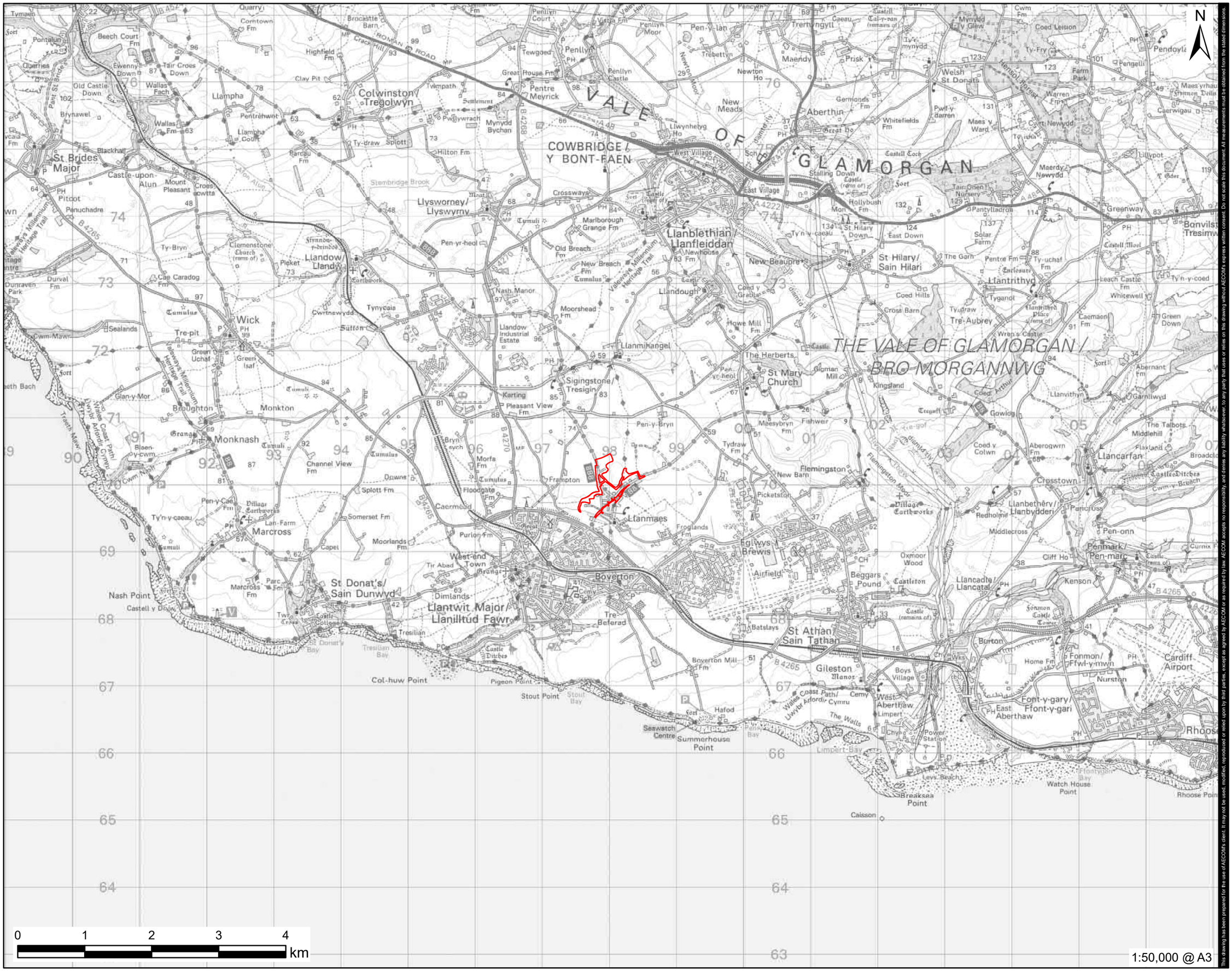

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LEGEND

Site Boundary

NOTES

ISSUE PURPOSE

FOR INFORMATION

PROJECT NUMBER

60160078

SHEET TITLE

Site Location

SHEET NUMBER

Figure 1

Filename: G:\Projects\GIS Management\001 Projects\2021\60160078 - Llanmaes Flood Alleviation Scheme\02_Maps\Fig_02_Site_Layout_NoOSMM.mxd Date: 23/03/2021
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Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

ISSUE PURPOSE

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PROJECT NUMBER

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SHEET TITLE

Site Layout

SHEET NUMBER

Figure 2

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Revision: 1
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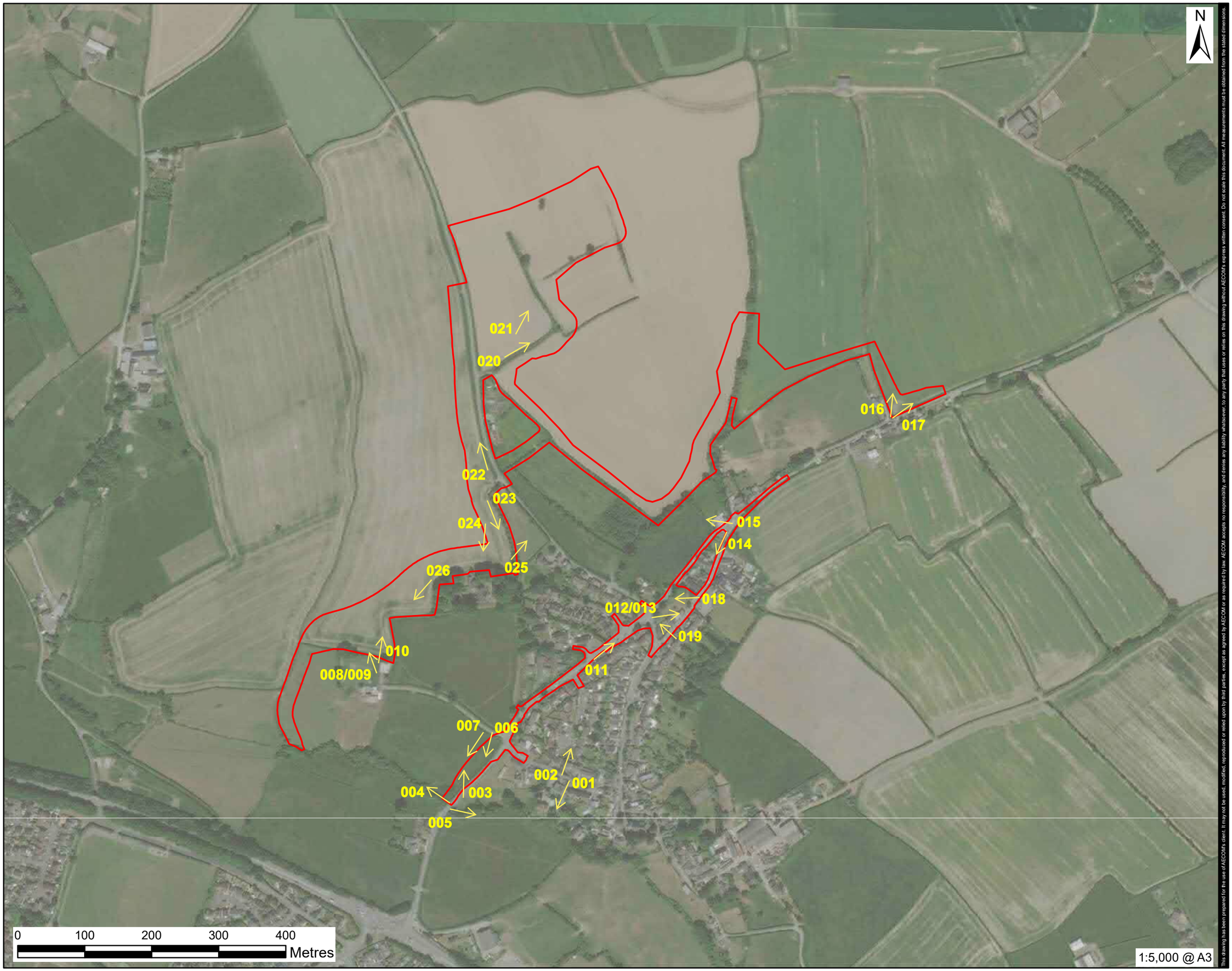

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ISSUE PURPOSE

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PROJECT NUMBER

60160078

SHEET TITLE

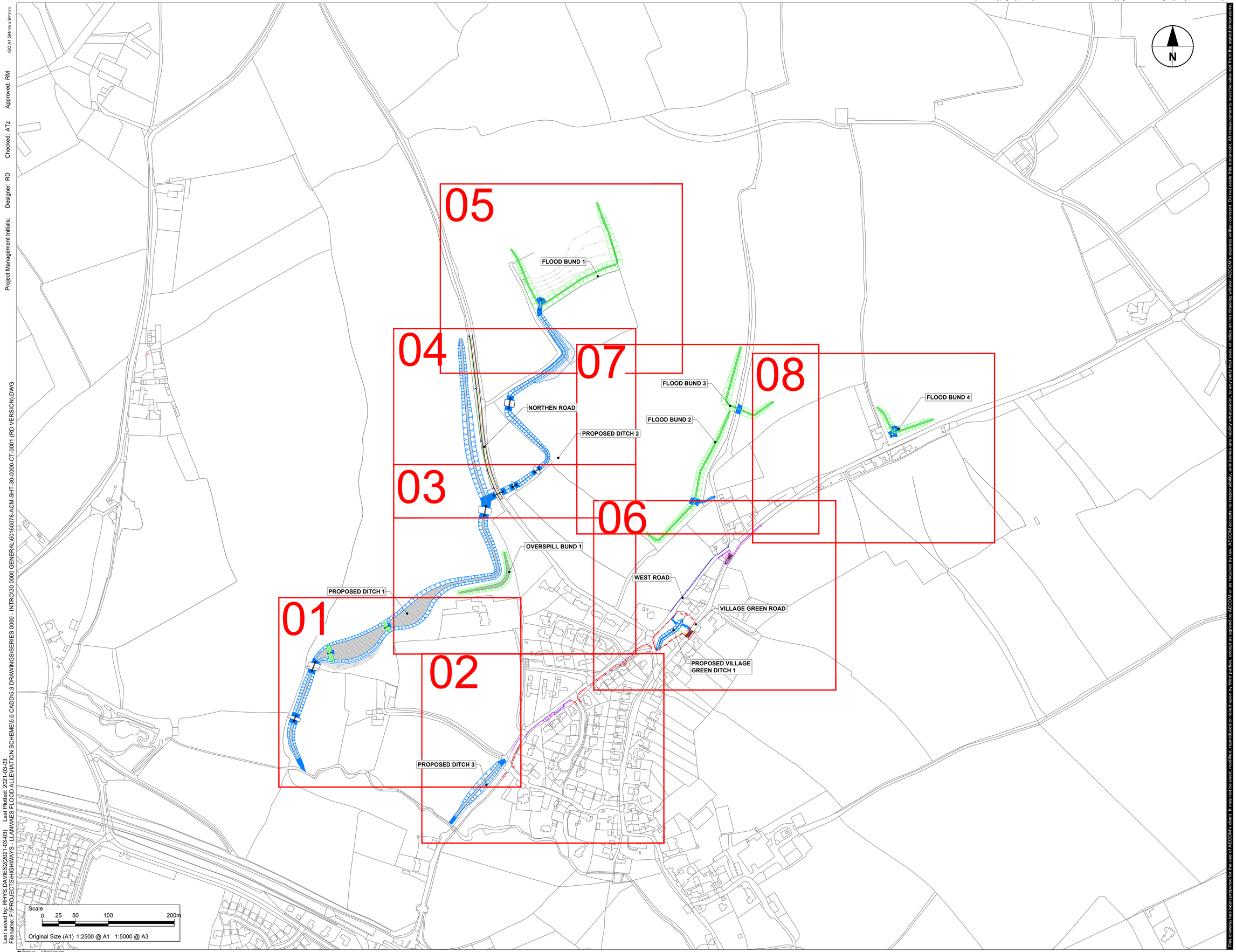
Site Walkover Location Plan

SHEET NUMBER

Figure 3

Project reference: 60160078-ACM-RP-ENV-001-1
Project number: 60160078

Appendix A Proposed Flood Alleviation Scheme Plans



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1. TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION / INFORMATION.
2. ALL LEVELS RELATE TO ORDNANCE DATUM.
3. DO NOT SCALE FROM THIS DRAWING, USE PRINTED DIMENSIONS ONLY.

LEGEND

01 SHEET LAYOUT AND NUMBER

STATUS

DETAILED DESIGN

ISSUE/REVISION

B	26/02/2021	DETAILED DESIGN
A	16/12/2020	DRAFT DETAILED DESIGN
I/R	DATE	DESCRIPTION

PROJECT NUMBER

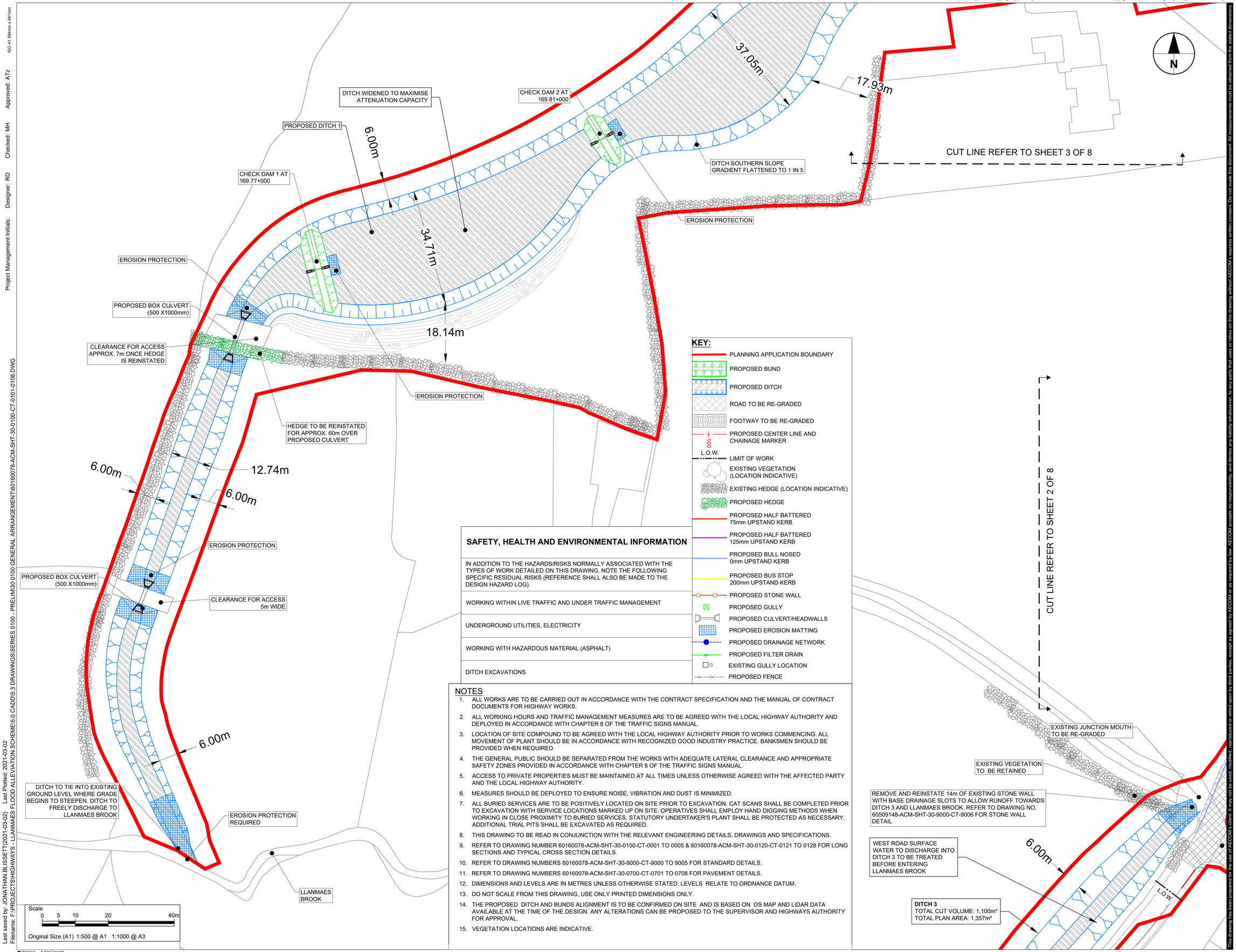
60160078

SHEET TITLE

LLANMAES VILLAGE
FLOOD ALLEVIATION SCHEME
LOCATION PLAN
SCALE: 1:2500

SHEET NUMBER

60160078-ACM-SHT-30-0000-CT-0001



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING SPECIFIC RESIDUAL RISKS (REFERENCE SHALL ALSO BE MADE TO THE DESIGN HAZARD LOG).
WORKING WITHIN LIVE TRAFFIC AND UNDER TRAFFIC MANAGEMENT
UNDERGROUND UTILITIES, ELECTRICITY
WORKING WITH HAZARDOUS MATERIAL (ASPHALT)
DITCH EXCAVATIONS

NOTES

1. ALL WORKS ARE TO BE CARRIED OUT IN ACCORDANCE WITH THE CONTRACT SPECIFICATION AND THE MANUAL OF CONTRACT DOCUMENTS FOR HIGHWAY WORKS.
2. ALL WORKING HOURS AND TRAFFIC MANAGEMENT MEASURES ARE TO BE AGREED WITH THE LOCAL HIGHWAY AUTHORITY AND DEPLOYED IN ACCORDANCE WITH CHAPTER 8 OF THE TRAFFIC SIGNS MANUAL.
3. LOCATION OF SITE COMPOUND TO BE AGREED WITH THE LOCAL HIGHWAY AUTHORITY PRIOR TO WORKS COMMENCING. ALL MOVEMENT OF PLANT SHOULD BE IN ACCORDANCE WITH RECOGNIZED GOOD INDUSTRY PRACTICE. BANKSMEN SHOULD BE PROVIDED WHEN REQUIRED.
4. THE GENERAL PUBLIC SHOULD BE SEPARATED FROM THE WORKS WITH ADEQUATE LATERAL CLEARANCE AND APPROPRIATE SAFETY ZONES PROVIDED IN ACCORDANCE WITH CHAPTER 8 OF THE TRAFFIC SIGNS MANUAL.
5. ACCESS TO PRIVATE PROPERTIES MUST BE MAINTAINED AT ALL TIMES UNLESS OTHERWISE AGREED WITH THE AFFECTED PARTY AND THE LOCAL HIGHWAY AUTHORITY.
6. MEASURES SHOULD BE DEPLOYED TO ENSURE NOISE, VIBRATION AND DUST IS MINIMIZED.
7. ALL BURIED SERVICES ARE TO BE POSITIVELY LOCATED ON SITE PRIOR TO EXCAVATION. CAT SCANS SHALL BE COMPLETED PRIOR TO EXCAVATION WITH SERVICE LOCATIONS MARKED UP ON SITE. OPERATIVES SHALL EMPLOY HAND DIGGING METHODS WHEN WORKING IN CLOSE PROXIMITY TO BURIED SERVICES. STATUTORY UNDERTAKER'S PLANT SHALL BE PROTECTED AS NECESSARY. ADDITIONAL TRIAL PITS SHALL BE EXCAVATED AS REQUIRED.
8. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE RELEVANT ENGINEERING DETAILS, DRAWINGS AND SPECIFICATIONS.
9. REFER TO DRAWING NUMBER 60160078-ACM-SHT-30-0150-CT-0001 TO 0005 & 60160078-ACM-SHT-30-0120-CT-0121 TO 0128 FOR LONG SECTIONS AND TYPICAL CROSS SECTION DETAILS.
10. REFER TO DRAWING NUMBERS 60160078-ACM-SHT-30-9000-CT-9000 TO 9005 FOR STANDARD DETAILS.
11. REFER TO DRAWING NUMBERS 60160078-ACM-SHT-30-0700-CT-0701 TO 0708 FOR PAVEMENT DETAILS.
12. DIMENSIONS AND LEVELS ARE IN METRES UNLESS OTHERWISE STATED. LEVELS RELATE TO ORDNANCE DATUM.
13. DO NOT SCALE FROM THIS DRAWING, USE ONLY PRINTED DIMENSIONS ONLY.
14. THE PROPOSED DITCH AND BUNDS ALIGNMENT IS TO BE CONFIRMED ON SITE AND IS BASED ON OS MAP AND LIDAR DATA AVAILABLE AT THE TIME OF THE DESIGN. ANY ALTERATIONS CAN BE PROPOSED TO THE SUPERVISOR AND HIGHWAYS AUTHORITY FOR APPROVAL.
15. VEGETATION LOCATIONS ARE INDICATIVE.

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LLANMAES VILLAGE FLOOD ALLEVIATION SCHEME

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A	16/12/2020	DRAFT DETAILED DESIGN

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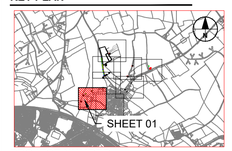

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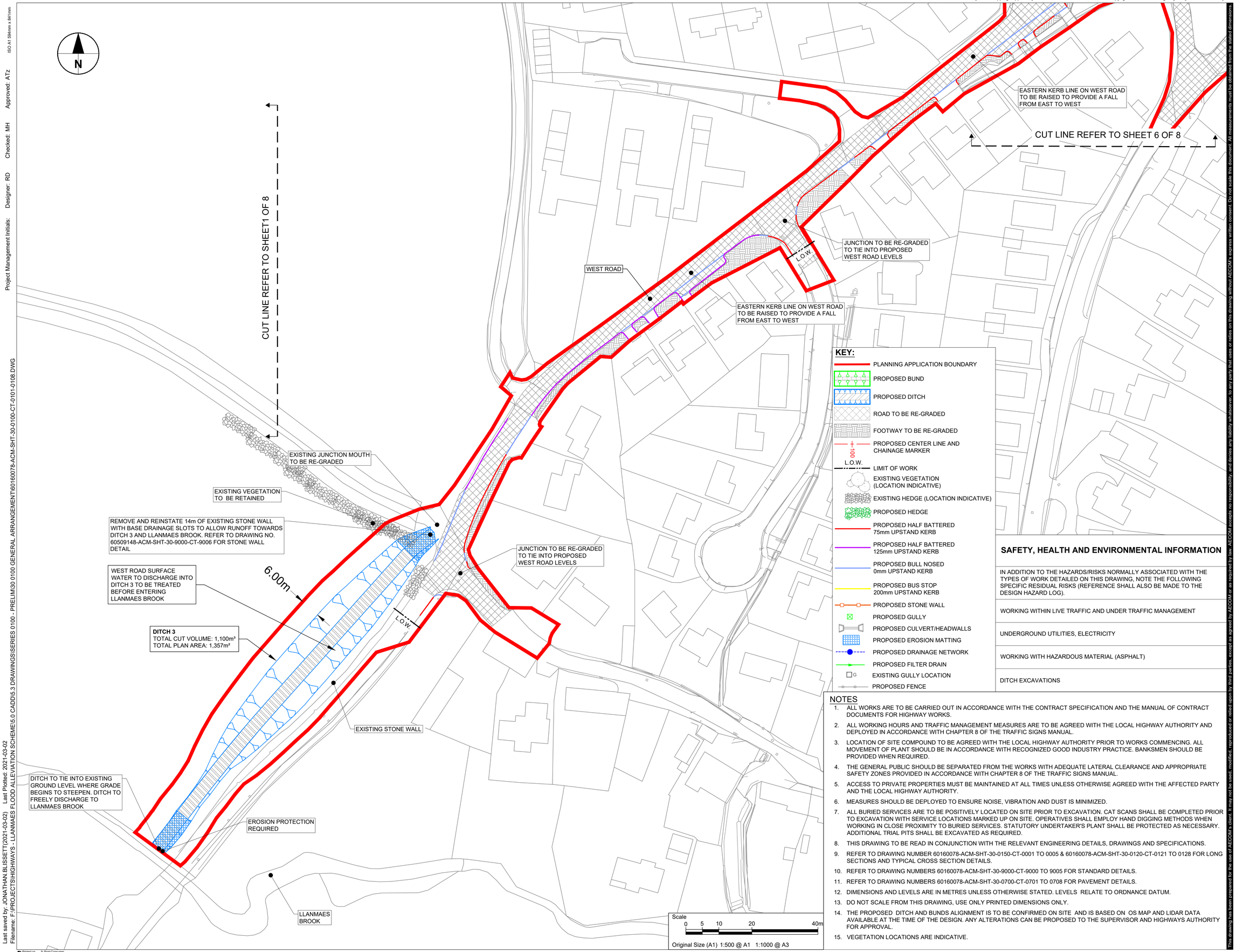
LLANMAES VILLAGE
FLOOD ALLEVIATION SCHEME
GENERAL ARRANGEMENT PLAN
SHEET 1 OF 8

SHEET NUMBER
60160078-ACM-SHT-30-0100-CT-0101



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WORKING WITHIN LIVE TRAFFIC AND UNDER TRAFFIC MANAGEMENT
UNDERGROUND UTILITIES, ELECTRICITY
WORKING WITH HAZARDOUS MATERIAL (ASPHALT)
DITCH EXCAVATIONS

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10. REFER TO DRAWING NUMBERS 60160078-ACM-SHT-30-9000-CT-9000 TO 9005 FOR STANDARD DETAILS.
11. REFER TO DRAWING NUMBERS 60160078-ACM-SHT-30-0700-CT-0701 TO 0708 FOR PAVEMENT DETAILS.
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15. VEGETATION LOCATIONS ARE INDICATIVE.

AECOM

PROJECT

LLANMAES VILLAGE FLOOD ALLEVIATION SCHEME

CLIENT

VALE OF GLAMORGAN COUNCIL

VALE of GLAMORGAN BRO MORGANNWG

CONSULTANT

AECOM
1 CALLAGHAN SQUARE
CARDIFF
CF10 5BT
TEL: (029) 20674600
FAX: (029) 20674699

STATUS

DETAILED DESIGN

ISSUE/REVISION

I/R	DATE	DESCRIPTION
B	26/02/2021	DETAILED DESIGN
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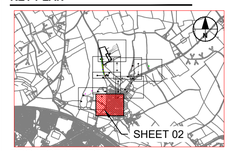

PROJECT NUMBER

60160078

SHEET TITLE

LLANMAES VILLAGE
FLOOD ALLEVIATION SCHEME
GENERAL ARRANGEMENT PLAN
SHEET 2 OF 8

SHEET NUMBER

60160078-ACM-SHT-30-0100-CT-0102

Scale
0 5 10 20 40m
Original Size (A1) 1:500 @ A1 1:1000 @ A3

N

SECTION OF EXISTING ROAD TO BE RE-GRADED TO FALL EAST TO WEST

PROPOSED BOX CULVERT (500 X1000mm)

PROPOSED FILTER DRAIN OUTFALL

CLEARANCE FOR ACCESS 2.5m WIDE

CUT LINE REFER TO SHEET 4 OF 8

EXISTING ACCESS TO REMAIN

TIE IN TO EXISTING CARRIAGEWAY

CLEARANCE FOR ACCESS 10m WIDE

6.00m

12.50m

CLEAR VEGETATION TO ALLOW BUND CONSTRUCTION

DITCH 1
TOTAL CUT VOLUME: 13,890m³
TOTAL PLAN AREA: 14,330m²

6.00m

11.00m

OVERSPILL BUND 1

5.00m

EXISTING HEDGES TO RETAINED.

11.48m

6.00m

37.05m

17.93m

OVERSPILL BUND 1
FILL VOLUME: 820m³
TOTAL PLAN AREA: 1,235m²

EXISTING TREES AND HEDGES HERE TO RETAINED.

DITCH SOUTHERN SLOPE GRADIENT FLATTENED TO 1 IN 5

CUT LINE REFER TO SHEET 1 OF 8

EROSION PROTECTION

TIE IN WITH EXISTING GROUND LEVEL

CUT LINE REFER TO SHEET 6 OF 8

WEST ROAD

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- DITCH EXCAVATIONS

KEY:

- PLANNING APPLICATION BOUNDARY
- PROPOSED BUND
- PROPOSED DITCH
- ROAD TO BE RE-GRADED
- FOOTWAY TO BE RE-GRADED
- PROPOSED CENTER LINE AND CHAINAGE MARKER
- L.O.W. LIMIT OF WORK
- EXISTING VEGETATION (LOCATION INDICATIVE)
- EXISTING HEDGE (LOCATION INDICATIVE)
- PROPOSED HEDGE
- PROPOSED HALF BATTERED 75mm UPSTAND KERB
- PROPOSED HALF BATTERED 125mm UPSTAND KERB
- PROPOSED BULL NOSED 0mm UPSTAND KERB
- PROPOSED BUS STOP 200mm UPSTAND KERB
- PROPOSED STONE WALL
- PROPOSED GULLY
- PROPOSED CULVERT/HEADWALLS
- PROPOSED EROSION MATTING
- PROPOSED DRAINAGE NETWORK
- PROPOSED FILTER DRAIN
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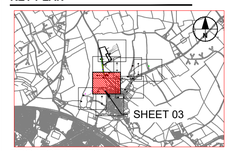

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60160078

SHEET TITLE
LLANMAES VILLAGE
FLOOD ALLEVIATION SCHEME
GENERAL ARRANGEMENT PLAN
SHEET 3 OF 8

SHEET NUMBER
60160078-ACM-SHT-30-0100-CT-0103

ISO A1 594mm x 841mm
Approved: ATz
Checked: MH
Designer: RD
Project Management Initials:

Last saved by: JONATHAN.BLISSETT (2021-03-02) Last Plotted: 2021-03-02
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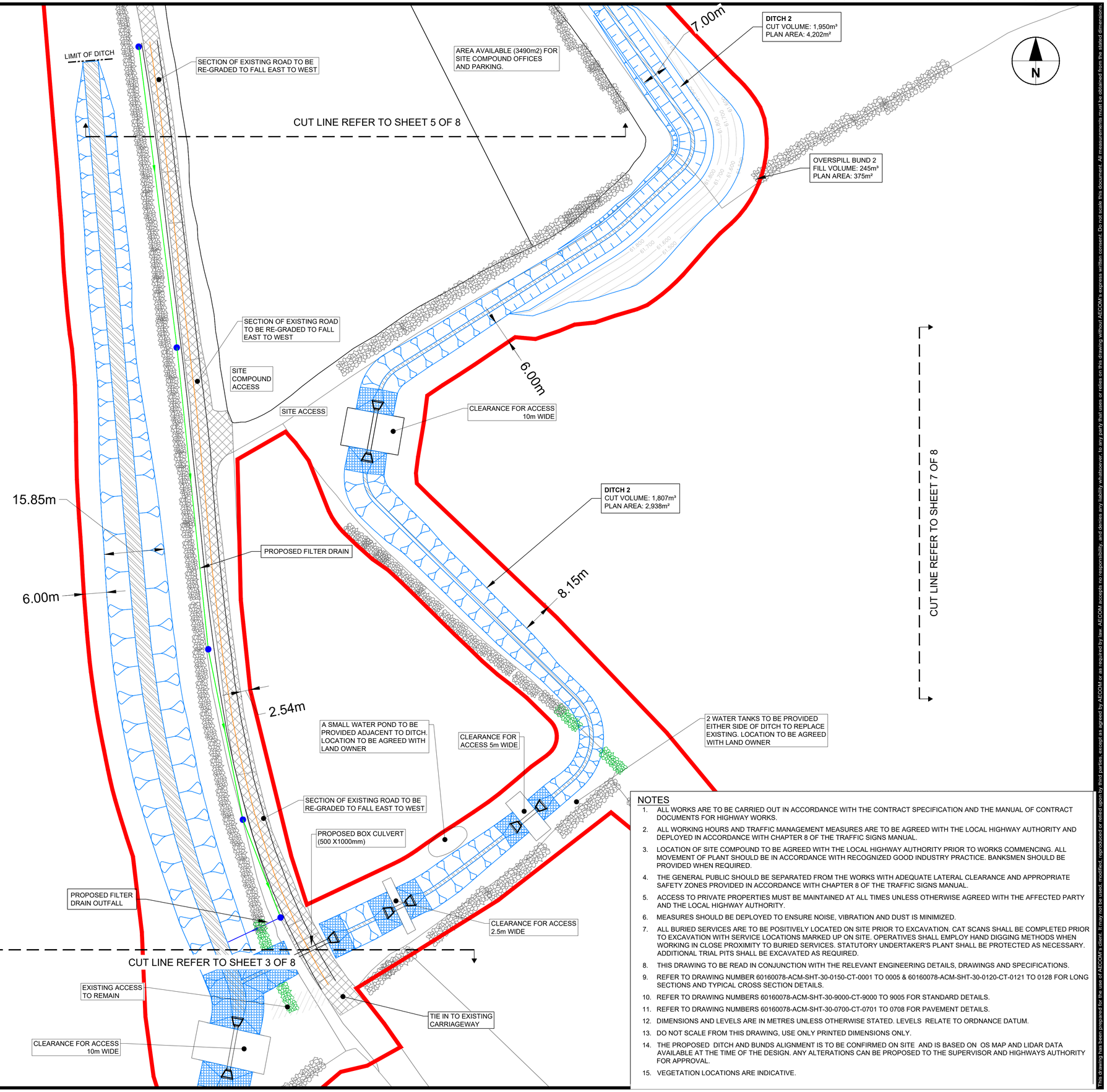

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SHEET 4 OF 8

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