



306-011-RP1

Flood Consequence Assessment and SuDs Drainage Strategy

Land at Dowlais Top, Merthyr Tydfil

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1 Introduction

Haydn Evans Consulting Ltd (HEC) has been commissioned by Conrad Energy (Developments) II Ltd (hereafter referred to as the Client) to carry out a Flood Consequence Assessment (FCA) and SuDS Surface Water Drainage Strategy to support a planning application for the construction and operation of a Hydrogen Plant with associated infrastructure and access.

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1.1 Site Proposal

The proposed development covers a total area of approximately 0.22 hectares (ha).

A hydrogen scheme is proposed, which will utilise fuel cells to convert hydrogen into electricity. Various infrastructure is proposed across the site to facilitate the proposed development, along with a hardstanding access road. Two accesses are proposed to allow vehicle circulation around the site, via the existing access to the sub-station to the north, which is under the ownership of the Client.

2 Location & Existing Conditions

2.1 Site Location

The site is located to the north of Dowlais in Pengarnddu, Merthyr Tydfil on approximate Ordnance Survey (OS) the grid reference 307671,208881 (see Figure 1).

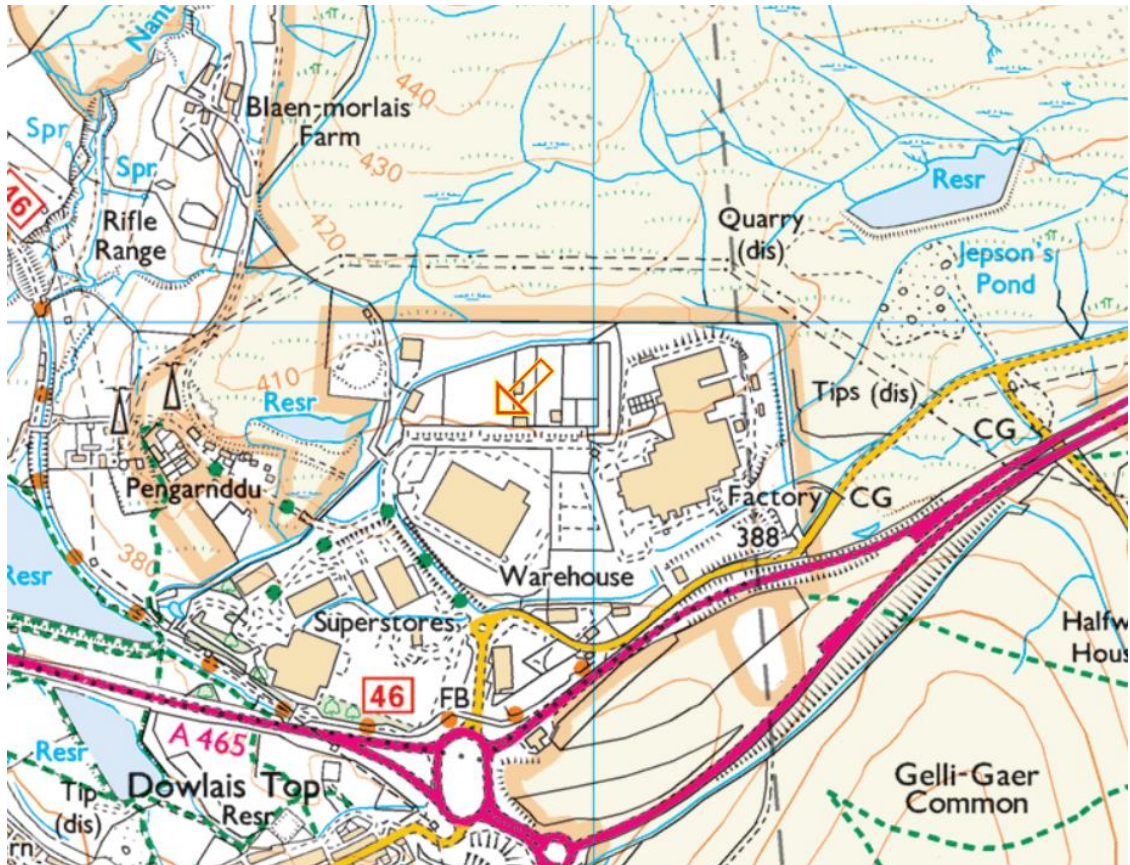


Figure 1: Site location map

The red line boundary on Figure 2 demonstrates the location of the site in relation to the wider site area in the ownership of the Client.



Figure 2 - Red line boundary

The site is predominantly surrounded by land used for industrial purposes. The sub-station under Client ownership is located directly north of the development site with a wooded area forming the northern boundary beyond, a scrap yard is located to the east of the site, a further substation to the west and a buffer 'mound' to the south. Access to the site is from the south where the industrial estate carriageway is present, to the south of the buffer.

2.2 Existing Topography

A topographical survey has been produced for the site (see Appendix A). A 'mound' is shown in the centre of the site, with levels falling away from this area - it is assumed that this will be removed to facilitate the development area and therefore it is not referred to any further in this report. The survey shows ground levels across the site to generally fall from north-east to south-west. The ground levels at the high point are circa 402.0metres Above Ordnance Datum (mAOD), falling to circa 400.5 in the south-east. The level difference across the site is therefore approximately 1.5m over a distance of approximately 55m.

The survey shows some vegetation along the southern boundary of the site.

2.3 Existing Sewer Assets

Welsh Water (WW) sewer records show a 300mm vitrified clay surface water pipe to be present in the existing access road to the site (see Appendix B). This connects into a 375mm vitrified clay surface water pipe in the carriageway to the south of the site, shown to flow in an east to west direction. No chambers are shown on the record drawing.

The topographical survey shows two inspection chambers located to the immediate west of the site. A channel drain is also shown to be located across the wider site access.

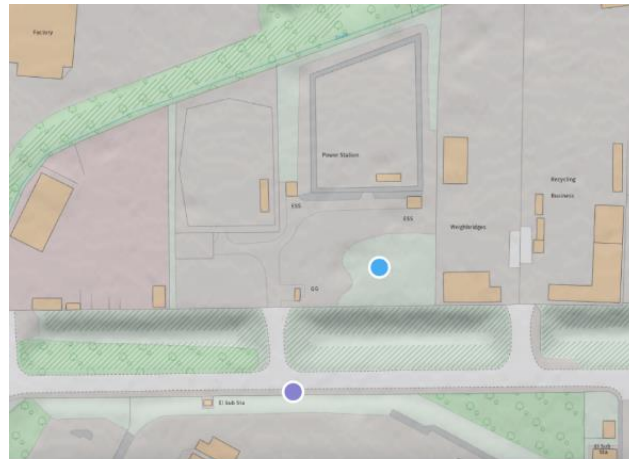
A 150mm uPVC pipe is also present in the carriageway to the south of the site, shown to flow in a west to east direction.

2.4 Existing Drainage Regime

There is no formal drainage regime for this site, surface water is likely to flow overland following the ground topography from north-east to south-west.

2.5 Ground Conditions

British Geological Survey (BGS) mapping confirms the site to have a bedrock geology of South Wales Lower Coal Measures Formation (mudstone, siltstone, and sandstone) (see Figure 3) and superficial deposits of Till, Devensian (Diamicton) (see Figure 4).

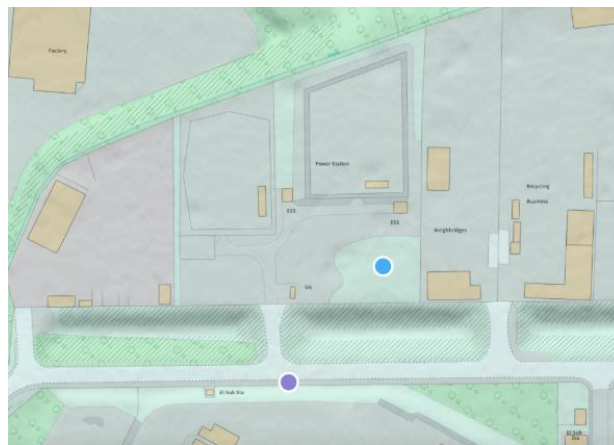


Geology

Bedrock geology

South Wales Lower Coal Measures Formation - Mudstone, siltstone and sandstone. Sedimentary bedrock formed between 319 and 318 million years ago during the Carboniferous period.

Figure 3: BGS map - Bedrock geology.



Geology

Superficial deposits

Till, Devensian - Diamicton. Sedimentary superficial deposit formed between 116 and 11.8 thousand years ago during the Quaternary period.

Figure 4: BGS map - Superficial deposits.

Infiltration testing was conducted on land to the north of the site, and subsequently the surface water drainage strategy for that site was developed utilising infiltration drainage techniques (see section 5 for more information).

Online mapping shows the site to be in an area with a 'low' groundwater vulnerability. The depth to groundwater is currently unknown.

3 Planning Policy Context

3.1 Planning Policy Wales - Technical Advice Note 15: Development and Flood Risk

This Technical Advice Note (TAN 15) provides technical guidance which supplements the policy set out in Planning Policy Wales (PPW) and advises on development and flood risk in relation to sustainability. It also provides framework within which flood risks can be assessed.

The general approach of PPW, with TAN, is to advise caution in respect of new development in areas at high risk of flooding by setting out a precautionary framework to guide planning decisions. The precautionary framework guidance is to direct new development away from those areas which are at high risk of flooding and where developments must be considered in high-risk areas (zone C). The precautionary framework is used for both forward planning and development control purposes.

The planning authority will need to be satisfied that a proposal is justified and that the consequences of flooding are acceptable. Where the risks/consequences of flooding cannot be managed to an acceptable level then developing in these areas shall be avoided.

3.2 Welsh Government - Statutory standards for sustainable drainage systems (2018)

There are two types of required Standards. Standard S1 is a Hierarchy Standard while S2 to S6 are Fixed Standards. The Fixed Standards (Standards S2 to 6) give:

- Design Standards which state the minimum design criteria that all SuDS should satisfy; and
- Standards which state how SuDS should be built, maintained and operated.

3.3 Merthyr Tydfil SAB Advice & Guidance

All new developments will require sustainable drainage to manage on-site surface water which must be designed and built in accordance with the mandatory standards for sustainable drainage published by Welsh Government. These systems must be approved by the local authority acting in its role as a SuDS Approval Body (SAB) before construction work begins. The SAB will have a duty to adopt compliant systems.

Schedule 3 of the Flood and Water Management Act (FWMA) 2010 requires surface water drainage for new developments to comply with the Statutory National Standards for SuDS in Wales.

4 Flood Consequence Assessment

4.1 Introduction

In line with the PPW and TAN 15, the main sources of flooding have been assessed as part of this report, as follows:

- Tidal and Fluvial;
- Pluvial;
- Groundwater;
- Sewers; and
- Reservoirs and other artificial sources.

4.2 Tidal and Fluvial

Tidal, or coastal flooding from the sea, is the inundation of land along the coast usually caused by high tides or storm surge. Fluvial, or river flooding, occurs when the water level in a river, lake or stream rises and overflows onto neighbouring land because of the capacity of rivers being exceeded by the river flow.

Due to the location of the site (inland), the site is not at risk of tidal flooding.

There are no Main Rivers in the immediate vicinity of the site. The Natural Resources Wales (NRW) website confirms the site location is not in an area at likelihood of flooding and is therefore classified as being at less than 0.1% annual risk of flooding from rivers and seas (see Figure 5). A minor watercourse is shown on OS mapping to form the substation to the north's northern boundary, flowing in a south-westerly direction.



Figure 5: Natural Resources Wales Flood Map - River Flooding

The closest area at risk of flooding from rivers is located approximately 1.3km west of the site at its closest point.

The site is at low risk of flooding from tidal and fluvial sources.

4.3 Pluvial

Pluvial, or surface water flooding, occurs when heavy rainfall creates a flood independent of an overflowing water body. Pluvial flooding can occur in any location and is usually a result of intense rainfall saturating an urban drainage system, rainfall run-off on elevated terrain or where natural ground has been paved. Surface water run-off can be channelled either by natural features such as valley lines or by artificial features such as highways, to low points in the topography. If surface water is not able to flow away from topographical low points, then pluvial flooding can occur.

The NRW Flood Risk from Surface Water & Small Watercourses map (see Figure 6) shows the site and majority of the surrounding area to be at a very low risk of flooding from surface water.

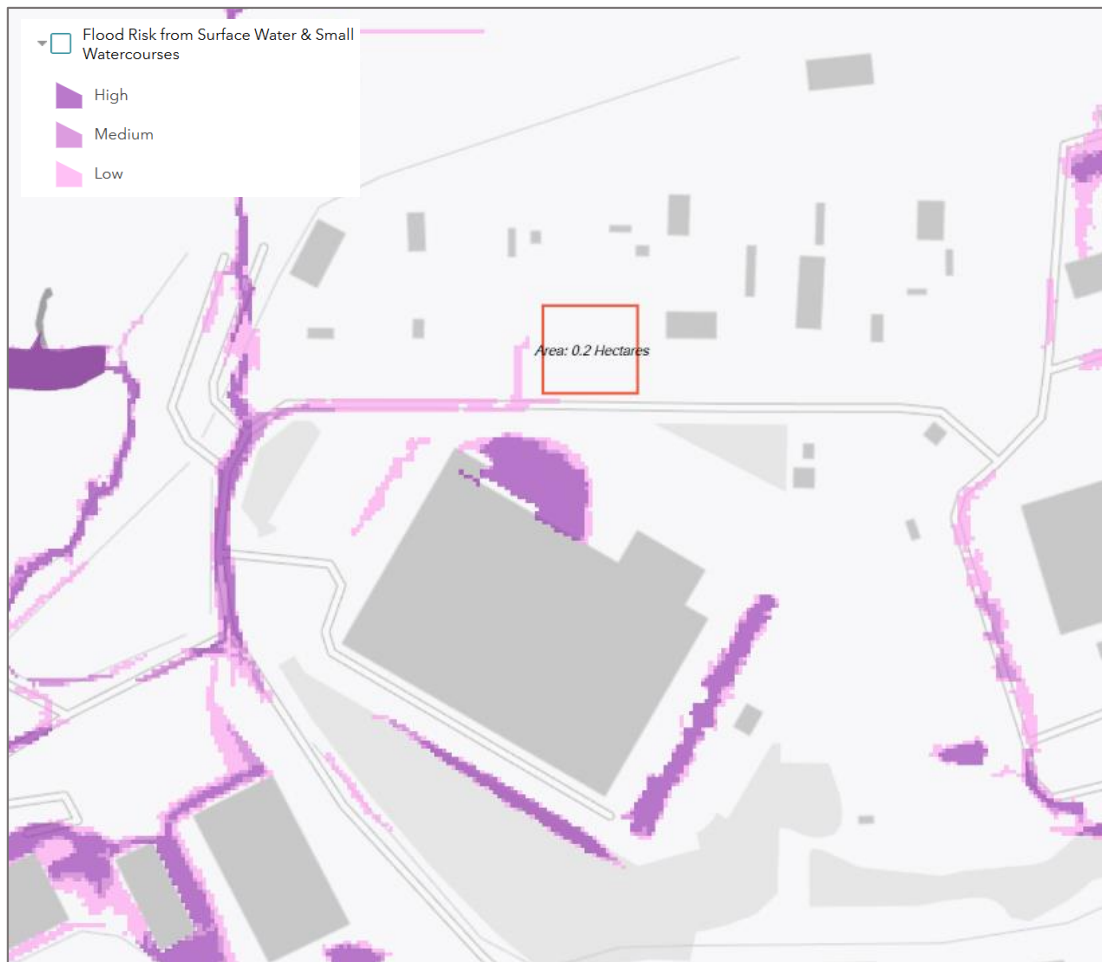


Figure 6: NRW Flood Risk from Surface Water & Small Watercourses map

The area shown to be most at risk within the immediate vicinity of the site is just beyond the south-western boundary of the site. Ground levels in this location are lower than the on-site levels and as such the surface water run-off would flow away from the proposed site. Refer to Figure 6 above.

OS mapping contours show surrounding ground levels fall from the north-east to the south-west. The land to the north of the site is at a higher elevation and largely greenfield land, with a network of minor watercourses and reservoirs. The risk of a significant amount of surface water from reaching the site is low, because the existing drainage features would most likely intercept any overland flow prior to it reaching the site.

The proposed surface water drainage strategy for the site is outlined in section 5 of this report. In summary, the surface water drainage proposals for the site mimic the existing drainage regime and restrict run-off to greenfield run-off rates; this mitigates the potential for any surface water flooding to occur at the site and reduces the risk of surface water flooding to off-site receptors.

The site is at a low risk of flooding from this source.

4.4 Groundwater

Groundwater flooding generally occurs when water levels below the ground rise during wet winter months; these levels usually fall again in the summer months as water flows out into rivers.

As discussed in Section 2.5, the site is in a low groundwater vulnerability area and therefore groundwater expression at the surface is unlikely.

The site is at low risk of flooding from this source.

4.5 Sewers

As discussed in section 2.3, Welsh Water sewers are located in the industrial estate carriageway to the south of the site; this area is at a lower elevation to the site and therefore is unlikely that any flooding caused by these assets would affect the site.

The site is at a low risk of flooding from sewers.

4.6 Reservoirs & Artificial Sources

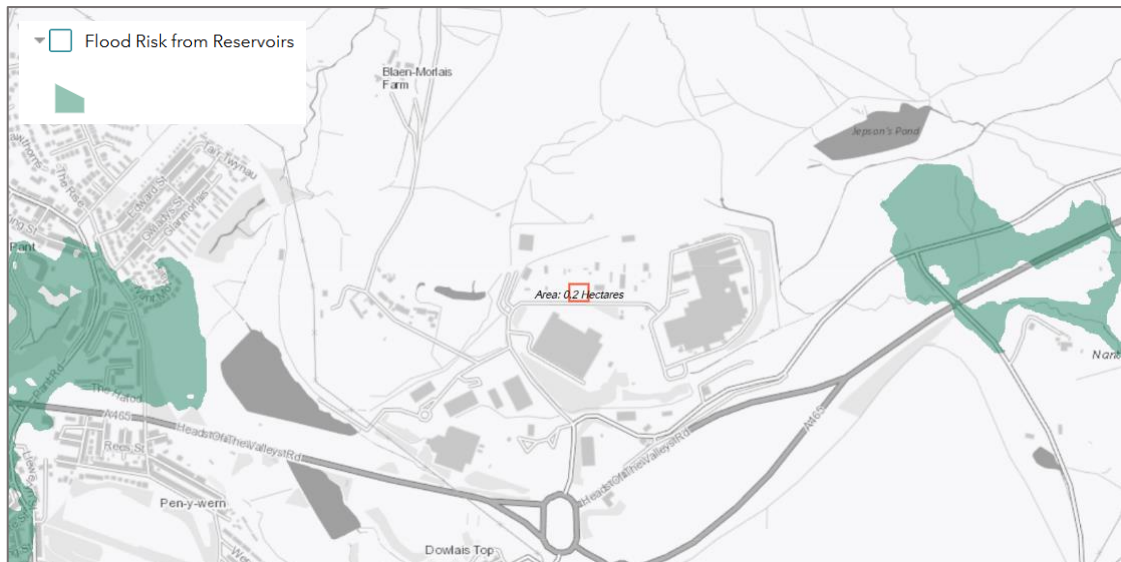


Figure 7: NRW Flood Risk from Reservoirs map

A review of OS mapping shows a reservoir located approximately 260m to the west of the site; this is Pengarnddu Underground Reservoir, operated by Welsh Water. A small open reservoir is located adjacent which is assumed to be associated with the underground reservoir. Information provided by NRW states the following: *'Reservoir flooding is extremely unlikely to happen. There has been no loss of life in the UK from reservoir flooding since 1925. All large reservoirs must be inspected and supervised by reservoir panel engineers. As the enforcement authority for the Reservoirs Act 1975 in Wales, we ensure that reservoirs are inspected regularly, and essential safety work is carried out.'*

The site is at low risk of flooding from these sources.

5 SuDS Drainage Strategy

The surface water drainage strategy has been designed based on the requirements of Flood & Water Management Act 2010 Schedule 3 Sustainable Drainage and the Welsh Government document *Statutory standards for sustainable drainage systems* (2018) which, as mentioned in section 3, has required standards to achieve. The standards are listed below, along with justification for meeting the requirements.

5.1 Standard S1 - Surface water runoff destination

5.1.1 Priority Level 1: Surface water runoff is collected for use.

It is not possible to collect surface water runoff for re-use due to the intermittent use of the site, the site will be un-maned with only occasional maintenance visits. Re-use of surface water runoff would be insufficient.

5.1.2 Priority Level 2: Surface water runoff is infiltrated into the ground.

It is proposed to discharge surface water runoff generated by the site into the ground using infiltration techniques.

Infiltration testing was undertaken immediately to the north of the site, for land operated by the client. Tests were undertaken by Nolan Associates in 2015. The least favourable test result rate has been used in the drainage design for this site which is 1.93×10^{-5} , a copy of this is included in Appendix C.

Surface water generated by the site is discharged via an infiltration blanket or an infiltration swale. Hardstanding areas should be laid to fall towards the infiltration feature.

5.2 Standard S2 - Surface water runoff hydraulic control

Surface water is managed to prevent discharge from the site for rainfall events of less than 5mm through the use of infiltration.

The site has been split into three areas in order to model the drainage design effectively based on the SuDS technique relevant to the area. Attenuation has been sized using FEH data and Causeway Flow software to accommodate the temporary run-off for rainfall events up to and including the 1:100 year event. In order to consider the consequences of a greater event, an exercise has been undertaken for the 1:100 year plus 40% climate change. The contributing areas and attenuation volumes are shown on drawings 306-011-D001 and D002 in Appendix C, these are summarised in Table 1 below:

Area	SuDS Component	Contributing Area (ha)	Attenuation Volume - 1:100 year (m ³)	Attenuation Volume - 1:100 year + 40% climate change (m ³)
1	Infiltration blanket	0.120	40.0	64.2
2	Infiltration blanket	0.042	14.2	22.5
3	Swale and filter trench	0.035	15.3	22.8

Table 1 - SuDS feature information

The SuDS features accommodate the 100 year plus 40% climate change event. The surface water strategy prevents the first 5mm of rainfall leaving the site. The surface water drainage drawings and supporting calculations are provided in Appendix C.

5.3 Standard S3 - Surface water quality management

The above proposal ensures that surface water is managed 'at source'. All surface water from the site will pass through the infiltration blanket or the swale; the swale will have a filter drain underneath. In accordance with the CIRIS SuDS Manual C753, this type of development has a 'Low' pollution hazard level, as shown in table 26.2 of C753. The relevant land use is tabled below, with the SuDS pollution indices tabled (as per table 26.4 of C753).

Pollution Hazard indices for different land use classifications				
Land Use	Pollution Hazard Level	Total suspended solids pollution index	Metals	Hydrocarbons (HC)
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, home zones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie., 300 traffic movements/day	Low	0.5	0.4	0.4
Indicative SuDS mitigation indices for discharges to surface waters				
Area 1				
A soil with good contaminant attenuation potential of at least 300mm in depth.		0.4	0.3	0.3
Infiltration trench (where a suitable depth of filtration material is included that provides treatment, ie graded gravel with sufficient smaller particles but not single size coarse aggregate such as 20mm gravel) underlain by a soil with good contaminant attenuation potential ² of at least 300mm in depth. (secondary treatment stage indices are halved)		0.2 (0.4)	0.2 (0.4)	0.2 (0.4)
Area 1 Total		0.6	0.5	0.5
Areas 2 and 3				
Infiltration blanket (where a suitable filtration layer is included that provides treatment, and including a geotextile at the base separating the foundation from the subgrade) underlain by a soil with good		0.7	0.6	0.7

contaminant attenuation potential of at least 300m in depth.			
Areas 2 and 3 Total	0.7	0.6	0.7

Table 2: SuDS Pollution Assessment

The mitigation techniques provided exceed that required for the proposed land use and should therefore be found acceptable.

5.4 Standard S4 - Amenity

Amenity benefits are provided for the site through the use of infiltration drainage techniques. Different SuDS techniques have been selected for different areas, based on the areas available to provide open SuDS, contributing to green space in the area.

5.5 Standard S5 - Biodiversity

Biodiversity benefits are provided at the site by using drainage systems which are on the surface and visible with vegetated components where feasible. This is provided by the swale area along the eastern boundary which will be appropriately planted to increase biodiversity in the area.

A Biodiversity Assessment, undertaken by Western Ecology, has been produced for the site; this is included in Appendix E.

5.6 Standard S6 - Design of drainage for Construction, Operation and Maintenance

The surface water drainage system has been designed so that it can be constructed and maintained easily; this has been achieved by using SuDS techniques that allow surface water to be managed at source.

Like all aspects of drainage systems, SuDS components should be regularly inspected and maintained. This ensures efficient operation and reduces the likelihood of failure. The level of inspection and maintenance will vary depending on the type of SuDS component.

A SuDS Management and Maintenance Plan is provided in Appendix C.

6 Summary and Conclusion

Haydn Evans Consulting Ltd (HEC) has been commissioned by Conrad Energy (Developments) II Ltd (hereafter referred to as the Client) to carry out a Flood Consequence Assessment (FCA) and SuDS Surface Water Drainage Strategy to support a planning application for the construction and operation of a Hydrogen Plant with associated infrastructure and access.

The site is at a low risk of flooding from all sources and meets the requirements of the TAN 15 in terms of appropriate development.

It is proposed to discharge surface water runoff generated by the site into the ground using infiltration techniques. An infiltration rate of 1.93×10^{-5} m/s has been applied to the drainage design; this rate is based on testing undertaken on the site immediately to the north of the proposed development site which is operated by the Client.

Surface water generated by the site is discharged via an infiltration blanket or a swale and infiltration trench. Hardstanding areas should be laid to fall towards the infiltration feature.

Surface water is managed at source to prevent discharge from the site for rainfall events of less than 5mm through the use of infiltration.

Attenuation has been sized using FEH data and Causeway Flow software to accommodate the temporary run-off for rainfall events up to and including the 1:100 year event. In order to consider the consequences of a greater event, an exercise has been undertaken for the 1:100 year plus 40% climate change.

The pollution mitigation techniques provided by the SuDS exceed that required for the proposed land use.

The use of infiltration drainage techniques, green space and vegetated components provide amenity and biodiversity benefits.

The surface water drainage system has been designed so that it can be constructed and maintained easily; this has been achieved by using SuDS techniques that allow surface water to be managed at source. A SuDS Management and Maintenance Plan is provided.

Standards 1-6 required by the Welsh Government document *Statutory standards for sustainable drainage systems* (2018) have been met.

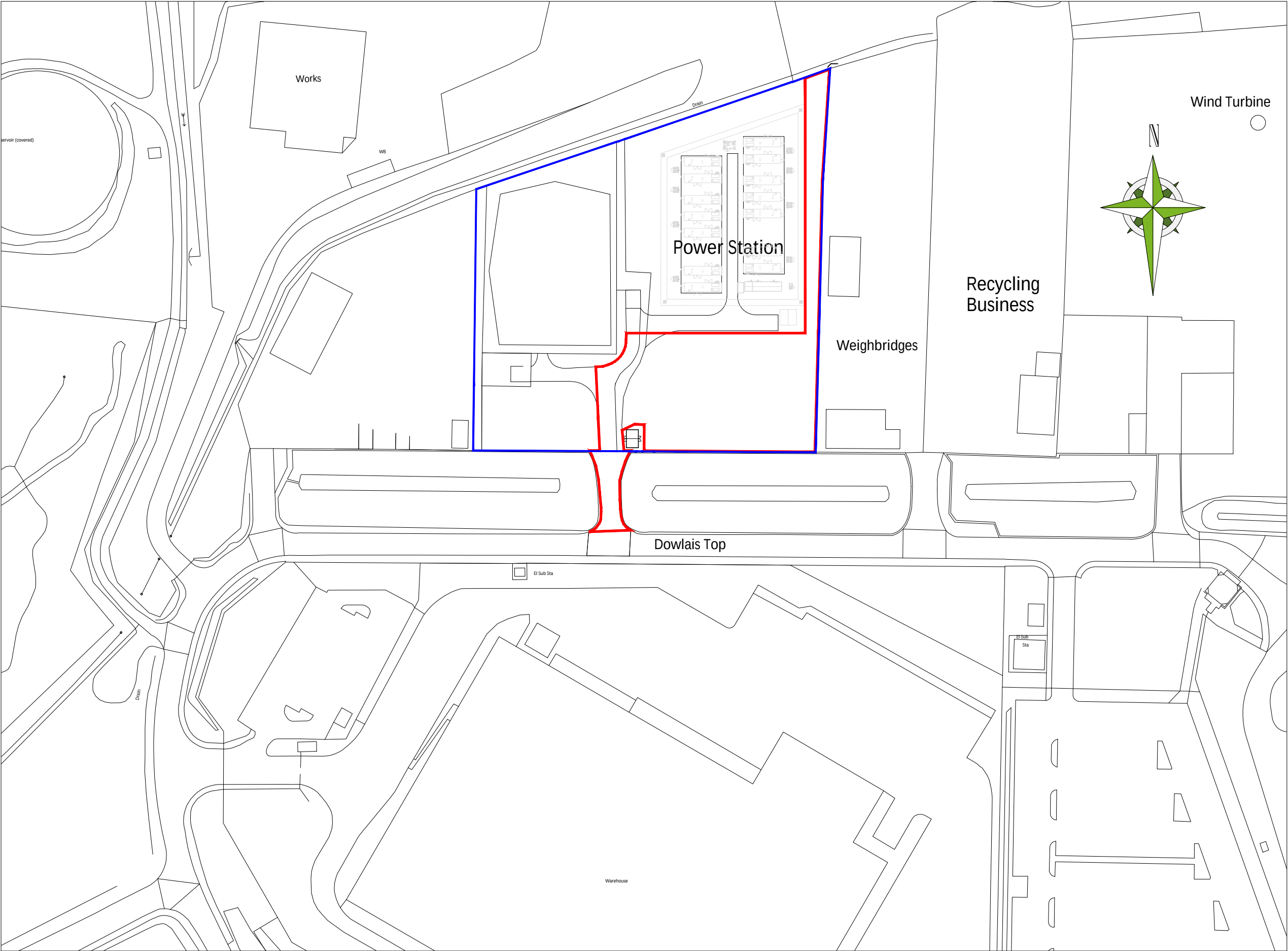
The proposals for the site do not increase on or off-site flood risk and should therefore be found acceptable

Appendix A - Existing and Proposed Site

Conrad Energy drawing CEL-21011-LOP-001 A - Location Plan

Subsite Surveys drawing 0624-GEG-001 - Topographical Survey

Conrad Energy drawing CEL-21011-SP-001 A - Proposed Site Plan



LOCATION PLAN

LEGEND:

LANDLORD'S PROPERTY

PROPOSED SITE

A	Planning boundary extended to accommodate Biodiversity enhancement area	ST	SW	SW-AM	31-07-24
Rev	Rev Description	Drw	Chk	Apprv	Date
REVISIONS					

Planning

ALL DIMENSIONS TO BE CHECKED ON SITE
WORK TO FIGURED DIMENSIONS ONLY
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Project Title:
PROPOSED POWER GENERATION HYDROGEN PLANT
LAND AT PENYGARNDU INDUSTRIAL ESTATE
MATHYR TYDFIL
CF48 2TA

LOCATION PLAN

Scale @A3: 1:1250

Date: 29-07-2024

Drawn: ST

Checked: SW

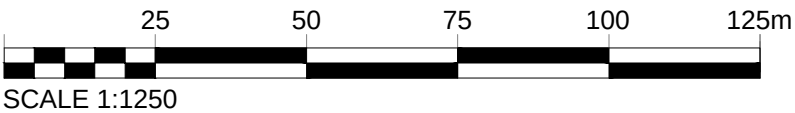
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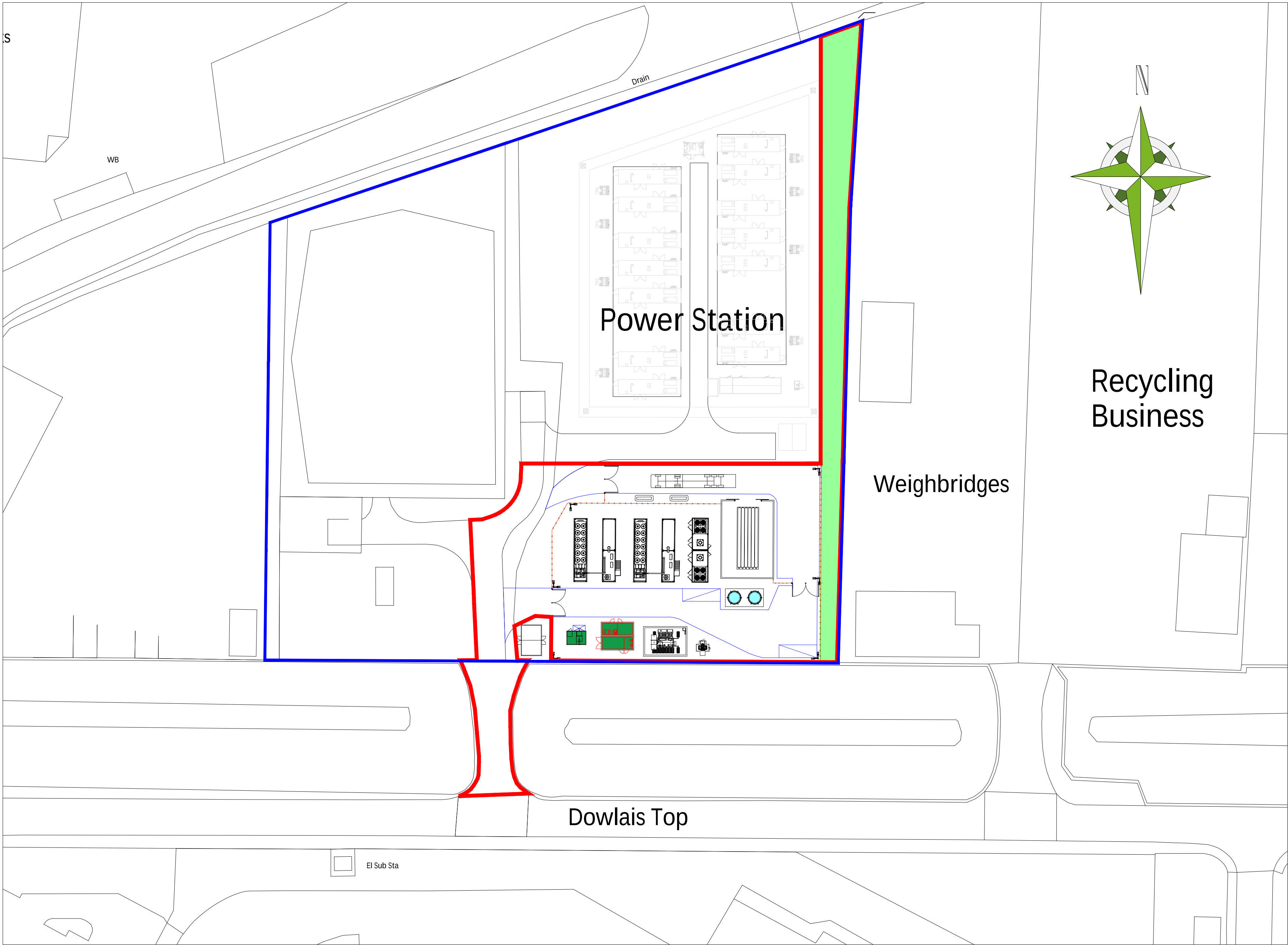
Rev: A

001

LOCATION PLAN

Scale: 1:1250@A3



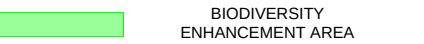
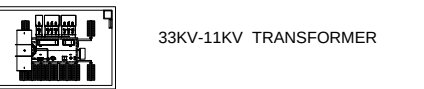
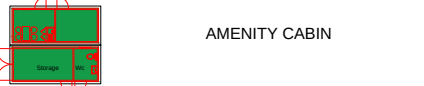
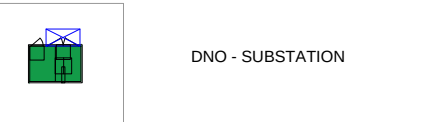
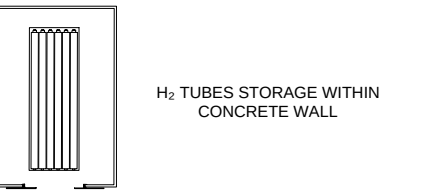
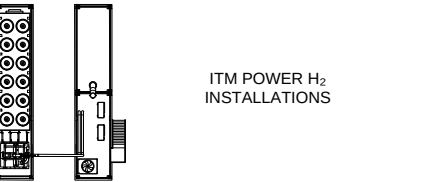


PROPOSED SITE PLAN

LEGEND:

SITE INFRASTRUCTURE:

- LANDLORDS PROPERTY
- PROPOSED SITE
- PERIMETER PALISADE FENCELINE



A	Planning boundary extended to accommodate Biodiversity enhancement area	ST	SW	SW-AM	31-07-24
Rev	Rev Description	Drw	Chk	Apprv	Date

REVISIONS

Planning

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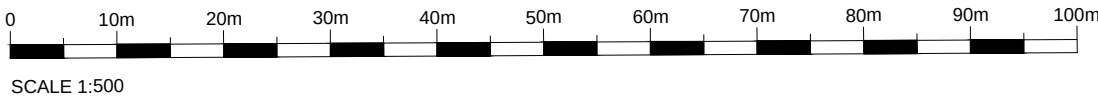
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Project Title:
PROPOSED POWER GENERATION HYDROGEN PLANT
LAND AT PENYGARNDU INDUSTRIAL ESTATE
MARTHYR TIDFIL
CF48 2TA

Drawing Title:

PROPOSED SITE PLAN

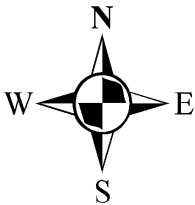
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Drawing No: CEL-21011-SP-001 Rev: A



Appendix B – Welsh Water

Sewer records

Pengarnddu Industrial Estate, Dowlais,
Merthyr Tydfil, CF48 2TA



LEGEND(Representative of most common features)

Waste network:	Foul chamber	Surface water chamber	Combined chamber	Combined sewer overflow	Special purpose chamber	Treatment works	Pumping station	Outfall	Storm Overflow	Rising main	Gravity sewer	Private sewer	Private sewer subject to Sect. 104 adoption agreement	Private Sewer Transfer	Lateral Drain	Inspection Chamber
	Combined chamber	Surface water chamber	Combined chamber	Combined sewer overflow	Special purpose chamber	Treatment works	Pumping station	Outfall	Storm Overflow	Rising main	Gravity sewer	Private sewer	Private sewer subject to Sect. 104 adoption agreement	Private Sewer Transfer	Lateral Drain	Inspection Chamber
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Notes:

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

Dŵr 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. The onus of locating apparatus before carrying out any excavations rests entirely on you. The information which is supplied by the Company, is done so in accordance with statutory requirements of sections 198 and 199 of the Water Industry Act 1991 which is 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 water main, service pipe, sewer, lateral drain or disposal main and any associated apparatus 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.

Service pipes are not generally shown but their presence should be anticipated.

**EXACT LOCATIONS OF ALL APPARATUS
TO BE DETERMINED ON SITE.**

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Map Ref: 307772,208830
Map scale: 1:3000
Printed by: Tyrieque Golding
Printed on: 15 Jul 2024

Appendix C - Surface Water Drainage Strategy

Infiltration testing undertaken by Nolan Associates

Haydn Evans drawing 306-011-D001 - Surface Water Drainage Strategy

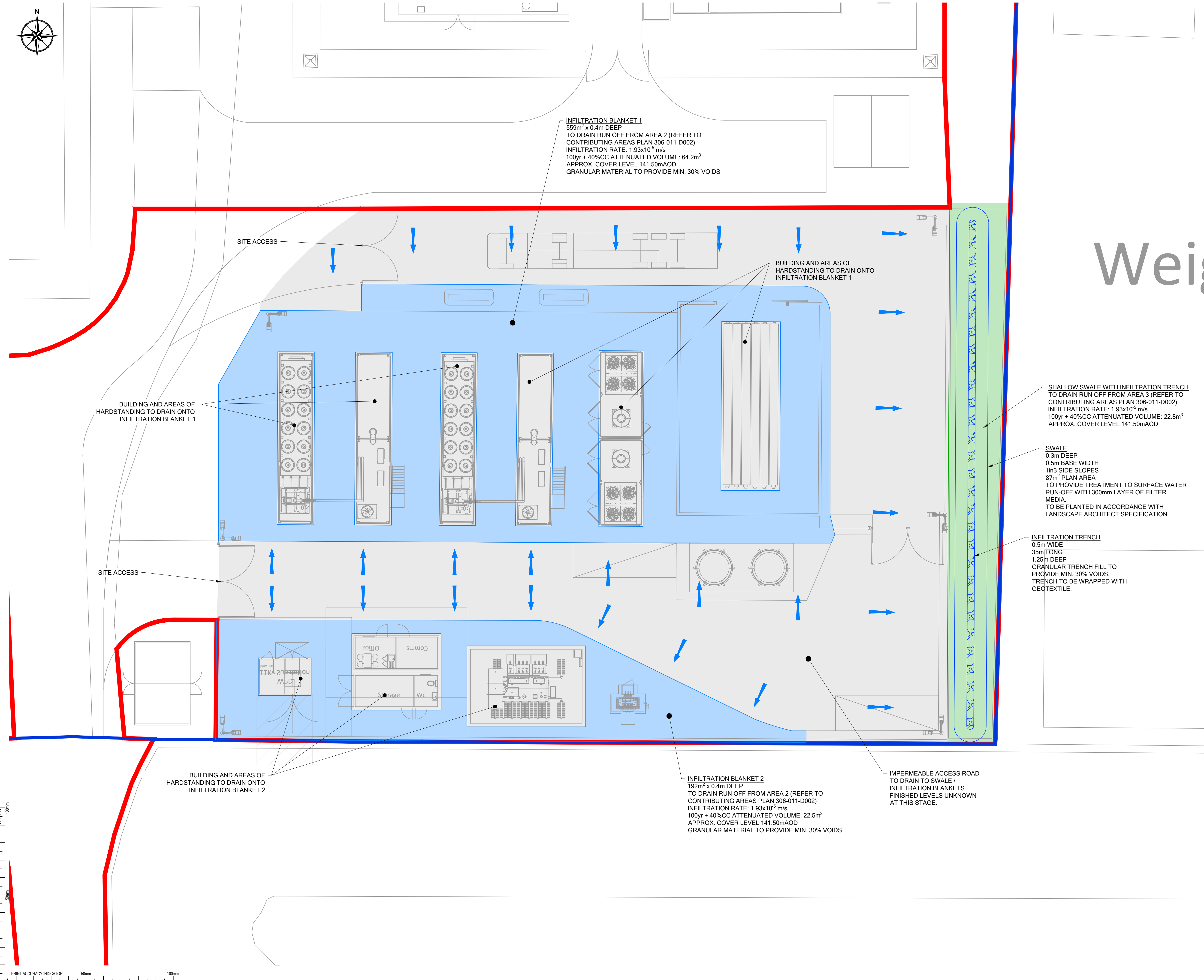
Haydn Evans drawing 306-011-D002 - Contributing Areas Plan

Haydn Evans drawing 306-011-D003 - SuDS Details

Surface Water Drainage Calculations ref: 306-011-CA1

Test 1

Soakaway Tests								
Project	Dowlais							
Client								
Job No.	2015-036							
	Date			09/09/2015				
	Trial Pit No.			TH1				
	Soakage Test No.			1				
	Pit Length (m)			1.86				
	Pit Width (m)			1.435				
	Pit Depth (m)			1.25				
	Gravel Void ratio			1				
								outflow
								velocity
	Depth to	wetted	wetted	Gross	Water loss	t	Delta time	(using base
Time	Water (m)	depth (m)	Area	Volme (cu.m)		seconds		area)
11:00	0.670	0.58	6.49	2		39600		
11:01	0.690	0.56	6.36	1	0.05	39660	60	1.38E-04
11:02	0.730	0.52	6.10	1	0.11	39720	60	2.86E-04
11:03	0.740	0.51	6.03	1	0.03	39780	60	7.34E-05
11:04	0.760	0.49	5.90	1	0.05	39840	60	1.49E-04
11:05	0.790	0.46	5.70	1	0.08	39900	60	2.30E-04
11:06	0.800	0.45	5.63	1	0.03	39960	60	7.85E-05
11:07	0.830	0.42	5.44	1	0.08	40020	60	2.41E-04
11:08	0.840	0.41	5.37	1	0.03	40080	60	8.23E-05
11:09	0.860	0.39	5.24	1	0.05	40140	60	1.68E-04
11:10	0.890	0.36	5.04	1	0.08	40200	60	2.60E-04
11:20	0.900	0.35	4.98	1	0.03	40800	600	8.88E-06
11:30	0.930	0.32	4.78	1	0.08	41400	600	2.74E-05
11:40	0.940	0.31	4.71	1	0.03	42000	600	9.38E-06
11:50	0.960	0.29	4.58	1	0.05	42600	600	1.91E-05
12:00	1.000	0.25	4.32	1	0.11	43200	600	4.00E-05
13:00	1.080	0.17	3.79	0	0.21	46800	3600	1.46E-05
14:00	1.140	0.11	3.39	0	0.16	50400	3600	1.24E-05
15:00	1.170	0.08	3.20	0	0.08	54000	3600	6.75E-06
16:00	1.190	0.06	3.06	0	0.05	57600	3600	4.74E-06
17:00	1.210	0.04	2.93	0	0.05	61200	3600	4.95E-06
18:00	1.210	0.04	2.93	0	0.00	64800	3600	0.00E+00
0.25 depth =	0.815	nearest time =		11:06:00				
0.75 depth =	1.105	nearest time =		14:00:00				
Results for this period								
11:06	0.800	0.45	5.63	1		39960		
14:00	1.140	0.11	3.39	0	0.91	50400	10440	1.93E-05



NOTES

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- SITE LAYOUT BASED ON 'CONRAD ENERGY', DRAWING REF '21011-MASTER CAD-DWG-23-07-24', DATE RECEIVED 24/07/2024. TOPOGRAPHICAL SURVEY FROM 'SUB SITE SURVEYS' DRAWING REF. '0624-GEG-001', UNDERTAKEN 25/06/2024.
- THIS DRAINAGE STRATEGY DRAWING SHOWS HOW SURFACE WATER RUN-OFF COULD BE MANAGED ON SITE USING INFILTRATION. FOR ALL RAINFALL EVENTS UP TO AND INCLUDING THE 100 YEAR RETURN PERIOD, EVENT PLUS 40% CLIMATE CHANGE TO ENSURE NO INCREASED FLOOD RISK TO OTHERS AS A RESULT OF THE PROPOSED DEVELOPMENT.

THIS IS NOT INTENDED TO BE A DETAILED DESIGN AT THIS STAGE. PLEASE NOTE THAT THE FINAL LAYOUT MAY BE SUBJECT TO REFINEMENT TO MEET CERTAIN TECHNICAL CRITERIA.
- INFILTRATION RATE TAKEN FROM TESTING UNDERTAKEN FOR WIDER SITE AREA. ON-SITE GROUND CONDITIONS AND GROUNDWATER LEVELS ARE UNKNOWN AT THIS STAGE.

KEY

- APPROX. PLANNING BOUNDARY
- LAND OWNERSHIP BOUNDARY
- INFILTRATION BLANKET
- INFILTRATION TRENCH
- SWALE
- SOFT LANDSCAPE
- ACCESS ROAD / HARDSTANDING / BUILDING
- OVERLAND FLOW ROUTE

DRAWING FOR APPROVAL
NOT FOR CONSTRUCTION

P02	31.07.2024	BOUNDARIES UPDATED	THW	BP	BP
P01	31.07.2024	PRELIMINARY ISSUE	BP	BH	JRC

Rev'n	Date	Description	Drawn	Chk'd	App'd
Status					

PRELIMINARY



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Client

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Project

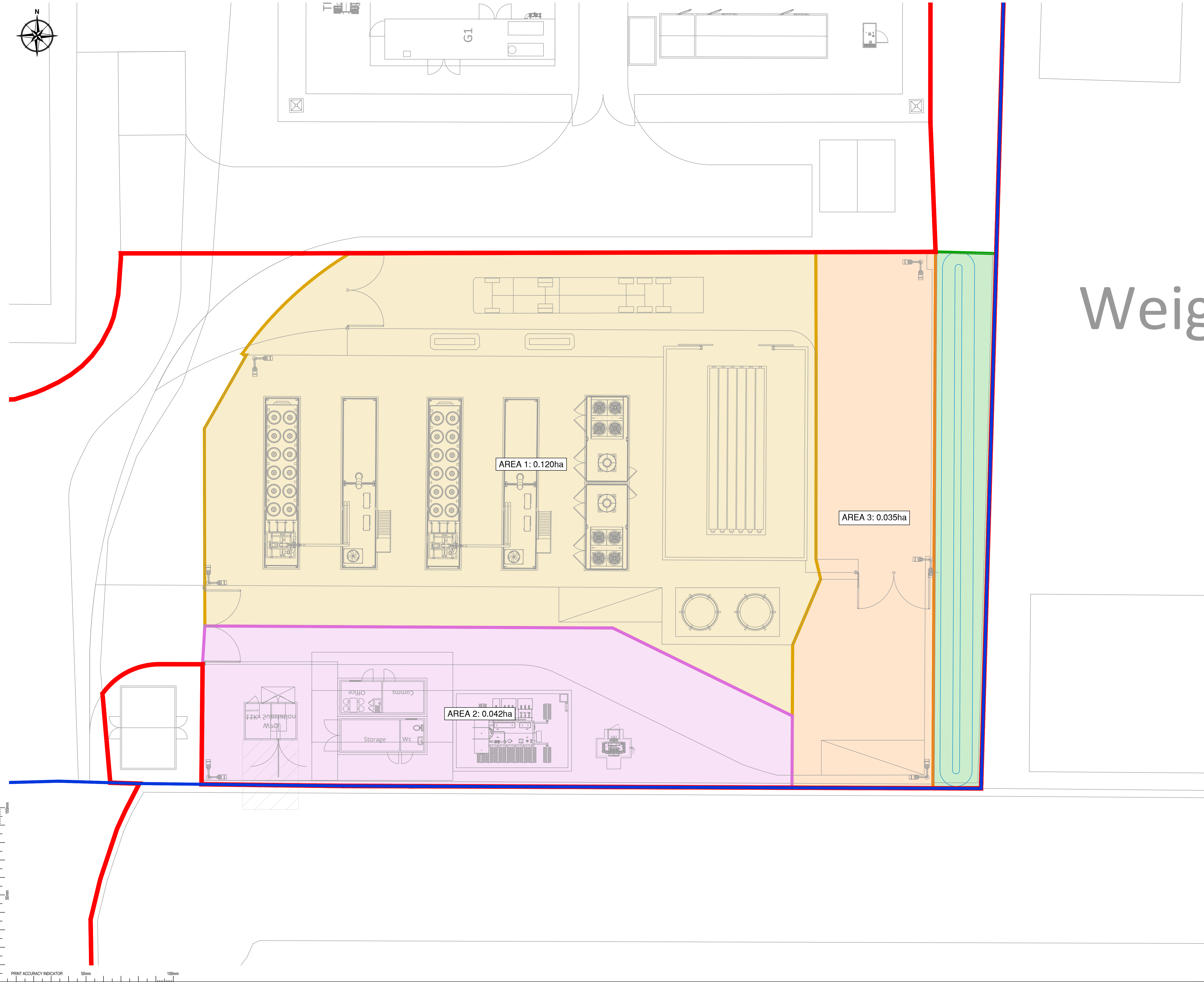
LAND AT DOWLAIS
MERTHYR TYDFIL

Drawing title

SURFACE WATER
DRAINAGE STRATEGY

Scale	Drawn	Checked	Approved	Date
A1@1:125	BP	BH	JRC	JULY 2024

Drawing no.	Revision
306-011-D001	P02



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KEY

	APPROX. PLANNING BOUNDARY
	LAND OWNERSHIP BOUNDARY
	AREA 1 - 0.120ha
	AREA 2 - 0.042ha
	AREA 3 - 0.035ha
	SOFT LANDSCAPE

P02	31.07.2024	BOUNDARIES UPDATED	THW	BP	BP
P01	31.07.2024	PRELIMINARY ISSUE	THW	BH	JRC
Rev'n	Date	Description	Drawn	Chk'd	App'd

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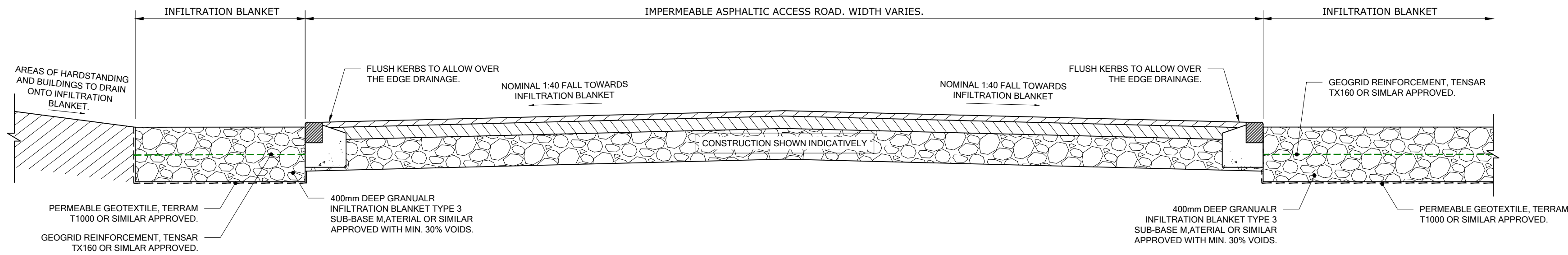
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**LAND AT DOWLAIS
MERTHYR TYDFIL**

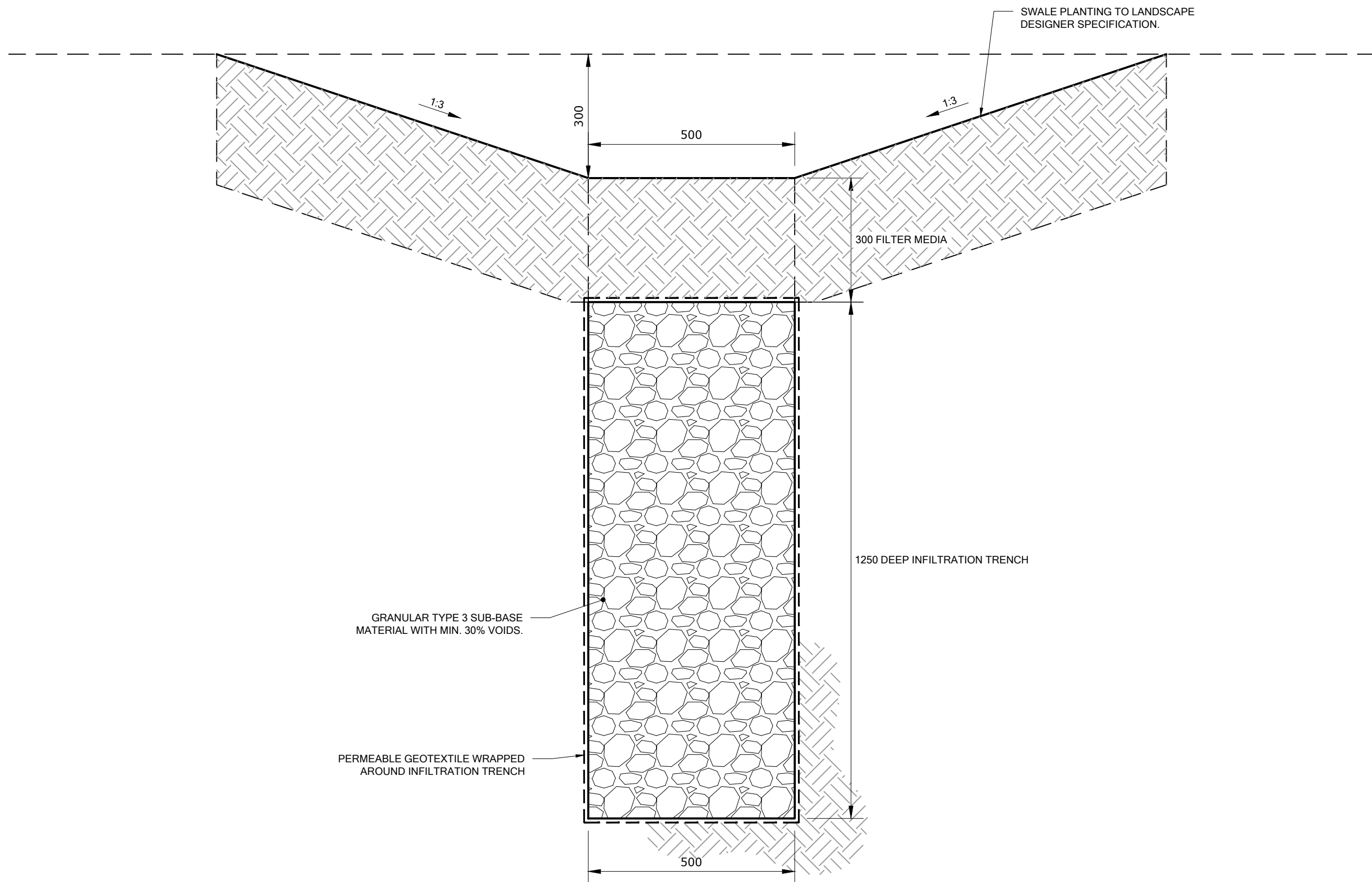
Drawing title
CONTRIBUTING AREAS

Scale A1@1:125	Drawn THW	Checked BH	Approved JRC	Date JULY 2024
Drawing no. 306-011-D002	Revision P02			



TYPICAL SECTION THROUGH INFILTRATION BLANKET
SCALE 1:25

GROUND CONDITIONS ARE UNKNOWN AT THIS STAGE.
INVESTIGATION INTO THE SITE'S GEOLOGY SHOULD BE UNDERTAKEN, ALONG WITH GROUNDWATER TESTING.



TYPICAL SWALE AND INFILTRATION TRENCH DETAIL
SCALE 1:10

GROUND CONDITIONS ARE UNKNOWN AT THIS STAGE.
INVESTIGATION INTO THE SITE'S GEOLOGY SHOULD BE UNDERTAKEN, ALONG WITH GROUNDWATER TESTING.

NOTES

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Rev'n	Date	Description	Drawn	Chk'd	App'd

Status	PRELIMINARY
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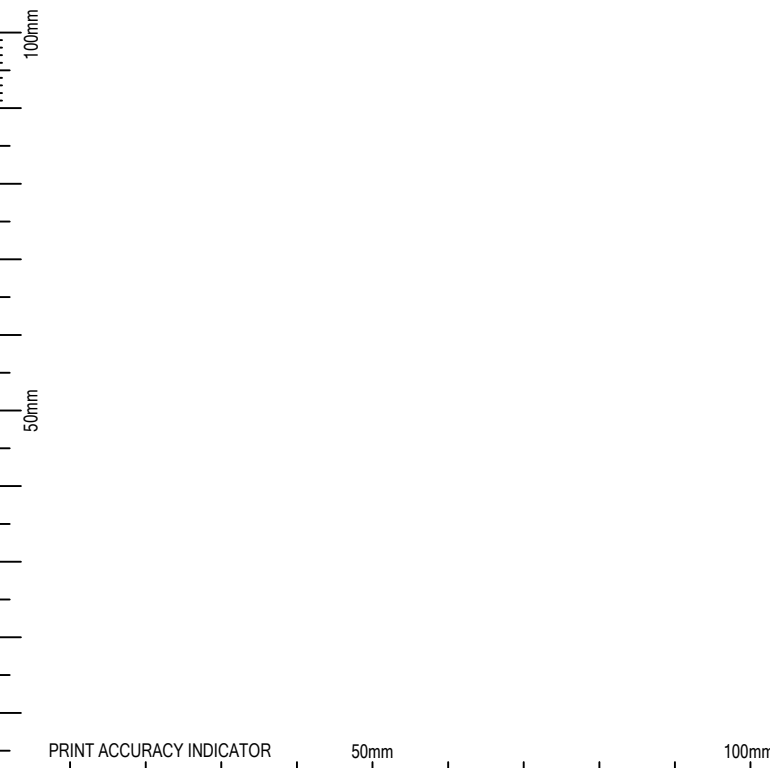
LAND AT DOWLAIS
MERTHYR TYDFIL

Drawing title

SUDS DETAILS

Scale	Drawn	Checked	Approved	Date
A1@VARIES	THW	BH	JRC	JULY 2024

Drawing no.	Revision
306-011-D003	P01



Calculated by:	Beverley Hunter
Site name:	Dowlais
Site location:	Dowlais

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	51.77066° N
Longitude:	3.33702° W
Reference:	1430903473
Date:	Jul 16 2024 14:46

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):	0.1
-----------------------	-----

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

Soil characteristics

	Default	Edited
SOIL type:	5	5
HOST class:	N/A	N/A
SPR/SPRHOST:	0.53	0.53

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

Hydrological characteristics

	Default	Edited
SAAR (mm):	1516	1516
Hydrological region:	9	9
Growth curve factor 1 year:	0.88	0.88
Growth curve factor 30 years:	1.78	1.78
Growth curve factor 100 years:	2.18	2.18
Growth curve factor 200 years:	2.46	2.46

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	1.55	1.55
1 in 1 year (l/s):	1.36	1.36
1 in 30 years (l/s):	2.75	2.75
1 in 100 year (l/s):	3.37	3.37
1 in 200 years (l/s):	3.81	3.81

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Appendix D - SuDS Management & Maintenance

Haydn Evans report 306-011-RP2 - SuDS Management & Maintenance Plan

Plot 2, Pengarnddu Industrial Park, Dowlais Top SuDS Management & Maintenance Plan

1 Introduction

Sustainable Drainage Systems (SuDS) features are utilised to manage rainfall and use landscape features to deal with surface water. SuDS control the flow rate and volume of water leaving the development area and reduce pollution by intercepting silt and cleaning run-off from hard surfaces.

Like all aspects of drainage systems, SuDS components should be regularly inspected and maintained. This ensures efficient operation and reduces the likelihood of failure. The level of inspection and maintenance will vary depending on the type of SuDS component. Further information on maintenance can be found in The SuDS Manual (CIRIA publication C753).

As the proposed SuDS serve a single property, maintenance will remain the responsibility of the site owner; Conrad Energy (Developments) II Ltd

2 Managing SuDS

The SuDS features have been designed for easy maintenance to comprise:

- Regular day to day care - litter collection and checking the inlets and outlets where water enters or leaves the SuDS feature.
- Occasional tasks - removing any silt that builds up, cutting back and clearing excessive vegetation growth, inspection of inlet headwall, manhole and flow control connecting to the basin or trench.
- Remedial work - repairing damage where necessary.

3 SuDS Maintenance

The surface water drainage system utilises an infiltration blanket, swale and an infiltration trench.

Tables 1 to 3 below provides a breakdown of typical maintenance requirements appropriate to the types of SuDS proposed at this site.

Operation and Maintenance requirements for Swales		
Responsible for Maintenance	Site Owner	
Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Remove litter and debris	Monthly, or as required
	Cut grass - retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for .48hrs	Monthly, or when required
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional maintenance	Reseed areas of poor vegetation growth, after plant types to better suit conditions, if required.	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial Actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

Table 1: Site specific maintenance requirements - Swales

Operation and Maintenance Requirements for Filter Drains		
Responsible for Maintenance	Site Owner	
Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Remove litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices	Monthly (or as required)
	Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage	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	Six monthly, or as required
Occasional maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (eg NJUG, 2007 or BS 3998:2010)	As required
	At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium	Five yearly, or as required
	Clear perforated pipework of blockages	As required

Table 2: Site specific maintenance requirements - Filter Drains

Operation and Maintenance Requirements for Infiltration Blankets		
Responsible for Maintenance	Dwelling Owner	
Maintenance Schedule	Required Action	Typical Frequency
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required Once per year on less frequently used pavements
Remedial action	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving	As required
	Remedial work to any depressions, rutting considered detrimental to the performance or a hazard to users, and replace lost material	As required
	Rehabilitation of surface and upper substructure	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth - if required, take remedial action	Three-monthly, 48 hrs after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually

Table 3: Site specific maintenance requirements - Infiltration Blankets

Appendix E - Biodiversity Assessment and GI Assessment

Western Ecology document ref: WOR4 4747.2 - Biodiversity Assessment and Green
Infrastructure assessment

Dowlais

Biodiversity
and
Green Infrastructure Assessment

July 2024

A report by

Colin Hicks BSc (Hons) MCIEEM, Principal Ecologist



Report details

Site name: Dowlais
Site address: Dowlais, Merthy Tydfil, CF48 2TA
Grid reference: SO 07791 08849
Report date: 31st July 2024
Report author: Colin Hicks BSc (Hons) MCIEEM

Report reference: WOR 4747.2

Declaration of compliance

Code of Professional Conduct

The information which we have prepared is true, and has been prepared and provided in accordance with the Chartered Institute of Ecology and Environmental Management's Code of Professional Conduct. We confirm that the opinions expressed are our true and professional bona fide opinions.

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1.2 DECCA Framework.....	4
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1. Introduction

1.1. Background

Western Ecology has been commissioned to complete a Biodiversity strategy to align the proposed hydrogen plant with National Policy in relation to Net benefit to Biodiversity (NBB).

1.2 DECCA Framework

A briefing on the approach of NBB in Wales is provided by CIEEM¹ in which they state:

“It puts the emphasis on proactive consideration of biodiversity and wider ecosystem benefits within a placemaking context early in the design process. The aim is that the planning system will encourage the use of high calibre ecological expertise and early discussions with planning teams to design developments on a case-by-case basis that positively impact ecosystem resilience.”

When assessing planning applications, Planning Policy Wales instructs planning authorities to take account of and promote the resilience of ecosystems, in particular the five attributes (DECCA) of ecosystem resilience as follows:

- Diversity: maintaining and enhancing diversity at every scale, including genetic, structural, habitat and between-habitat levels. This supports the complexity of ecosystem functions and interactions that deliver services and benefits².
- Extent: incorporating measures which maintain and increase the area of semi-natural habitat/features and linkages between habitats. In general, smaller ecosystems have reduced capacity to adapt, recover or resist disturbance.
- Condition: The condition of an ecosystem is affected by multiple and complex pressures acting both as short term and longer term types of disturbance. Both direct and wider impacts should be considered, for example avoiding or mitigating pressures such as climate change, pollution, invasive species, land management neglect etc.
- Connectivity: This refers to the links between and within habitats, which may take the form of physical corridors, stepping stones in the landscape, or patches of the same or related vegetation types that together create a network that enables the flow or movement of genes, species and natural resources. Developments should take opportunities to develop functional habitat and ecological networks within and between ecosystems, building on existing connectivity.
- Aspects of ecosystem resilience (adaptability, recovery and resistance): ecosystem resilience is a product of the above four attributes. Adaptability, recovery and resistance to/from a disturbance are defining features of ecosystem resilience.

1.3 Green infrastructure

Taking into account the scale and nature of the proposals, this document also provides details to meet Green Infrastructure Assessment requirements.

¹ CIEEM Briefing: Welsh Government's Approach to Net Benefits for Biodiversity and the DECCA Framework, September 2022

² For clarity, text taken from Government documents is shown in blue font.

2. Methodology to establish ecological baseline

A preliminary ecological appraisal (PEA) has been completed for this site and is reported elsewhere.

The site visit was completed by Chris Ayre BSc (hons) on 17th May 2024.

This survey provides the ecology baseline of the site against which changes associated with development can be assessed.

2.1. Baseline habitats

Baseline habitat descriptions within the application boundary are as follows and are detailed in the preliminary ecological appraisal:

Phase 1 habitat	Description	Ecological value	Area (m ²)
Bare ground	Gravelled hardcore which is bare.	Negligible	50
Ephemeral/short perennial	Other parts of the gravelled hardcore has encroaching vegetation colonising the ground, which grows thicker toward the fence boundaries.	Site	1039
Scattered scrub	On the southern fence boundary and growing around parts of the spoil heap, are patches of low, recently established scrubby vegetation.	Site	NA
Semi-improved neutral grassland	Boundary edges support low grass and forbs, with some ruderal and scrub growing in patches.	Site	778
Spoil	On the east side of the compound is a large spoil heap, consisting of hardcore, gravel and earth. It has been profiled and sloped and has been colonised by grasses, forbs and scrub.	Site	911

2.2 Potential for other protected species

During the preliminary ecological appraisal, potential for the following protected species was noted:

Birds

It is possible that common bird species nest within scrub and trees at the site boundary.

In addition:

Invasive non-native plants

Japanese Knotweed is growing just outside the southern boundary of the site, and it is likely that over time this plant will begin to colonise the development site.

3. Mapping of development and associated habitats

Proposed habitats associated with the redline are shown within Map 1, and Proposed site plan CEL-21011-SP-001 A included here as Appendix 1.

Vegetated habitats lost within the redline

- Ephemeral/short perennial = 1039m²
- Semi-improved neutral grassland = 778m²
- Scattered scrub = estimated at 30m²

Vegetated habitats created within the redline

- Tussocky grassland = 144m²

Vegetated habitats enhanced within the redline

- Semi-improved neutral grassland enhanced to tussocky grassland = 580m²

4. Assessment of biodiversity changes

4.1. Baseline

Currently the site comprises an area of sparsely vegetated land with limited value for biodiversity. The main features of value are areas of grassland at the margins. These could provide a food resource for occasional passerines and invertebrates.

4.2. Proposed

Please see Map 1. Ecological opportunities plan.

Tussocky grassland

144m² of species rich, tussocky grassland will be created on the eastern boundary of the site for the benefit of pollinators and other invertebrates (Map 1).

In addition, this will maintain connectivity from the vegetated roadside bund going away to the north.

It is also proposed that a grassland habitat along the eastern boundary of the development to the north and within this application site (Map 1) will be enhanced to create a species rich, tussocky grassland through overseeding and selective management. This will create a vegetated corridor through the landscape for the dispersal of small mammals, invertebrates and plant propagules.

Bird boxes

A sparrow terrace will be fitted to the eastern aspect of the amenity cabin (Map 1) to provide habitat for house sparrow, and other nesting birds.

This terrace has been designed to help redress the balance of falling House Sparrow numbers. The current UK population of 6 million pairs is half what it was in 1980 and this is thought to be due to habitat destruction and lack of suitable nesting spaces. Sparrows are social birds and like to nest in company. Each terrace provides ideal nesting opportunities for three families. Made of wood-concrete mix, this terrace is durable, breathable and will last many decades.



Sparrow terrace

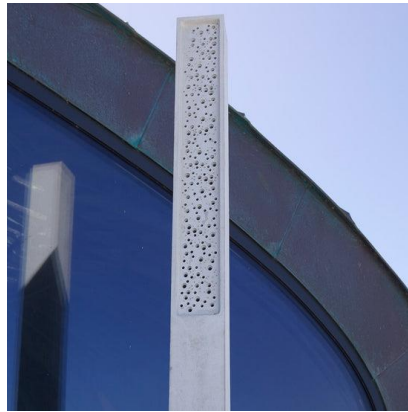
Invertebrates

If the amenity cabin had block-built walls, at least three bee bricks will be fitted 1.5m above ground level on its southern aspect. These attract solitary bees and wasps.



Bee brick

If bee bricks cannot be fitted, a bee post or similar will be installed in the south-eastern corner of the site.



Bee post

Invasive non-native plants

It is likely that over time Japanese Knotweed will colonise the development site.

A Japanese knotweed management should be developed to avoid its spread into the site and may include vertical root barriers at the site margin.

5. Assessment against BBN requirements

This aligns the project with each of the DECCA attributes as follows:

- Diversity: maintaining and enhancing diversity at every scale, including genetic, structural, habitat and between-habitat levels. This supports the complexity of ecosystem functions and interactions that deliver services and benefits;
 - There is the opportunity to create and maintain a species-rich grassland, whilst bee posts and bird boxes will create and secure habitats for these species which are largely lacking within the site at present.
- Extent: incorporating measures which maintain and increase the area of semi-natural habitat/features and linkages between habitats. In general, smaller ecosystems have reduced capacity to adapt, recover or resist disturbance:
 - It is accepted that due to site extent, overall vegetated habitats areas cannot be increased, whilst allowing development. However, linkage through the site and away to the north and south will be enhanced.
- Condition: The condition of an ecosystem is affected by multiple and complex pressures acting both as short term and longer term types of disturbance. Both direct and wider impacts should be considered, for example avoiding or mitigating pressures such as climate change, pollution, invasive species, land management neglect etc:
 - There is an opportunity to enhance the grassland along the eastern boundary.
 - Control of Japanese Knotweed will ensure future site condition does not deteriorate.
- Connectivity: This refers to the links between and within habitats, which may take the form of physical corridors, stepping stones in the landscape, or patches of the same or related vegetation types that together create a network that enables the flow or movement of genes, species and natural resources. Developments should take opportunities to develop functional habitat and ecological networks within and between ecosystems, building on existing connectivity.
 - A small-scale ecological network will be created with ecologically functional linkage to the north and south.
- Aspects of ecosystem resilience (adaptability, recovery and resistance): ecosystem resilience is a product of the above four attributes. Adaptability, recovery and resistance to/from a disturbance are defining features of ecosystem resilience.

Should this project be permissioned, it would be expected that suitable planning conditions will be required to ensure habitat creation, management and monitoring.

6. Assessment against Green Infrastructure requirements

Green infrastructure is the network of natural and semi-natural features, green spaces, rivers and lakes that intersperse and connect places.

The proposed development will provide connectivity at a small scale between habitats to the north and south, whilst providing areas of grassland managed for their biodiversity value.

This will reverse, and protect against, habitat fragmentation at this site.



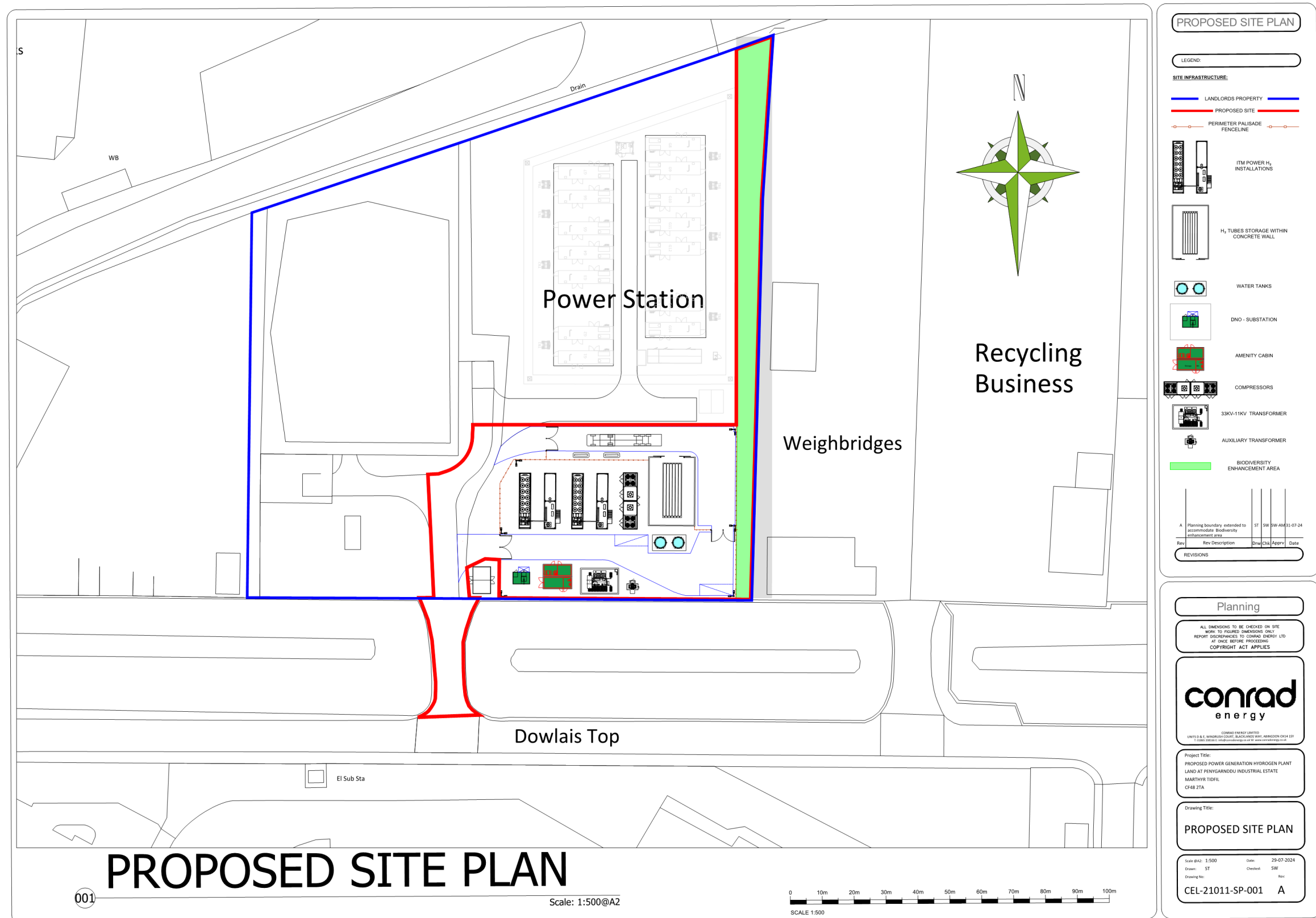
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- Legend
- Target note
 - Linkage
 - Developed areas
 - New grassland area
 - Existing grassland enhanced

Title: Map 1. Ecological opportunities plan

Project: Dowlais

Checked by: CDH Version: 01
Date: 31/07/2024





HAYDN
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