



# **DRAINAGE STRATEGY**

## **PROPOSED RESIDENTIAL DEVELOPMENT AT THE SITE ADJECENT TO CROWN STREET, GWALCHMAI**

**JUNE 2022**  
**Suitability S1**  
**Revision P02**

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| SUITABILITY | REV | DATE     | DESCRIPTION  | Org. | Chk'd | App'd |
|-------------|-----|----------|--------------|------|-------|-------|
| S1          | P01 | 21.06.22 | First Issue. |      |       |       |
|             |     |          |              |      |       |       |

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## 1.0 Introduction

### 1.1 Project Background

1.1.1 Cadarn Consulting Engineers Ltd have been appointed by AMP Construction and Groundworks Ltd to provide a drainage strategy, for both surface water and foul, for the proposed development at the site adjacent to Llain Rallt, Gwalchmai (National Grid Reference: **SH 39404 75966**). Refer to the drawing enclosed in **Appendix A** for the proposed site location plan.

1.1.2 Cadarn Consulting Engineers Ltd reserve the right to undertake further investigation into the adequacy of the recommendations made within this report, if works on site have not commenced within twelve months of the issuing of this report.

### 1.2 Scope of Proposed Drainage Strategy

1.2.1 This report aims to provide a suitable drainage strategy for the discharge of surface water and foul effluent generated by the proposed development.

1.2.2 The purpose of the calculations enclosed within this report and accompanying details are to produce a drainage layout that complies with the relevant legislation of the Tan 15, CIRIA C753 '*The SuDS Manual*' and Approved Document H of the Building Regulations 2010.

### 1.3 Proposed Development

1.3.1 AMP Construction and Groundworks Ltd are proposing to construct a residential housing development consisting of 33 properties with a new Highway network separated into two phases on a greenfield parcel of land located in Gwalchmai. The proposed site layout is illustrated within **Appendix B**.

## **1.4 Site Hydrology**

1.4.1 The site generally falls south easterly away from the Crown St highway, down towards the boundary with the adjacent field.

## **1.5 Existing Land Drainage Features / Watercourses.**

1.5.1 There are no existing land drainage features within the site although there is an existing land drainage feature located within the adjacent field to the southeast of the site.

## **1.6 Existing Nearby Drainage**

1.6.1 As noted in **Section 1.5**, an onsite investigation within the site and surrounding area has identified a land drainage feature located within the field adjacent to the south-eastern boundary of the development site, running along the boundary of the adjacent field and Gwalchmai football field. The invert of this land drainage ditch has been identified as being 1m lower than the lowest point of the proposed development site and is separated from the site by a soil bund. The existing site drainage arrangement has been illustrated on the attached layout contained within **Appendix C**.

1.6.2 The Dwr Cymru / Welsh Water (DCWW) apparatus map contained within **Appendix D** indicates there is a 150mm vitrified clay (VC) foul sewer located within the Crown St Highway which serves the existing Maes Meurig housing estate located to the south of the site of the proposed development. This foul sewer then proceeds to continue in a southeastern direction to the sewage treatment plant.

## 2.0 Design Criteria

2.1.1 The following design criteria will apply to the surface water run-off and foul discharge design for the site:

- Approved Document H, Building Regulations.
- BRE Digest 365;
- BS EN 752:2017;
- CIRIA C753 'The SuDS Manual' 2015;
- DEFRA / Environment Agency 'Preliminary Rainfall Runoff Management for Developments' Technical Report;
- Discharge Units from BS EN 12056: Part 2;
- Flood & Water Management Act 2010;
- Highways Act 1991;
- Institute of Hydrology Report (IHR) 124;
- Land Drainage Act 1991;
- Modified Rational Method;
- Sewers for Adoption 7<sup>th</sup> Edition;
- Statutory standards for sustainable drainage systems – designing, constructing, operating and maintaining surface water drainage systems
- Technical Advice Note (TAN) 15: Development and Flood Risk;
- Wallingford Procedure;
- Water Industries Act 1991.

## **3.0 Surface Water Drainage Design**

### **3.1 Guiding Principles**

3.1.1 The disposal of surface water has been designed in strict accordance with the provision of TAN 15, the Flood and Water Management Act 2010 and other best practice documents, such as CIRIA C753 'SuDS Manual' 2015.

### **3.2 Method of discharge**

3.2.1 In accordance with the SuDS Manual 2015, surface water should be managed and discharged from a new development in line with the following hierarchy:

- Priority level 1: Re-use of water;
- Priority level 2: Infiltration into ground;
- Priority level 3: Discharge to a water body;
- Priority level 4: Discharge to a surface water run-off drain;
- Priority level 5: Discharge to a combined surface water run-off and foul drain.

3.2.2 Re-use of surface water cannot be considered as the sole method of surface water disposal, paragraph G1.1 The Statutory SuDS Guidance for Wales states "As much of the runoff as possible (subject to technical or cost constraints) should be discharged to each destination before a lower priority destination (level) is considered." Therefore, attempts must be made to reuse as much surface water as possible. Therefore, it is proposed to provide above ground water butts on one rainwater downpipes to the rear of each property to allow the residence of the development the ability to water the plants and rear garden areas.

3.2.3 Infiltration testing has been undertaken by 'Cadarn' as part of a phase I & II site investigation (this report is not included as part of this strategy due to the size, however this can be issued upon request). A summary of the report is provided below.



- Porosity testing was undertaken within two trial pits located within the site, a drop in water level of 0.10m – 0.12m was recorded within the first 1.5 hours (90 minutes) although slowed to a halt.
- BRE 365 requires three tests to be undertaken within each trial hole however due to the slow rate of infiltration recorded this was not possible.

3.2.4 The report concludes that the use of infiltration systems such as soakaways for the disposal of surface water run-off generated from the proposed development is not suitable, however as noted in **Section 3.2.2** attempts should be made despite the poor infiltration rate, therefore all proposed attenuation features are to be wrapped in a non-woven geotextile to allow migration of surface water into the ground.

3.2.5 As noted in **Section 1.5** there is land drainage feature located 20m east of the sites boundary therefore it is proposed to communicate flows from the site to this watercourse.

### 3.3 Climate Change

3.3.1 TAN 15 states that an allowance for climate change should be provided within the on-site attenuation, without specifying what allowance should be made. The NPPF, which is the English equivalent of TAN 15, does however provide guidance derived from DEFRA FCDPAG3 ‘Economic Appraisal Supplementary Note to Operating Authorities – Climate Change Impacts’ October 2006 (see **Table 1**). This document considers the effects of climate change for different design criteria.

3.3.2 The proposed development will have a design life of 100 years; based on the NPPF’s guidance, the development therefore requires an allowance of 30% for climate change to be applied to the peak rainfall intensity.

**Table 1.** Climate Change Requirements.

| Parameter               | 1990 to<br>2025 | 2025 to<br>2055 | 2055 to<br>2085 | 2085 to<br>2115 |
|-------------------------|-----------------|-----------------|-----------------|-----------------|
| Peak Rainfall Intensity | +5%             | +10%            | +20%            | +30%            |
| Peak River Flow         | +10%            | +20%            |                 |                 |
| Offshore Wind Speed     | +5%             |                 | +10%            |                 |
| Extreme Wave Height     | +5%             |                 | +10%            |                 |

### 3.4 Design Philosophy

Based upon existing site information and the details of the proposed development, an assessment of the site run-off has been undertaken utilising the ‘Flow’ hydraulic modelling package (refer to **Appendix E**). This has enabled the existing greenfield run-off flows to be assessed and quantified, in accordance with IHR 124.

3.4.1 The tables below summarise the existing effective areas with their corresponding run-off coefficients, as per the Wallingford procedure, IHR 124.

**Table 2.** Existing Greenfield Areas.

| Surface | Total Area               | Coefficient | Effective Area          |
|---------|--------------------------|-------------|-------------------------|
| Grass   | 8,206.316 m <sup>2</sup> | 0.35        | 2872.211 m <sup>2</sup> |
| Surface | 2,003.308 m <sup>2</sup> |             | 2872.211 m <sup>2</sup> |

3.4.2 The areas provided within **Table 2** are provided on the existing greenfield area drawing contained within **Appendix F**. Reference should be made to the attached hydraulic model output calculations containing the run-off rates for the site (**Appendix E**), which are summarised as follows:

**Table 3.** Greenfield Run-off rates for different return periods.

| Reference       | 1 in 1 Year | 1 in 30 Year | 1 in 100 Year |
|-----------------|-------------|--------------|---------------|
| Greenfield Rate | 5.5 l/s     | 11.2 l/s     | 13.5 l/s      |

3.4.3 The Statutory SuDS guidance for Wales requests all development to be restricted to minim greenfield run-of rates.

3.4.4 The exact greenfield run-off rates discharge rates connect be achieved without the need for a second hydrobrake within the chamber therefore a slight betterment for storm events over the 1:1 year return period.

### 3.5 Method of Storage

3.5.1 Surface water run-off generated from all proposed hardstanding areas for the 1 in 100-year return period plus an allowance of 30% for climate change is to be attenuated onsite within a below ground storage structures and the below ground piped drainage network. Raingardens and porous paving are also included as part of the design however have not been accounted for within the attenuated volume but will help to reduce the rate of flow through the site. This section of the report should be read in conjunction with the proposed on-site drainage arrangement enclosed in **Appendix G**.

3.5.2 The proposed measured hardstanding areas accounted for within each soakaway summarised within **Table 4** and illustrated on the proposed impermeable area plan contained within **Appendix H**.

**Table 4.** North section of site.

| Surface                      | Total Area               | Coefficient | Effective Area           |
|------------------------------|--------------------------|-------------|--------------------------|
| Houses                       | 1,646.241 m <sup>2</sup> | 1.00        | 1,646.241 m <sup>2</sup> |
| Path                         | 1,189.051 m <sup>2</sup> | 1.00        | 1,189.051 m <sup>2</sup> |
| Swale                        | 429.651 m <sup>2</sup>   | 1.00        | 429.651 m <sup>2</sup>   |
| Parking Bays                 | 864.832 m <sup>2</sup>   | 1.00        | 864.832 m <sup>2</sup>   |
| Road                         | 1,461.139 m <sup>2</sup> | 1.00        | 1,461.139 m <sup>2</sup> |
| Grass                        | 2,615.401 m <sup>2</sup> | 0.35        | 915.390 m <sup>2</sup>   |
| <b>Total</b>                 | 8,206.316 m <sup>2</sup> |             | 6,506.304 m <sup>2</sup> |
| <b>Total – Grass Removed</b> | 5,590.915 m <sup>2</sup> |             | 5,590.915 m <sup>2</sup> |

3.5.3 An Additional 10% is applied to the effective area (grass removed) to account for urban creep, therefore the total effective area is: **6,150.035 m<sup>2</sup>**

3.5.4 The ‘Flow’ hydraulic modelling package output is contained within **Appendix E** which indicates sufficient storge is provided within the site.

### 3.6 Drainage System Maintenance

- 3.6.1 The SuDS Manual 2015 requires appropriate measures to be in place for the maintenance of surface water drainage systems and sustainable drainage features.
- 3.6.2 The maintenance schedule shown in **Tables 5 & 6** have been derived in strict accordance with the SuDS Manual 2015 and from a risk-assessed approach during the design stage. These schedules are not exhaustive and should be reassessed at regular intervals to determine if any additional maintenance requirements are required to preserve the performance and condition of the site drainage system.
- 3.6.3 All surface water drainage located within the highway will be adopted and maintained by the highway authority under section 38 of the Highways Act 1980. The remainder of the drainage network (besides private drainage within an individual property boundary) is to be adopted and maintained by the SAB. The maintenance schedule for each component of the proposed drainage network is contained within **Tables 5 & 6**.
- 3.6.4 Provided preventive maintenance measures are undertaken in accordance with the frequencies recommended in **Tables 5 & 6**, the need for corrective maintenance should rarely arise.
- 3.6.5 Maintenance activities should be detailed in the Principal Contractor's Health and Safety Plan and Risk Assessments and should be updated on a regular basis to ensure the continued performance and long-term condition of the drainage system.

**Table 5.** Operation and maintenance requirements for filter drains in line with table 16.1 of the CIRIA C753 ‘The SuDS Manual 2015.

| Maintenance Schedule                        | Required Action   | Typical Frequency           |
|---|---|-----------------------------|
| Monitoring                                  | Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standard water, and structural damage.                                     | Six Monthly                 |
|   | Inspect pre-treatment systems, inlets, and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies.                                   | Six Monthly                 |
|   | Inspect filter drain for tree roots encroaching sides.  |                             |
| Regular Maintenance                         | Remove litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices   | Six Monthly                 |
|   | Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standard water, and structural damage.                                     | Six Monthly                 |
|   | Inspect pre-treatment systems, inlets, and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies.                                   | Six Monthly                 |
|   | Remove Sediment from pre-treatment devices  | Six Monthly or as required. |
| Occasional Maintenance                      | Remove or control tree roots where they are encroaching the side of the filter drain, using recommended methods (eg NJUG, 2007 or SB 3998:2010)                             | As required.                |
|   | In locations where high level of pollutants are anticipated, remove surface geotextile and replace or wash, and replace overlaying filter medium.                           | As required.                |
|   | Clear perforated pipework of blockages  | As required.                |
| Remedial Actions/<br>Corrective Maintenance | Reconstruct filter drain (replacing the all geotextile/membrane and granular medium) if not maintained in line with the above recommendations and is completely clogged up. | As required.                |

**Table 6.** Operation and maintenance requirements for Swale in line with table 17.1 of the CIRIA C753 ‘The SuDS Manual 2015.

| Maintenance Schedule   | Required Action   | Typical Frequency                                       |
|------------------------|---|---|
| Monitoring             | Inspect Inlets & Outlets for blockages and clear if required.   | Quarterly   |
|                        | Record rate of sediment accumulation and establish appropriate silt removal frequency/maintenance plan. | Quarterly for first year, then annually or as required. |
|                        | Inspection of check dams to ensure they are intact are holding water back effectively                   | Annually.   |
| Regular Maintenance    | Removal of litter and debris.   | as required.  |
|                        | Cutting Grass in and around swale.  | as required (Spring – before nesting season and autumn) |
|                        | Manage vegetation and removal nuisance plants.  | Two monthly for 6 months, then annually.                |
|                        | Remove sediments from inlets and outlets.   | Annually or as required.                                |
| Occasional Maintenance | Reseed areas of poor vegetation growth.   | As required.  |
| Remedial Actions/      | Repair erosion or other damage by reseedling or re-turfing.   | As required.  |
| Corrective Maintenance | Repairing check dams if damaged.  | As required.  |
|                        | Repair/rehabilitation of inlets and outlets.  | As required.  |
|                        | Relevel uneven surfaces and reinstate design levels.  | As required.  |

**Table 7.** Operation and maintenance requirements for bioretention systems (Rain-gardens) in line with table 18.3 of the CIRIA C753 ‘The SuDS Manual 2015.

| Maintenance Schedule                        | Required Action   | Typical Frequency |
|---|---|-------------------|
| Monitoring                                  | Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in under drain (if appropriate) to determine if maintenance is necessary. | Six Monthly.      |
|   | Check operation of under drains   | Annually.         |
|   | Assess Plants for disease, infection, poor growth, invasive species etc. and replace is necessary   | Six monthly.      |
|   | Inspect inlets and outlets for blockages  | Six monthly.      |
| Regular Maintenance                         | Removal of litter and debris and weeds  | Quarterly         |
|   | Replace any plants, to maintain planting density.   | as required.      |
| Occasional Maintenance                      | Infill any holes or scour in the filter medium, improve erosion protection if required.   | As required.      |
|   | Repair minor accumulation of silts by raking away surface mulch, scarifying surface of medium and replacing mulch,  | As required.      |
| Remedial Actions/<br>Corrective Maintenance | Remove and replace filter medium and vegetation above.  | As required.      |

**Table 8.** Operation and maintenance requirements for porous paving in line with table 20.15 of the CIRIA C753 ‘The SuDS Manual 2015.

| Maintenance Schedule   | Required Action  |  | Typical Frequency  |
|------------------------|--|--|--|
| Monitoring             | Initial inspection   |  | Monthly for first 3 months   |
|                        | Inspect for evidence of poor operation and/or weed growth and take appropriate action if required.   |  | Annually or as required.   |
|                        | Inspect silt accumulation rates and establish appropriate brushing frequencies.  |  | Annually.  |
| Regular Maintenance    | Brushing and vacuuming over whole surface, (standard cosmetic sweep over whole surface).   | Annually after autumn leaf fall, or reduce frequency as required based on site-specific observations of clogging or manufacturers recommendations – pay close attention to areas where water runs onto porous areas from adjacent impervious areas as this is most likely to collect the most sediments. |  |
| Occasional Maintenance | Removal of weeds or management using glyphosate applied directly into weeds by an applicator rather than spraying.   |  | As required.   |
|                        | Stabilise and mow contributing and adjacent areas.   |  | As required.   |
| Remedial actions       | Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised within 50mm of the level of the paving.  |  | As required.   |
|                        | Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users and replace lost jointing material. |  | As required.   |
|                        | Rehabilitation of surface and upper substructure by remedial sweeping  |  | Every 10 to 15 years or as required (if infiltration performance is reduced due to clogging) |



**Table 9.** Operation and maintenance requirements for pipework & chambers.

| Maintenance Schedule                        | Required Action   | Typical Frequency              |
|---|---|--------------------------------|
| Monitoring                                  | Inspect using CCTV drain surveys to ensure they are in good condition and operating as designed.  | Every 5 years (or as required) |
|   | Inspect chambers to ensure they are in good condition and that accumulation of sediment, debris etc. is not preventing them from operating as designed. | Annually                       |
| Regular Maintenance                         | Remove any accumulation of silt, sediment, leaves, debris etc.  | Bi-annually                    |
| Occasional Maintenance                      | High-pressure water jet for removal of silt builds up and avoid blockages, particularly at bends or changes in direction.                               | Every 5 years (or as required) |
| Remedial Actions/<br>Corrective Maintenance | High-pressure water jet to remove blockages.  | As Required.                   |

\*Hydrobrake flow control device to be maintained in accordance with hydro international's recommendations.

### 3.7 Surface Water Treatment

3.7.1 In accordance with the SuDS Manual 2015, Table 26.2, commercial yards and delivery areas are classified as having a 'medium' pollution hazard level. **Table 12** shows the pollution hazard indices for the land use.

**Table 10.** Pollution Hazard Indices

| Land Use                                  | Pollution Hazard Level | Total Suspended Soils (PMI <sub>TSS</sub> ) | Hydrocarbons (PMI <sub>HM</sub> ) | Heavy Metals (PMI <sub>PAH</sub> ) |
|---|------------------------|---|-----------------------------------|------------------------------------|
| Residential Roofs                         | Very Low               | 0.2   | 0.05                              | 0.2                                |
| Low Traffic Roads / Residential Car Parks | Low                    | 0.5   | 0.4                               | 0.4                                |

3.7.2 The SuDS Manual 2015 also provides pollution mitigation indices for different SuDS drainage features, as detailed in **Table 13**. The increase in surface water pollution resulting from the hardstanding areas during normal conditions is likely to be negligible. However, this risk increases during rainfall events of greater intensity. As previous noted the proposed design includes two shallow planted swales, rain gardens and soakaways (the raingardens and planted swales can be classified as bioretention systems), the proposed soakaways can also be classified as filter drains due to their granular nature all surface water run-off from the site passing through at least two of these systems.

**Table 11.** Pollution Mitigation Indices

| SuDS Component                | Pollution Mitigation Indices  |                                   |                                    |
|-------------------------------|---|-----------------------------------|------------------------------------|
|                               | Total Suspended Soils (PMI <sub>TSS</sub> )   | Hydrocarbons (PMI <sub>HM</sub> ) | Heavy Metals (PMI <sub>PAH</sub> ) |
| Filter Strip                  | 0.9   | 0.8                               | 0.7                                |
| <b>Filter Drain</b>           | <b>0.6</b>  | <b>0.8</b>                        | <b>0.7</b>                         |
| <b>Swale</b>                  | <b>0.7</b>  | <b>0.6</b>                        | <b>0.4</b>                         |
| <b>Bioretention System</b>    | <b>0.8</b>  | <b>0.8</b>                        | <b>0.8</b>                         |
| <b>Porous Paving</b>          | <b>0.2</b>  | <b>0.3</b>                        | <b>0.3</b>                         |
| Infiltration Basin            | 0.05  | 0.05                              | 0.05                               |
| <b>Detention Basin</b>        | <b>0.7</b>  | <b>0.7</b>                        | <b>0.6</b>                         |
| Pond                          | 0.7   | 0.7                               | 0.5                                |
| Wet Land                      | 0.8   | 0.8                               | 0.8                                |
| Proprietary Treatment Systems | These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1-year return period event, for inflow concentrations relevant to the contributing drainage. |                                   |                                    |

3.7.3 The sum of the highlighted mitigation values (Bold) within each column of **Table 12** surpass the hazard values within **Table 13**, therefore suitable treatment of the surface water run-off from the site is provided, as indicated within **Table 14**.

## **4.0 Foul Drainage Design**

### **4.1 Method of Discharge**

4.1.1 Design of the foul sewers included within the proposal has been carried out in accordance with BS EN 12056 Part 2, Approved Document H of the Building Regulations 2010 and other best practice documents, such as the ‘Sewers for Adoption’ 7<sup>th</sup> edition. In accordance with Approved Document H, the preference in terms of the priority for discharging foul effluent is to discharge into a public foul sewerage system.

4.1.2 As previously detailed, there is a Ø150mm gravity foul sewer located within the highway located to the north of the proposal and within the Maes Meurig housing estate. As identified within the DCWW pre planning advice PPA the point of connection to the sewer has been confirmed as being to the south of the site at the chamber within the adjoining playground, however due to site levels a connection is to be formed slightly downstream of the originally suggested location. The hierarchy outlined in Approved Document H of the Building Regulations 2010 can therefore be satisfied by connecting into this sewer.

4.1.3 The design of the foul drainage system, along with the surface water system, for the proposed development is illustrated in the drawing enclosed in **Appendix G**.

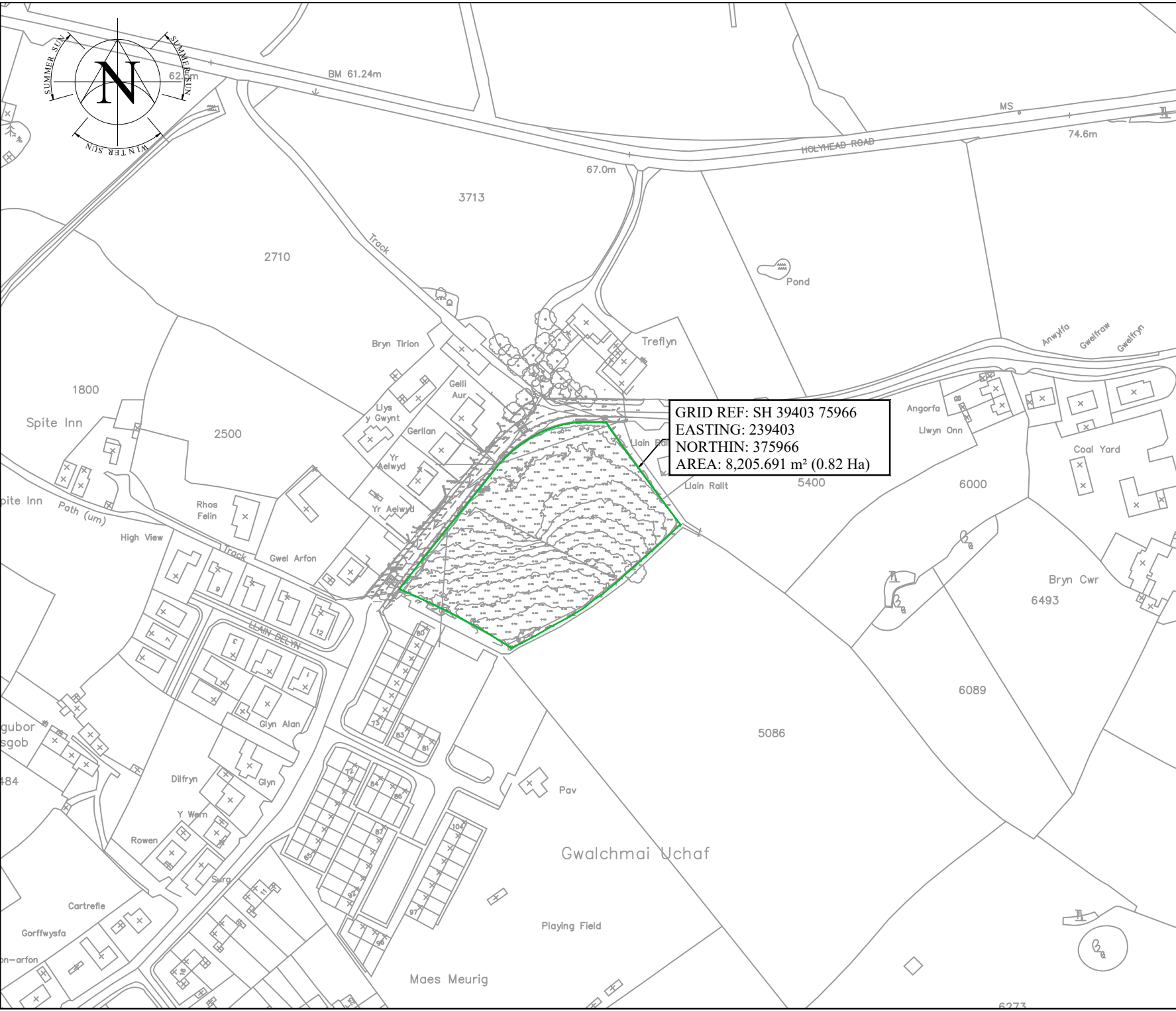
### **4.2 Drainage System Maintenance**

4.2.1 The site’s foul drainage system shall be adopted by the Local Water Company, Dŵr Cymru / Welsh Water, who shall be responsible for maintaining the system in strict accordance with their own standards and any relevant codes and regulations. The sections of proposed foul drainage which are serving a single property and within the boundary of said property will remain private and the responsibility of the homeowner.

# APPENDICES

# **APPENDIX A**

## **Site Location Plan**



GRID REF: SH 39403 75966  
 EASTING: 239403  
 NORTHING: 375966  
 AREA: 8,205.691 m<sup>2</sup> (0.82 Ha)

**NOTES**

1. DO NOT SCALE FROM THIS DRAWING.
2. ALL LEVELS IN METRES UNLESS NOTED OTHERWISE ON DRAWING.
3. ALL DIMENSIONS AND LEVELS TO BE CHECKED ON SITE PRIOR TO UNDERTAKING ANY WORKS, ORDERING MATERIALS OR FABRICATING ANY COMPONENTS
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEER'S AND ARCHITECT'S DRAWINGS AND RELEVANT SPECIFICATION CLAUSES.

**KEY**

█ DENOTES PROPOSED SITE BOUNDARY.

|             |     |          |             |     |       |       |        |
|-------------|-----|----------|-------------|-----|-------|-------|--------|
| S1          | P01 | 10.06.22 | FIRST ISSUE |     |       |       |        |
| SUITABILITY | REV | DATE     | DESCRIPTION | Org | Clk'd | App'd | Auht'd |

DRAWING STATUS:  
 PROJECT TITLE:  
**LAND ADJ TO CROWN STREET,  
 GWALCHMAI**

DRAWING TITLE:  
**SITE LOCATION PLAN**

|                |             |             |            |                 |          |
|----------------|-------------|-------------|------------|-----------------|----------|
| PROJECT        | ORIGINATOR  | VOL.        | LOC.       | TYPE            | ROLE     |
| <b>09422</b>   | <b>CCE</b>  | <b>V1</b>   | <b>XX</b>  | <b>40:40:01</b> | <b>C</b> |
| CLASSIFICATION | No.         | SUITABILITY | REVISION   |                 |          |
| <b>50:30</b>   | <b>0001</b> | <b>S1</b>   | <b>P01</b> |                 |          |

|                 |                   |               |                |
|-----------------|-------------------|---------------|----------------|
| ORIGINATOR:     | DATE:             | SCALE:        | ORIGINAL SIZE: |
| <b>B.Thorne</b> | <b>10.06.2022</b> | <b>1:2500</b> | <b>A4</b>      |



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 Bryn Cefni,  
 Llangefti,  
 LL77 7XA  
**E-mail:** Admin@cadarnconsulting.co.uk  
**Tel:** 01407 730912

# **APPENDIX B**

## **Proposed Site Layout**



**HOUSING MIX - PHASE I**

6 No. - 2 BEDROOM 2 STOREY DWELLINGS  
 6 No. - 3 BEDROOM 2 STOREY DWELLINGS  
 2 No. - 4 BEDROOM 2 STOREY DWELLINGS  
 8 No. - 1 BEDROOM APARTMENTS  
**GRAND TOTAL - 22 RESIDENTIAL UNITS**

**HOUSING MIX - PHASE 2 (TBC)**

4 No. - 2 BEDROOM 2 STOREY DWELLINGS  
 2 No. - 3 BEDROOM 2 STOREY DWELLINGS  
 1 No. - 4 BEDROOM 2 STOREY DWELLINGS  
 4 No. - 1 BEDROOM APARTMENTS  
**GRAND TOTAL - 11 RESIDENTIAL UNITS**

**KEY**

- SITE BOUNDARY - PHASE I
- SITE BOUNDARY - PHASE 2
- 2.4m x 70m VISIBILITY SPLAYS
- 5.5m WIDE TARMACADAM ESTATE ROAD
- TARMACADAM FOOTWAY
- 4.8m x 2.4m TARMACADAM PARKING BAYS
- PAVED AREAS
- GARDENS / TURFED AREAS
- AREAS DESIGNATED FOR SUDS DRAINAGE

Peidiwch a chymryd mesuriadau graddfa oddi ar y dyluniad hwn  
 Os yn amau - gofynnwch  
 Do not scale from this drawing  
 If in doubt - ask

Mae'r dyluniad hwn yn hawffruint Penseiri Russell-Hughes ac ni  
 chaniateir ei gopio neu ei atgynhyrchu heb ganiatad

This drawing is the copyright of Russell-Hughes architects and  
 must not be copied or reproduced without permission

**Newidiadau - Amendments**

REV A - 25/03/2022 - SCHEME REDUCED TO 20 DWELLINGS  
 REV B - 22/04/2022 - SCHEME AMENDED TO ADD 1 BEDROOM APARTMENTS  
 REV C - 23/05/2022 - FULL SCHEME INCLUDED ON DRAWING  
 REV G - 16/6/2022 - LAYOUT AMENDED  
 REV J - 17/6/2022 - LAYOUT AMENDED

Cynllun - Job

**RESIDENTIAL DEVELOPMENT ON LAND ADJACENT TO  
 LLAIN RALLT, GWALCHMAI**

Dyluniad - Drawing  
**PROPOSED SITE PLAN**

Rhif Dyluniad - Drawing No.  
**2947:21:3J**

Graddfa - Scale  
**1:500 A3**

Dyddiad - Date  
**May 2022**



56 Bridge Street,  
 Llangefni,  
 Ynys Mon  
 LL77 7HH

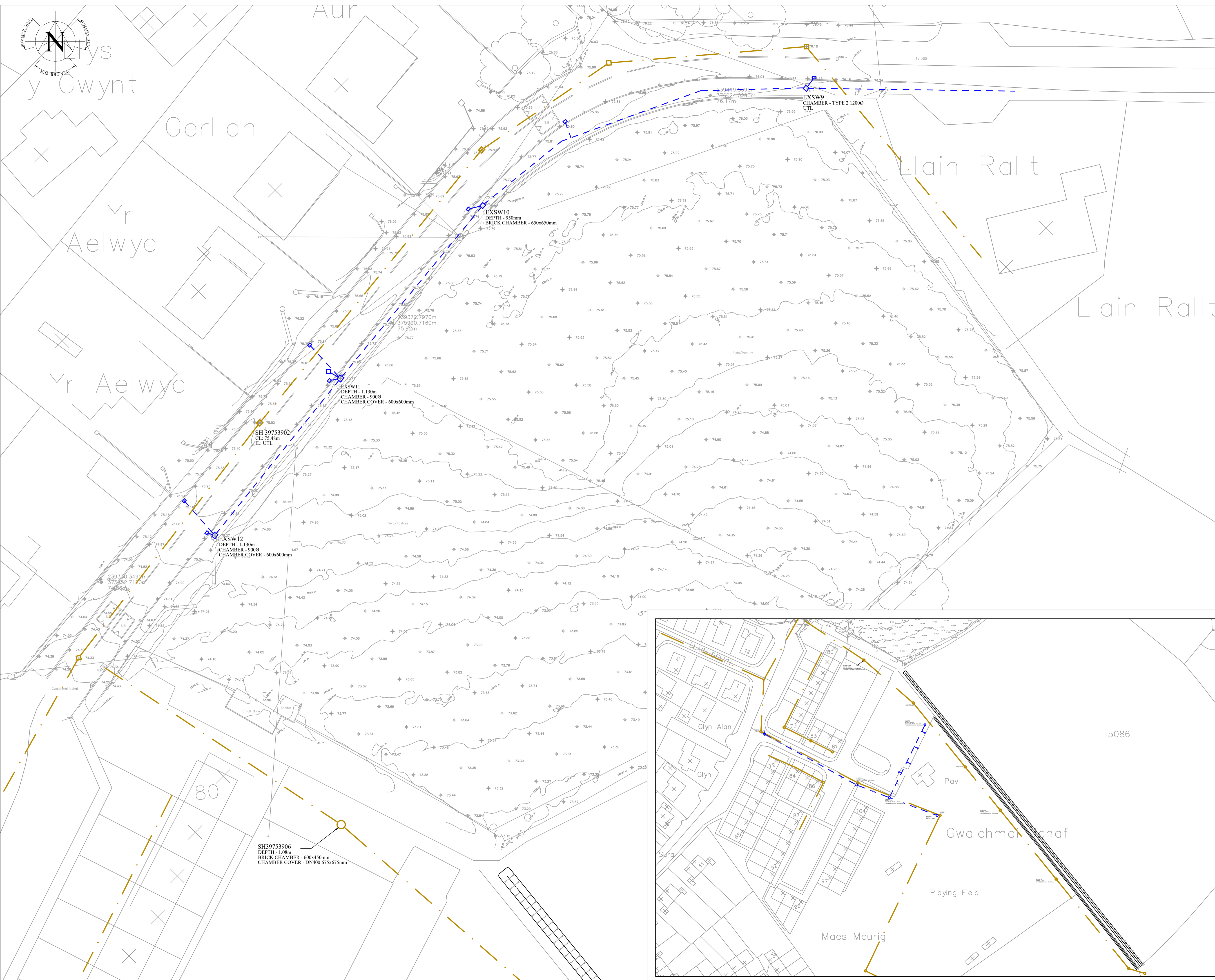
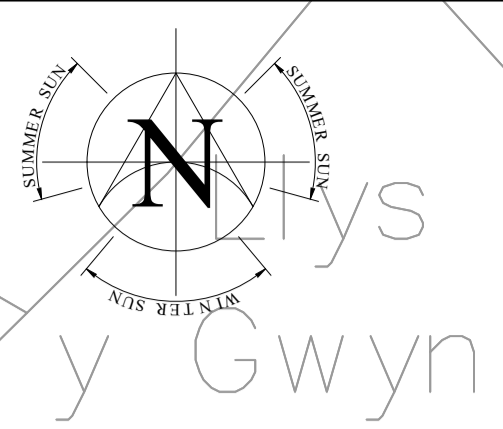
Tel: 01248 722333  
 Fax: 01248 750600  
 E-mail: info@russellhughes.co.uk





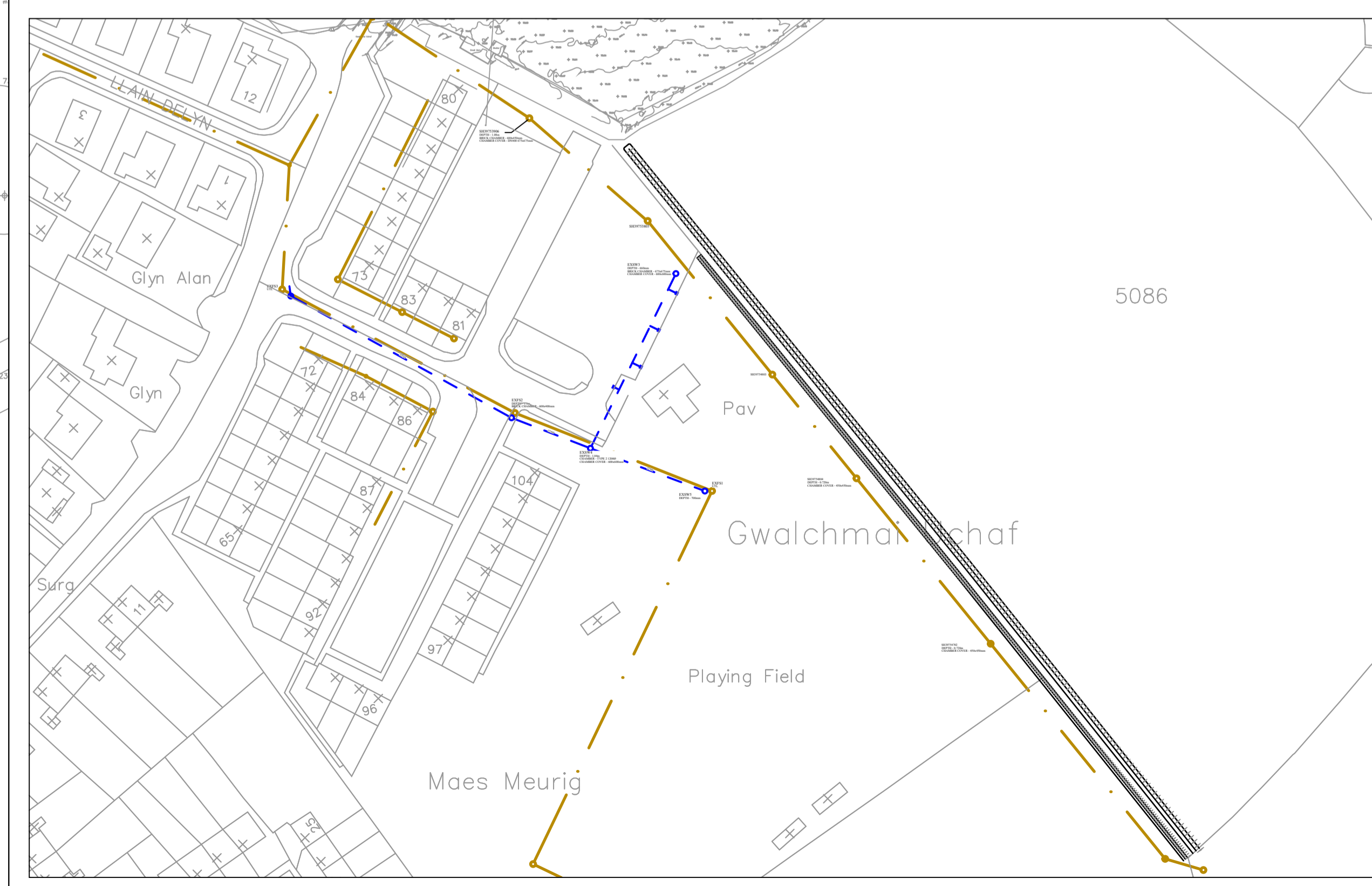
# **APPENDIX C**

## **Topographic Survey and Drainage Layout**



- NOTES**
- DO NOT SCALE FROM THIS DRAWING.
  - ALL LEVELS IN METRES UNLESS NOTED OTHERWISE ON DRAWING.
  - ALL DIMENSIONS AND LEVELS TO BE CHECKED ON SITE PRIOR TO UNDERTAKING ANY WORKS. ORDERING MATERIALS OR FABRICATING ANY COMPONENTS.
  - THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEER'S AND ARCHITECT'S DRAWINGS AND RELEVANT SPECIFICATION CLAUSES.

- KEY**
- DENOTES PROPOSED DEVELOPMENT SITE BOUNDARY.
  - DENOTES EXISTING FOUL SEWER.
  - DENOTES EXISTING SURFACE WATER DARIANAGE



|             |     |          |             |     |      |      |      |
|-------------|-----|----------|-------------|-----|------|------|------|
| SI          | PO  | 13.06.22 | FIRST ISSUE |     |      |      |      |
| SUITABILITY | REV | DATE     | DESCRIPTION | Eng | CHKD | Appr | Auth |

DRAWING STATUS:  
PROJECT TITLE:  
**LAND ADJ TO CROWN STREET, GWALCHMAI**

DRAWING TITLE:  
**EXISTING TOPOGRAPHIC SURVEY AND DRAINAGE**

|             |                |             |           |             |                 |          |
|-------------|----------------|-------------|-----------|-------------|-----------------|----------|
| DRAWING No: | PROJECT        | ORIGINATOR  | VOL       | LOC         | TYPE            | ROLE     |
|             | <b>09422</b>   | <b>CCE</b>  | <b>V1</b> | <b>XX</b>   | <b>40:40:01</b> | <b>C</b> |
|             | <b>50:30</b>   | <b>0002</b> | <b>S1</b> | <b>P01</b>  |                 |          |
|             | CLASSIFICATION |             | No.       | SUITABILITY | REVISION        |          |

|                |                   |              |                |
|----------------|-------------------|--------------|----------------|
| ORIGINATOR:    | DATE:             | SCALE:       | ORIGINAL SIZE: |
| <b>M.Jones</b> | <b>13.06.2022</b> | <b>1:250</b> | <b>A1</b>      |

**CADARN**  
CONSULTING ENGINEERS

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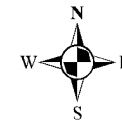
# **APPENDIX D**

## **Dŵr Cymru / Welsh Water Apparatus Map**

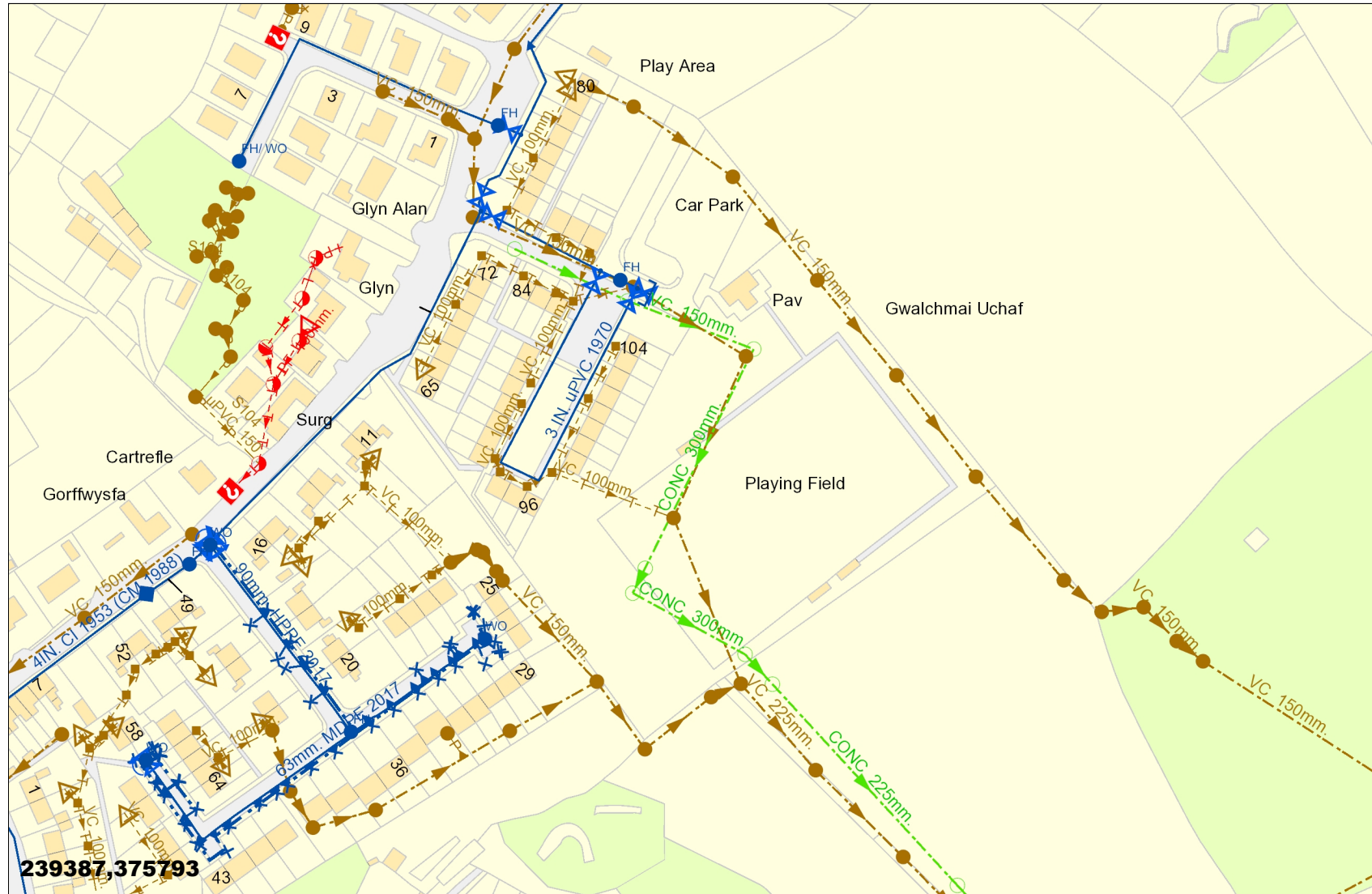


Dwr Cymru  
Welsh Water

16/06/2022



Scale: 1: 2163



**LEGEND**

**Clean Water**

- Sluce Val
- Air Val, SINGLE
- Tap
- Pressure Reducing Valve
- Meter
- BULK Meter
- FH
- Cap
- Existing Main
- NON COMPANY

**Sewerage External**

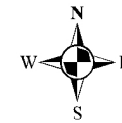
- Foul
- Surface Water
- Combined
- Rising Main
- Private
- Treatment Works
- Pumping Station
- Special Purpose
- Unknown End
- Change, Combined Overflow
- Outfall, FOUL
- Lamp Hole, Foul
- Private Sewer Transfer
- Lateral Drain
- Inspection Chamber

Dwr Cymru Cyfyngedig ('the Company') gives this information as to the position of its underground apparatus by way of general guidance only and on the strict understanding that it is based on the best information available and no warranty as to its correctness is relied upon in the event of excavations or other works made in the vicinity of the company's apparatus and any onus of locating the apparatus before carrying out any excavations rests entirely on you. The information which is supplied hereby by the company, is done so in accordance with statutory requirements of sections 198 and 199 of the water industry Act 1991 based upon the best information available and in particular, but without prejudice to the generality of the foregoing, it should be noted that the records that are available to the Company may not disclose the existence of a drain sewer or disposal main laid before 1 September 1989, or if they do, the particulars thereof including their position underground may not be accurate. It must be understood that the furnishing of this information is entirely without prejudice to the provision of the New Roads and Street Works Act 1991 and the company's right to be compensated for any damage to its apparatus.

**EXACT LOCATION OF ALL APPARATUS TO BE DETERMINED ON SITE**

Reproduced from the Ordnance Survey's maps with the permission of the Controller of Her Majesty's Stationary Office. Crown Copyright. Licence No: WU298565.

Whilst every reasonable effort has been taken to correctly record the pipe material of DCWW assets, there is a possibility that in some cases pipe material (other than Asbestos Cement or Pitch Fibre) may be found to be Asbestos Cement (AC) or Pitch Fibre (PF). It is therefore advisable that the possible presence of AC or PF pipes be anticipated and considered as part of any risk assessment prior to excavation



Scale: 1: 2163





**LEGEND**

**Clean Water**

-  Sluice Val
-  Air Val, SINGLE
-  Tap
-  Pressure Reducing Valve
-  Meter
-  BULK Meter
-  FH
-  Cap
-  Existing Main
-  NON COMPANY

**Sewerage External**

-  Foul
-  Surface Water
-  Combined
-  Rising Main
-  Private
-  Treatment Works
-  Pumping Station
-  Special Purpose
-  Unknown End
-  Change, Combined Overflow
-  Outfall, FOUL
-  Lamp Hole, Foul
-  Private Sewer Transfer
-  Lateral Drain
-  Inspection Chamber

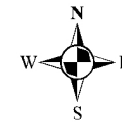
239553,375777

Dwr Cymru Cyfyngedig ('the Company') gives this information as to the position of its underground apparatus by way of general guidance only and on the strict understanding that it is based on the best information available and no warranty as to its correctness is relied upon in the event of excavations or other works made in the vicinity of the company's apparatus and any onus of locating the apparatus before carrying out any excavations rests entirely on you. The information which is supplied hereby by the company, is done so in accordance with statutory requirements of sections 198 and 199 of the water industry Act 1991 based upon the best information available and in particular, but without prejudice to the generality of the foregoing, it should be noted that the records that are available to the Company may not disclose the existence of a drain sewer or disposal main laid before 1 September 1989, or if they do, the particulars thereof including their position underground may not be accurate. It must be understood that the furnishing of this information is entirely without prejudice to the provision of the New Roads and Street Works Act 1991 and the company's right to be compensated for any damage to its apparatus.

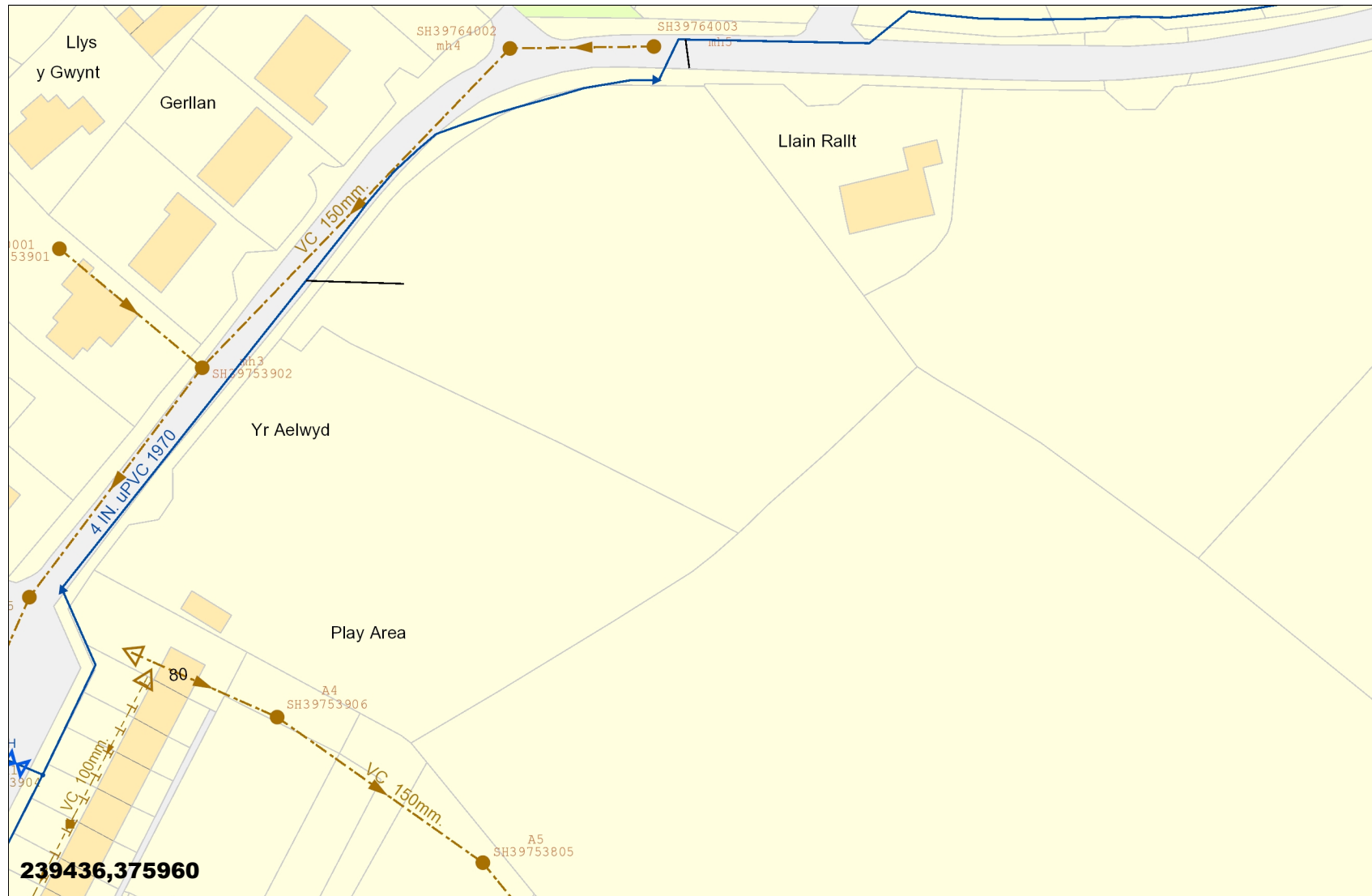
**EXACT LOCATION OF ALL APPARATUS TO BE DETERMINED ON SITE**

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





Scale: 1: 1043


















**LEGEND**

**Clean Water**

-  Sluice Val
-  Air Val, SINGLE
-  Tap
-  Pressure Reducing Valve
-  Meter
-  BULK Meter
-  FH
-  Cap
-  Existing Main
-  NON COMPANY

**Sewerage External**

-  Foul
-  Surface Water
-  Combined
-  Rising Main
-  Private
-  Treatment Works
-  Pumping Station
-  Special Purpose
-  Unknown End
-  Change, Combined Overflow
-  Outfall, FOUL
-  Lamp Hole, Foul
-  Private Sewer Transfer
-  Lateral Drain
-  Inspection Chamber

**239436,375960**

Dwr Cymru Cyfyngedig ('the Company') gives this information as to the position of its underground apparatus by way of general guidance only and on the strict understanding that it is based on the best information available and no warranty as to its correctness is relied upon in the event of excavations or other works made in the vicinity of the company's apparatus and any onus of locating the apparatus before carrying out any excavations rests entirely on you. The information which is supplied hereby by the company, is done so in accordance with statutory requirements of sections 198 and 199 of the water industry Act 1991 based upon the best information available and in particular, but without prejudice to the generality of the foregoing, it should be noted that the records that are available to the Company may not disclose the existence of a drain sewer or disposal main laid before 1 September 1989, or if they do, the particulars thereof including their position underground may not be accurate. It must be understood that the furnishing of this information is entirely without prejudice to the provision of the New Roads and Street Works Act 1991 and the company's right to be compensated for any damage to its apparatus.

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# **APPENDIX E**

## **‘Causeway Flow’ Hydraulic Model**

**Design Settings**

|                       |                   |                                      |               |
|-----------------------|-------------------|--------------------------------------|---------------|
| Rainfall Methodology  | FSR               | Maximum Time of Concentration (mins) | 30.00         |
| Return Period (years) | 100               | Maximum Rainfall (mm/hr)             | 50.0          |
| Additional Flow (%)   | 30                | Minimum Velocity (m/s)               | 1.00          |
| FSR Region            | England and Wales | Connection Type                      | Level Soffits |
| M5-60 (mm)            | 17.000            | Minimum Backdrop Height (m)          | 0.200         |
| Ratio-R               | 0.300             | Preferred Cover Depth (m)            | 1.200         |
| CV                    | 0.750             | Include Intermediate Ground          | ✓             |
| Time of Entry (mins)  | 5.00              | Enforce best practice design rules   | ✓             |

**Simulation Settings**

|                      |                   |                               |      |
|----------------------|-------------------|-------------------------------|------|
| Rainfall Methodology | FSR               | Drain Down Time (mins)        | 240  |
| FSR Region           | England and Wales | Additional Storage (m³/ha)    | 20.0 |
| M5-60 (mm)           | 17.000            | Check Discharge Rate(s)       | ✓    |
| Ratio-R              | 0.300             | 1 year (l/s)                  | 5.5  |
| Summer CV            | 0.750             | 30 year (l/s)                 | 11.2 |
| Winter CV            | 0.840             | 100 year (l/s)                | 13.5 |
| Analysis Speed       | Normal            | Check Discharge Volume        | ✓    |
| Skip Steady State    | x                 | 100 year +30% 360 minute (m³) | 362  |

**Storm Durations**

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440

| Return Period (years) | Climate Change (CC %) | Additional Area (A %) | Additional Flow (Q %) |
|-----------------------|-----------------------|-----------------------|-----------------------|
| 1                     | 30                    | 10                    | 0                     |
| 30                    | 30                    | 10                    | 0                     |
| 100                   | 30                    | 10                    | 0                     |

**Pre-development Discharge Rate**

|                        |            |                              |   |
|------------------------|------------|------------------------------|---|
| Site Makeup            | Brownfield | Time of Concentration (mins) |   |
| Brownfield Method      | MRM        | Betterment (%)               | 0 |
| Contributing Area (ha) | 0.610      | Q 1 year (l/s)               |   |
| PIMP (%)               | 100        | Q 30 year (l/s)              |   |
| CV                     | 0.750      | Q 100 year (l/s)             |   |

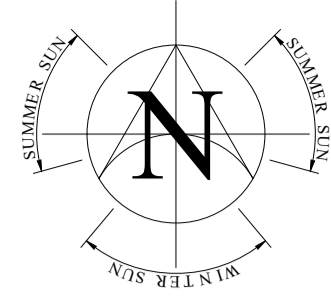
**Pre-development Discharge Volume**

|                        |            |                       |       |                    |       |
|------------------------|------------|-----------------------|-------|--------------------|-------|
| Site Makeup            | Brownfield | CV                    | 0.750 | Betterment (%)     | 0     |
| Brownfield Method      | MRM        | Return Period (years) | 100   | PR                 | 0.750 |
| Contributing Area (ha) | 0.610      | Climate Change (%)    | 30    | Runoff Volume (m³) | 362   |
| PIMP (%)               | 100        | Storm Duration (mins) | 360   |                    |       |



# **APPENDIX F**

## **Existing Greenfield Impermeable Area Plan**



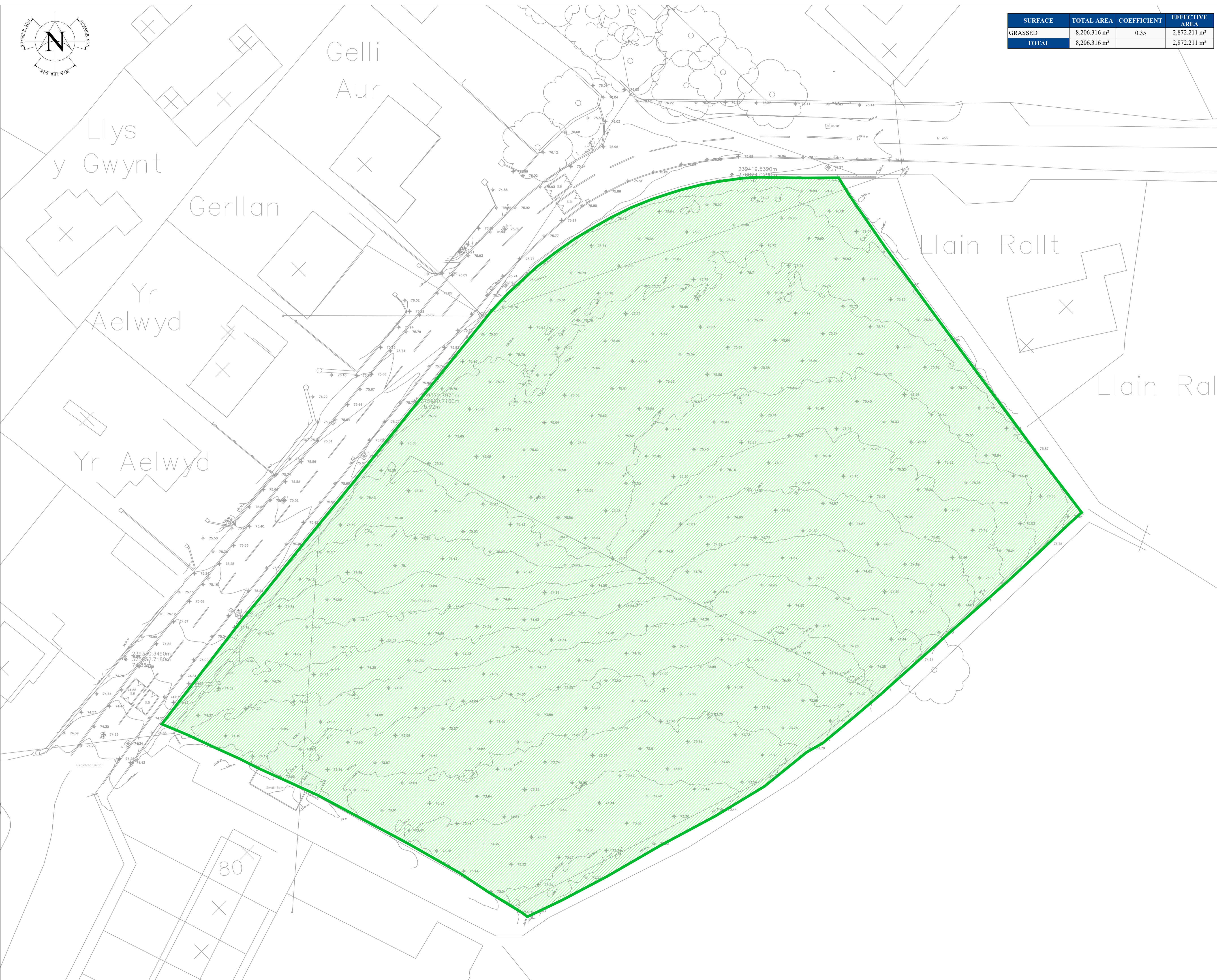
| SURFACE      | TOTAL AREA                     | COEFFICIENT | EFFECTIVE AREA                 |
|--------------|--------------------------------|-------------|--------------------------------|
| GRASSED      | 8,206.316 m <sup>2</sup>       | 0.35        | 2,872.211 m <sup>2</sup>       |
| <b>TOTAL</b> | <b>8,206.316 m<sup>2</sup></b> |             | <b>2,872.211 m<sup>2</sup></b> |

**NOTES**

- DO NOT SCALE FROM THIS DRAWING.
- ALL LEVELS IN METRES UNLESS NOTED OTHERWISE ON DRAWING.
- ALL DIMENSIONS AND LEVELS TO BE CHECKED ON SITE PRIOR TO UNDERTAKING ANY WORKS, ORDERING MATERIALS OR FABRICATING ANY COMPONENTS.
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEER'S AND ARCHITECT'S DRAWINGS AND RELEVANT SPECIFICATION CLAUSES.

**KEY**

- DENOTES AREA OF EXISTING GRASS.
- DENOTES SITE BOUNDARY



|             |     |          |             |     |     |      |      |
|-------------|-----|----------|-------------|-----|-----|------|------|
| SI          | PO  | 19.06.22 | FIRST ISSUE |     |     |      |      |
| SUITABILITY | REV | DATE     | DESCRIPTION | Eng | CHK | Appr | Auth |

DRAWING STATUS:  
PROJECT TITLE:  
**LAND ADJ TO CROWN STREET, GWALCHMAI**

DRAWING TITLE:  
**EXISTING AREAS**

|             |         |            |      |          |      |      |
|-------------|---------|------------|------|----------|------|------|
| DRAWING No: | PROJECT | ORIGINATOR | VOL. | LOC.     | TYPE | ROLE |
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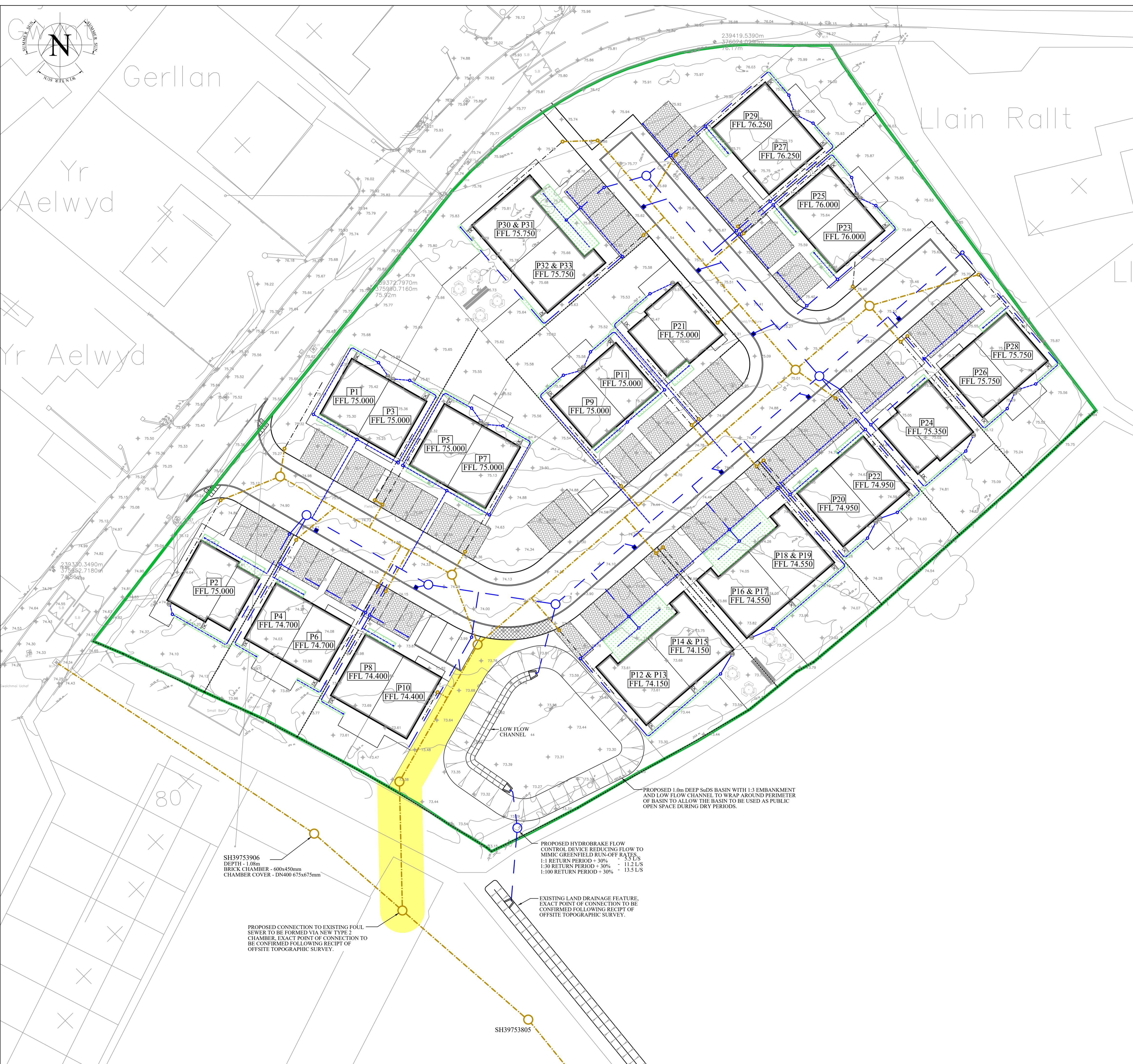
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|-------------|------------|--------|----------------|
| ORIGINATOR: | DATE:      | SCALE: | ORIGINAL SIZE: |
| M.Jones     | 13.06.2022 | 1:250  | A1             |



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Tel: 01407 730912

# **APPENDIX G**

## **Proposed Drainage Layout**



**NOTES CONTINUED**

23. BACKFILLING TO PIPE TRENCHES BENEATH LANDSCAPED AREAS TO BE SELECTED EXCAVATE MATERIAL FREE FROM LARGE STONES GREATER THAN 0mm. LUMPS OF CLAY OVER 100mm, ANY TIMBER, FROZEN MATERIAL OR VEGETATION MATTER UP TO FROMATION / GROUND LEVEL FROM THE TOP OF THE SPECIFIED PIPE SURROUND (WELL COMPACTED IN 150mm LAYERS)
24. GRANULAR MATERIAL NOMINAL SIZE 20mm SINGLE SIZED OR 14mm TO 5mm GRADED.
25. BACKFILL MUST NOT BE PLACED ON CONCRETE BEDDING OR SURROUND UNTIL THE CONCRETE COMPRESSIVE STRENGTH HAS REACHED 15N/mm<sup>2</sup>.
26. BRICKS OR BLOCKS MUST NOT BE PLACED IN THE BEDDING MORTAR FOR SETTING THE PIPES TO LEVEL.
27. ALL ROCKER PIPE LENGTHS TO BE MIN 600mm.
28. PROVIDE ROCKER PIPES AT TRANSITION FROM CONCRETE SURROUND TO GRANULAR SURROUND.
29. MAX DISTANCE FROM FACE OF CONCRETE SURROUND TO FIRST FLEXIBLE JOINT TO BE 150mm.
30. MANHOLE COVERS AND FRAMES MANHOLE COVERS AND FRAMES SHALL COMPLY WITH THE RELEVANT PROVISIONS OF THE BS EN 124M BS 7903 AND HIGHWAYS AGENCY GUIDANCE DOCUMENT HA 104/99. THEY SHALL BE OF NON ROCKING DESIGN WHICH DOES NOT RELAY TO THE CUSHION INSERTS. MANHOLE COVER ON FOUL ONLY SEWERS SHALL BE OF LOW LEAKAGE TYPES IN ORDER TO PREVENT EXCESSIVE SURFACE WATER INGRESS AS A MINIMUM, CLASS D400 SHALL BE USED IN CARRIAGEWAYS OR ROADS (INCLUDING PEDESTRIAN STREETS, HARD SHOULDERS AND PARKING AREAS USED BY ALL TYPES OF VEHICLES).
31. CONSTRUCTION OF SEWER TO BE IN ACCORDANCE WITH WELSH MINISTERS STANDARDS AND SFA 7TH EDITION.

**KEY**

- DENOTES PROPOSED FOUL CHAMBER & PIPE RUN TO BE ADOPTED BY WELSH WATER.
- DENOTES PROPOSED FOUL CHAMBER & PIPE RUN TO BE ADOPTED BY WELSH WATER.
- DENOTES EXISTING COMBINED FOUL SEWER.
- DENOTES PROPOSED SURFACE WATER CHAMBER & PIPE RUN, TO BE ADOPTED BY THE SuDS APPROVAL BODY (SAB)
- DENOTES PROPOSED RODDING EYE.
- DENOTES PROPOSED HIGHWAY GULLY AND 0 150mm CONNECTION TO SURFACE WATER NETWORK TO BE ADOPTED BY THE HIGHWAY AUTHORITY UNDER SECTION 38.0F OF THE HIGHWAYS ACT 1980.
- DENOTES PROPOSED SITE BOUNDARY.
- DENOTES PROPOSED POROUS PAVING TO BE LOCATED MIN 3m FROM ANY FOUL SEWER.
- DENOTES ABOVE GROUND WATER BUTT AT BASE OF RAIN WATER DOWN PIPE.
- DENOTES DISH CHANNEL KERB TO CONVEY WATER FROM WATER BUTT INTO RAIN GARDEN.
- DENOTES PROPOSED RAIN GARDEN WITH PERFORATED PIPE TO INTERCEPT SURFACE WATER THROUGH INFILTRATION.
- DENOTES EXTENT OF 6M EASEMENT

**NOTES**

1. ALL LEVELS IN METERS UNLESS NOTED OTHERWISE ON DRAWING.
2. ALL DIMENSIONS AND LEVELS TO BE CHECKED ON SITE PRIOR TO UNDERTAKING ANY WORKS. ORDERING MATERIALS OR FABRICATING ANY COMPONENTS.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS AND ARCHITECTS DRAWINGS AND RELEVANT SPECIFICATION CLAUSES.
4. PLEASE REFER TO ARCHITECTS DRAWINGS FOR FINAL BUILDING LOCATION.
5. THE LOCAL AUTHORITY AND SERVICE COMPANIES ARE TO BE NOTIFIED PRIOR TO COMMENCEMENT OF WORK ON SITE.
6. ALL DRAINAGE COMPONENTS ARE TO COMPLY WITH CURRENT BRITISH STANDARDS AND BUILDING REGULATIONS REQUIREMENTS.
7. ALL WORKS TO BE IN ACCORDANCE WITH THE LOCAL AUTHORITYS ROADS FOR ADOPTION SPECIFICATION.
8. ALL WORKS AND MATERIALS TO BE IN ACCORDANCE WITH THE SPECIFICATION FOR HIGHWAY WORKS (SHW SERIES 500).
9. DRAIN PIPE THROUGH WALLS OR BENEATH FOUNDATIONS (SPREAD ONLY) TO HAVE R.C BRIDGE LINTELS OVER AND PIPE SURROUNDED IN FLEXIBLE MATERIAL (50mm).
10. FINIAL LOCATIONS AND DETAILS OF SOIL VENT PIPES, STUB STACKS, RAINWATER DOWN PIPES, GULLIES ETC. TO BE CONFIRMED BY REFERENCE TO ARCHITECT DRAWINGS.
11. ALL THRESHOLD DRAIN DETAILS TO BE TO ARCHITECT DETAILS.
12. ALL PIPES INTO CHAMBERS TO SOFFIT TO SOFFIT U.N.O.
13. AT ALL OUTFALL POINTS TO AN EXISTING NETWORK, THE POSITION AND INVERT LEVEL OF EXISTING DRAINS MUST BE CONFIRMED WELL IN ADVANCE OF THE PROGRAMMED DATE FOR INSTALLING ANY OF THE UPSTREAM DRAINAGE, OR ORDERING OF ANY MATERIALS IN ORDER TO ALLOW TIME FOR ANY NECESSARY REVISIONS TO THE HYDRAULIC DESIGN.
14. ALL GRAVITY UPVC PIPEWORK TO BE TO BS 4660 OR BS 5481 WHERE RELEVANT UNLESS NOTED OTHERWISE.
15. ALL NON ADOPTABLE DOMESTIC FOUL AND SURFACE WATER PIPE RUNS SHALL CONSIST OF 100mm DIA. PIPES LAID AT NO FLATTER THAN 1:80 FALLS U.N.O. A SEWER OR LATERAL DRAIN WITH A NOMINAL INTERNAL DIAMETER OF 100mm, OR A LATERAL DRAIN SERVING TEN OR LESS PROPERTIES IS LAID TO A GRADIENT NOT FLATTER THAN 1:80, WHERE THERE IS AT LEAST ONE WC CONNECTED AND 1:40 IF THERE IS NO WC CONNECTED.
16. ALL CONNECTIONS FROM HIGHWAY GULLIES TO BE 150mm DIA. LAID AT FALLS OF BETWEEN 1:20 AND 1:100 WITH TYPE S BED AND SURROUND TO ALL CONNECTIONS WITH MIN. 1.20m COVER, TYPE Z BED AND SURROUND TO ALL OTHER CONNECTIONS.
17. THERMOPLASTIC PIPES & FITTINGS: THERMOPLASTIC PIPES, JOINTS & FITTINGS FOR GRAVITY SEWERS SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS EN 1401-1, BS EN 1852 & BS EN 12666-1.
18. THERMOPLASTIC STRUCTURED WALL PIPE: THERMOPLASTIC STRUCTURED WALL SEWER PIPE SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS EN 13476-1 & WS 4-35-01 AND BS EN 13476-2 OR BS EN 13476-3. PIPES SHALL BE BSI KITEMARKED OR HAVE EQUIVALENT THIRD PART CERTIFICATION. PIPES LESS THAN OR EQUAL TO 500mm IN DIAMETER SHALL HAVE NOMINAL SHORT-TERM RING STIFFNESS NOT LESS THAN 8kN/m<sup>2</sup> (SN8) OR BE SUBJECT TO A QUALITY SYSTEM FOR STORAGE & EMBEDMENT. Nom. SHORT TERM RING STIFFNESS OF 2kN/m<sup>2</sup> (SN2) IS ACCEPTABLE FOR PIPES GREATER THAN 0500mm, SUBJECT TO SUPPORTING STRUCTURAL DESIGN LOAD CALCULATIONS BEING PROVIDED. TRANSPORTATION, HANDLING, STORAGE AND LAYING SHALL BE IN ACCORDANCE WITH THE MANUFACTURERS INSTRUCTIONS. WHERE A FITTING IS INSTALLED ON A SEWER LENGTH, IT SHALL HAVE THE SAME INTERNAL BORE AS THE SEWER. Max. LENGTH OF PIPE FOR LAYING IS 3.0m OR Ø x 10, WHICHEVER IS THE GREATER, UNLESS WELDED JOINTS ARE USED.
19. CONNECTION TO THE PUBLIC SEWER A SECTION 106 APPLICATION TO CONNECT MUST BE MADE TO DCWW. THE DEVELOPER SHALL GIVE 21 DAYS NOTICE PRIOR TO CONNECTION. THE WORKS MAY ONLY BE UNDERTAKEN BY A DCWW HEALTH AND SAFETY APPROVED CONTRACTOR.
21. OPTIMUM TRENCH WIDTH OPTIMUM TRENCH WIDTH = PIPE + 300mm. CONTRACTOR TO ENSURE TRENCH WALLS ARE SUITABLY PROPPED.
22. BACKFILLING TO PIPE TRENCHES BENEATH ROADS, CAR PARKING AND STRUCTURES TO BE M.O.T. TYPE 1 GRANULAR MATERIAL UP TO FORMATION LEVEL FROM THE TOP OF THE SPECIFIED PIPE SURROUND (WELL COMPACTED IN 150mm LAYERS).

| SI | NO | DATE     | DESCRIPTION | Eng | CHKD | Appr | Auth |
|----|----|----------|-------------|-----|------|------|------|
|    | 01 | 21.06.22 | FIRST ISSUE |     |      |      |      |

DRAWING STATUS: PROJECT TITLE: **LAND ADJ TO CROWN STREET, GWALCHMAI**

DRAWING TITLE: **PROPOSED SECTION 104 DRAINAGE LAYOUT**

| PROJECT        | ORIGINATOR | VOL.        | LOC.     | TYPE     | ROLE |
|----------------|------------|-------------|----------|----------|------|
| 009422         | CCE        | V1          | XX       | 40:40:01 | C    |
| CLASSIFICATION | No.        | SUITABILITY | REVISION |          |      |
| 50:30          | 0006       | S1          | P01      |          |      |

| ORIGINATOR: | DATE:      | SCALE: | ORIGINAL SIZE: |
|-------------|------------|--------|----------------|
| B.Thorne    | 21.06.2022 | 1:250  | A1             |



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# **APPENDIX H**

## **Proposed Impermeable Area Plan**



| SURFACE      | TOTAL AREA                     | COEFFICIENT | EFFECTIVE AREA                |
|--------------|--------------------------------|-------------|-------------------------------|
| HOUSES       | 1,646.241 m <sup>2</sup>       | 1.00        | 1,646.241 m <sup>2</sup>      |
| PARKING      | 864.832 m <sup>2</sup>         | 1.00        | 864.832 m <sup>2</sup>        |
| ROAD         | 1,461.139 m <sup>2</sup>       | 1.00        | 1,461.139 m <sup>2</sup>      |
| PATHS        | 1,189.051 m <sup>2</sup>       | 1.00        | 1,189.051 m <sup>2</sup>      |
| GRASS        | 2,615.401 m <sup>2</sup>       | 0.35        | 915.390 m <sup>2</sup>        |
| SWALE        | 429.651 m <sup>2</sup>         | 1.00        | 429.651 m <sup>2</sup>        |
| <b>TOTAL</b> | <b>8,206.316 m<sup>2</sup></b> |             | <b>6506.304 m<sup>2</sup></b> |

- NOTES**
- DO NOT SCALE FROM THIS DRAWING.
  - ALL LEVELS IN METRES UNLESS NOTED OTHERWISE ON DRAWING.
  - ALL DIMENSIONS AND LEVELS TO BE CHECKED ON SITE PRIOR TO UNDERTAKING ANY WORKS, ORDERING MATERIALS OR FABRICATING ANY COMPONENTS.
  - THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEER'S AND ARCHITECT'S DRAWINGS AND RELEVANT SPECIFICATION CLAUSES.

- KEY**
- ▨ DENOTES AREA OF PROPOSED GRASS.
  - ▨ DENOTES AREA OF PROPOSED HOUSES.
  - ▨ DENOTES AREA OF PROPOSED PARKING.
  - ▨ DENOTES AREA OF PROPOSED CONCRETE PATHS.
  - ▨ DENOTES AREA OF PROPOSED ROAD.
  - ▨ DENOTES AREA OF PROPOSED SWALE.
  - DENOTES SITE BOUNDARY

| SI | NO  | DATE     | DESCRIPTION | By | CHK'd | App'd | Auth |
|----|-----|----------|-------------|----|-------|-------|------|
| S1 | P01 | 20.06.22 | FIRST ISSUE |    |       |       |      |

PROJECT TITLE:  
**LAND ADJ TO CROWN STREET, GWALCHMAI**

DRAWING TITLE:  
**PROPOSED AREAS**

| PROJECT        | ORIGINATOR | VOL.        | LOC.     | TYPE     | ROLE |
|----------------|------------|-------------|----------|----------|------|
| 09422          | CCE        | V1          | XX       | 40:40:01 | C    |
| CLASSIFICATION | No.        | SUITABILITY | REVISION |          |      |
| 50:30          | 0004       | S1          | P01      |          |      |

| ORIGINATOR | DATE       | SCALE | ORIGINAL SIZE |
|------------|------------|-------|---------------|
| B.Thorne   | 20.06.2022 | 1:250 | A1            |



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