KEY

- EXISTING WOODLAND TO BE RETAINED AND ENHANCED - 880m²
- EXISTING GRASSLAND TO BE RETAINED AND ENHANCED - 2,640m²
- PROPOSED REINFORCED GRASS AREA - 1,900m²
- PROPOSED POND AREA - 105m²
- PROPOSED WILDFLOWER GRASSLAND EH1 HEDGEROW MIX - 415m²
- PROPOSED WILDFLOWER GRASSLAND EM8 WETLAND MIX - 100m²
- PROPOSED HABITAT CREATION AREA FOR REPTILES, AMPHIBIANS AND HEDGEHOGS - 295m²

NOTES:

PLANTING OPERATIONS SPECIFICATION

TOPSOIL
Imported topsoil for reinforced grass areas shall comply with BS 3882 and shall be good quality, medium topsoil loam, acid or slight acid (ph not less than 5.0), stones not greater than 50mm in any dimension, perennial weeds and any other foreign matter, free from chemical or other polluted subsoil, weeds, straw, sticks, stones, clay lumps and other deleterious material. Topsoil containing a significant proportion of subsoil or other foreign matter will not be accepted on the site. On no account shall topsoil be brought on the site in excessively wet conditions or in a water logged state. It shall be from an approved source, shall be fertile with a humus and fibre content and shall have a good crumb structure with medium texture.

All areas of wildflower grass seeding shall be made up of low nutrient sub-soil to assist establishment and maintenance of the meadow grasslands.

WILDFLOWER SEEDING
Over seeding to occur during August / September. All noxious weeds to be spot sprayed until meadow area fully established. Any areas of failure to be re-seeded. Grass seed mix shall be Emorsgate (or similar approved by the LPA) EH1 Hedgerow Mix, 415m² and EM8 Wetland Mix, 100m², sown at a rate of 5g/m².

EH1 (Hedgerow Mix)

Wild Flowers

%	Latin name	Common name
0.5	Achillea millefolium	Yarrow
1.2	Agrimonia eupatoria	Agrimony
1.5	Alliaria petiolata	Garlic Mustard
0.4	Arctium minus	Lesser Burdock
0.5	Betonica officinalis	Betony
1.5	Centaurea nigra	Common Knapweed
0.4	Chaerophyllum temulum	Rough Chervil
2	Galium album	Hedge Bedstraw
1	Galium verum	Lady's Bedstraw
0.3	Geranium pyrenaicum	Hedgerow Crane's-bill
0.6	Hypericum perforatum	Perforate St John's Wort
0.3	Lathyrus sylvestris	Narrow-leaved Everlasting-pea
0.8	Leucanthemum vulgare	Oxeye Daisy - (Moon Daisy)
0.5	Origanum vulgare	Wild Marjoram
0.7	Plantago lanceolata	Ribwort Plantain
1	Primula veris	Cowslip
2.5	Silene dioica	Red Campion
0.5	Silene latifolia	White Campion
2	Torilis japonica	Upright Hedge-parsley
0.5	Verbascum thapsus	Great Mullein
0.5	Vicia cracca	Tufted Vetch
0.8	Vicia sativa ssp. segetalis	Common Vetch

Grasses

%	Latin name	Common name
10	Agrostis capillaris	Common Bent
2	Anthoxanthum odoratum	Sweet Vernal-grass (w)
7	Brachypodium sylvaticum	False Brome (w)
20	Cynosurus cristatus	Crested Dogstail
1	Deschampsia cespitosa	Tufted Hair-grass (w)
28	Festuca rubra	Slender-creeping Red-fescue
12	Poa nemoralis	Wood Meadow-grass

EM8 (Wetland Mix)

Wild Flowers

Latin name	Common name
Achillea millefolium	Yarrow
Centaurea nigra	Common Knapweed
Filipendula ularia	Meadowsweet
Galium verum	Lady's Bedstraw
Leontodon hispidus	Rough Hawkbit
Leucanthemum vulgare	Oxeye Daisy – (Moon Daisy)
Lotus corniculatus	Birdsfoot Trefoil
Plantago lancelata	Ribwort Plantain
Primula veris	Cowslip
Ranunculus acris	Meadow Buttercup
Rumex acetosa	Common Sorrel
Silaum silaus	Pepper Saxifrage
Succisa pratensis	Devil's-bit Scabious
Taraxacum officinale	Dandelion
Traopogon pratensis	Goat's-beard
Vicia cracca	Tufted Vetch

Grasses

Latin name	Common name
Agrostis capillaris	Common Bent (w)
Anthoxanthum odoratum	Sweet Vernal-grass (w)
Briza media	Quaking Grass (w)
Cynosurus cristatus	Crested Dogstail
Deschampsia cespitosa	Tufted Hair-grass (w)
Festuca rubra	Red Fescue

TGP LANDSCAPE ARCHITECTS
Suite 5, Third Floor, Adamson House,
65 Westgate Road, Newcastle-upon-Tyne,
NE1 1SG, Tel: 0191 383 9955
andrew.gardner@tgp.uk.com/www.tgp.uk.com
Also in Glasgow & Edinburgh

Project	BRIDGE ROAD, WREXHAM			
Title	LANDSCAPE PROPOSALS			
Date	Scale	Drawn	Checked	
09.09.22	1:250 @ A1	DR	AG	
Job	Suitability	No.	Issue	Revision
D330	-	D330.L.001	EXT	-

LI WORKSTAGE: 0/1 ☐ 2 ☐ 3 ☒ 4 ☐ 5 ☐ 6 ☐

DISCLAIMER:
Do not scale from this drawing.
All dimensions to be verified on site prior to commencement of works.
Drawing to be read in conjunction with related TGP drawings, consultants drawings and any other relevant information.
This drawing is the copyright of TGP Landscape Architects Ltd. unless otherwise specified.

Appendix D – NRW Response

RE: 315341 BESS Bridge Road North Data Request NRW:01920215

Data Distribution <datadistribution@cyfoethnaturiolcymru.gov.uk>

Mon 17/6/24 11:15 AM

To:Georgia Hirst <ghirst@mabbett.eu>

You don't often get email from datadistribution@cyfoethnaturiolcymru.gov.uk. Learn why this is important

Dear Ms Hirst,

Thank you for your email which has now been passed to the correct data team. Taking your requirements in turn, please see below:

1. Historical Flooding Information – Recorded Flood Extents | DataMapWales (gov.wales)

2. Any hydraulic models covering the site – NRW Local Model Manager | DataMapWales (gov.wales)

3. Flood/coastal defence survey data –

   Flood Defence Structures | DataMapWales (gov.wales) & Areas Benefiting from Flood Defences | DataMapWales (gov.wales) & Natural Resources Wales / Find flood defence structures near you (The National Flood Asset Database)

4. Operational procedures for hydraulic structures – If there are any structures in your area, please contact the relevant Assets Team through our Enquiries phone number - https://naturalresources.wales/about-us/contact-us/general-enquiries/?lang=en

5. Section 19 flood investigation reports – Section 19 flood investigation reports fall under the remit of the relevant Local Authority, so please contact then for this information.

6. The date and type of modelling that flood levels have been derived from – We will advise you in due course.

7. The technical report summarising the modelling methodology – We will advise you in due course.

8. Confirmation that the data is appropriate/relevant to inform flood risk within the Site – This will be advised with the flood modelling data, if available for your site.

9. Details of any flood defences within the vicinity of the Site (i.e type, crest levels, Standard of Protection, condition, etc) and any associated breach and/or overtopping flood extents and depths – Please see Number 3, above.

10. Hazard mapping detailing the depth, velocity and associated hazard rating for the Site – https://datamap.gov.wales/search/?title__icontains=National%20flood%20hazard&abstract__icontains=National%20flood%20hazard&keywords__name__icontains=National%20flood%20hazard&purpose__icontains=National%20flood%20hazard&f_method=or&limit=20&offset=0

11. Any information in relation to surface water flooding including confirmation is located within or outside of a Critical Drainage Area – Flood Risk Assessment Wales | DataMapWales (gov.wales) Further information on surface water data, should be available from the relevant Local Authority, as this falls into their remit.

12. Any information in relation to on-Site drainage – Natural Resources Wales / Sustainable Drainage Systems (SuDS) & further advise is available from our Planning department.

13. Any information in relation to groundwater flooding in the area. Where possible, please provide borehole locations and ground water levels – Unfortunately we don't hold records on instances of groundwater flooding. Please contact the relevant Local Authority as they are the Lead on mitigating risk from groundwater flooding in its area. Please therefore contact them for further information on this. For borehole locations, please follow this link - GeoIndex - British Geological Survey (bgs.ac.uk)

If you require groundwater levels, please fill in the criteria below and return to us:

- **Station Name** - Please provide the appropriate hydrometric station name from:
  - NRW's River levels, rainfall and sea levels website: *River levels, rainfall and sea data (naturalresources.wales)* *or*
  - National River Flow Archive (NRFA) website*:* *https://nrfa.ceh.ac.uk/* where historic flow data can also be downloaded.
- **Data Type -** Please provide the data type you require from the following:
  - Groundwater levels
- **Location** – If station name is unknown or unavailable on our website, e.g. for Groundwater sites, then please provide a 10-digit National Grid Reference (NGR*)* and a radial search value e.g. 2km.
  - **Date From** – required data start date
  - **Date To** – required data end date
  - **Temporal Resolution** – measuring interval of data required e.g. 15min/ Day Total/Day Mean etc.

14. Details of sensitive aquifers and known contamination issues – https://datamap.gov.wales/search/?title__icontains=landfill&abstract__icontains=landfill&keywords__name__icontains=landfill&purpose__icontains=landfill&f_method=or&limit=20&offset=0

15. Any information/mapping of historical flooding events on Site from all sources of flooding (i.e fluvial, tidal, surface water, groundwater, sewer, reservoir, canal, etc). Where available please can you provide flood levels, estimated return periods, photographs and other such data that may be relevant to our assessment – Please see Number 1, above.

Please also accept this as an acknowledgement that your request has been received.

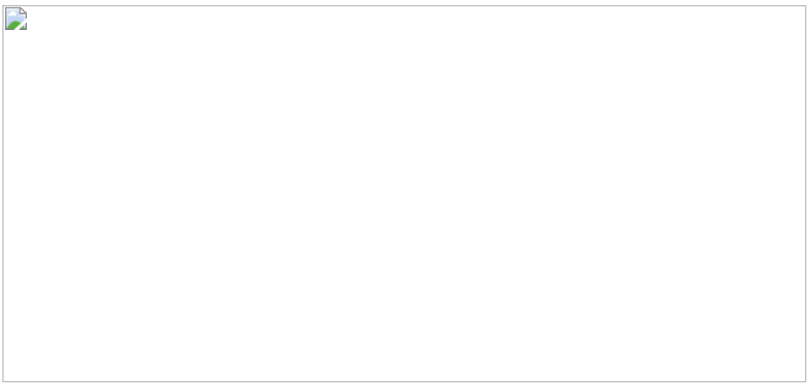
It can take up to 20 working days to supply data that is not available online, therefore if you have any queries on your data request, please contact us.

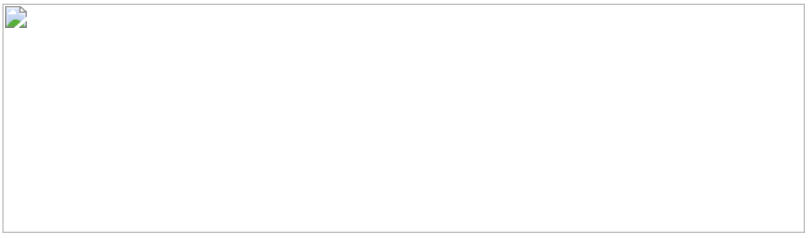
For further information on what you can expect from us, please visit our website:

Natural Resources Wales / Contact us or call the Customer Hub on 0300 065 3000 (open 9am-5pm, Monday to Friday).

We look forward to hearing from you in due course, and then we will provide you with the remaining aspects of your request.

Yours sincerely,





---------- Original Message ----------
From: Georgia Hirst <ghirst@mabbett.eu>;
Received: Fri Jun 14 2024 15:51:34 GMT+0100 (British Summer Time)
To: Enquiries Queue <enquiries@cyfoethnaturiolcymru.gov.uk>;
Subject: 315341 BESS Bridge Road North Data Request

You don't often get email from ghirst@mabbett.eu. Learn why this is important

Rhybudd: Deilliodd yr e-bost hwn o'r tu allan i'r sefydliad. Peidiwch â chlicio dolenni, atodiadau agored nac sganio codau QR oni bai eich bod yn cydnabod yr anfonwr ac yn gwybod bod y cynnwys yn ddiogel.

Caution: This email originated from outside of the organisation. Do not click links, open attachments or scan QR Codes unless you recognise the sender and know the content is safe.

To whom it may concern,

Mabbett & Associates Ltd have been instructed to undertake a Drainage Strategy in support of a BESS at Bridge Road North, Wrexham, known as the site hereon. I attach a site location plan and the site details below.

Appendix E – Causeway Flow Calculations

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	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	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S01	0.043	5.00	25.900	1200	338125.861	349594.106	1.300
S02	0.050	5.00	25.740	1200	338119.157	349573.712	1.340
S03			25.300	1200	338128.637	349556.574	1.000
S04			25.200	1200	338128.897	349538.645	1.000
Inlet			24.900		338125.358	349524.816	0.805
Outlet		5.00	25.000	1200	338129.815	349516.073	1.000
CMH			25.000	1200	338134.012	349515.097	1.050
Outlet 2			23.840	1200	338147.691	349511.712	1.000

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.001	S01	S02	21.468	0.600	24.600	24.400	0.200	107.3	225	5.28	50.0
1.002	S02	S03	19.585	0.600	24.400	24.300	0.100	195.9	225	5.63	50.0
1.003	S03	S04	17.931	0.600	24.300	24.200	0.100	179.3	225	5.94	50.0
1.004	S04	Inlet	14.275	0.600	24.200	24.100	0.100	142.7	225	6.16	50.0
1.006	Outlet	CMH	4.309	0.600	24.000	23.950	0.050	86.2	225	5.05	50.0
1.007	CMH	Outlet 2	14.092	0.600	23.950	22.840	1.110	12.7	225	5.11	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.001	1.261	50.1	5.8	1.075	1.115	0.043	0.0	51	0.846
1.002	0.931	37.0	12.6	1.115	0.775	0.093	0.0	90	0.842
1.003	0.973	38.7	12.6	0.775	0.775	0.093	0.0	88	0.872
1.004	1.092	43.4	12.6	0.775	0.575	0.093	0.0	83	0.950
1.006	1.409	56.0	0.0	0.775	0.825	0.000	0.0	0	0.000
1.007	3.692	146.8	0.0	0.825	0.775	0.000	0.0	0	0.000

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Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.001	21.468	107.3	225	Circular	25.900	24.600	1.075	25.740	24.400	1.115
1.002	19.585	195.9	225	Circular	25.740	24.400	1.115	25.300	24.300	0.775
1.003	17.931	179.3	225	Circular	25.300	24.300	0.775	25.200	24.200	0.775
1.004	14.275	142.7	225	Circular	25.200	24.200	0.775	24.900	24.100	0.575
1.006	4.309	86.2	225	Circular	25.000	24.000	0.775	25.000	23.950	0.825
1.007	14.092	12.7	225	Circular	25.000	23.950	0.825	23.840	22.840	0.775

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.001	S01	1200	Manhole	Adoptable	S02	1200	Manhole	Adoptable
1.002	S02	1200	Manhole	Adoptable	S03	1200	Manhole	Adoptable
1.003	S03	1200	Manhole	Adoptable	S04	1200	Manhole	Adoptable
1.004	S04	1200	Manhole	Adoptable	Inlet		Junction	
1.006	Outlet	1200	Manhole	Adoptable	CMH	1200	Manhole	Adoptable
1.007	CMH	1200	Manhole	Adoptable	Outlet 2	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S01	338125.861	349594.106	25.900	1.300	1200	0	1.001	24.600	225
S02	338119.157	349573.712	25.740	1.340	1200	1	1.001	24.400	225
						0	1.002	24.400	225
S03	338128.637	349556.574	25.300	1.000	1200	1	1.002	24.300	225
						0	1.003	24.300	225
S04	338128.897	349538.645	25.200	1.000	1200	1	1.003	24.200	225
						0	1.004	24.200	225
Inlet	338125.358	349524.816	24.900	0.805		1	1.004	24.100	225
Outlet	338129.815	349516.073	25.000	1.000	1200	0	1.006	24.000	225
CMH	338134.012	349515.097	25.000	1.050	1200	1	1.006	23.950	225
						0	1.007	23.950	225
Outlet 2	338147.691	349511.712	23.840	1.000	1200	1	1.007	22.840	225

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Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	17.000	Drain Down Time (mins)	240
Ratio-R	0.300	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

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 %)
2	40	0	0
30	40	0	0
100	40	0	0

Node CMH Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	23.950	Product Number	CTL-SHE-0054-1000-0500-1000
Design Depth (m)	0.500	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.0	Min Node Diameter (mm)	1200

Node Outlet Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	8.410
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	24.000	Main Channel Slope (1:X)	88.2
Safety Factor	2.0	Time to half empty (mins)	0	Main Channel n	0.030

Inlets

Inlet

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	22.0	0.0	0.800	128.0	0.0

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Results for 2 year +40% CC Critical Storm Duration. Lowest mass balance: 99.38%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S01	10	24.662	0.062	8.5	0.1109	0.0000	OK
15 minute winter	S02	10	24.516	0.116	18.1	0.2168	0.0000	OK
15 minute winter	S03	11	24.413	0.113	17.8	0.1273	0.0000	OK
240 minute winter	S04	192	24.328	0.128	4.3	0.1445	0.0000	OK
240 minute winter	Inlet	192	24.328	0.233	4.3	0.0000	0.0000	OK
240 minute winter	Outlet	192	24.328	0.328	4.0	0.3706	0.0000	SURCHARGED
240 minute winter	CMH	192	24.328	0.378	3.8	0.4271	0.0000	SURCHARGED
15 minute summer	Outlet 2	1	22.840	0.000	1.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S01	1.001	S02	8.4	0.576	0.167	0.3152	
15 minute winter	S02	1.002	S03	17.8	0.887	0.481	0.3943	
15 minute winter	S03	1.003	S04	17.9	0.954	0.464	0.3373	
240 minute winter	S04	1.004	Inlet	4.3	0.651	0.099	0.4498	
240 minute winter	Inlet	Flow through pond	Outlet	4.0	0.037	0.000	11.5438	
240 minute winter	Outlet	1.006	CMH	3.8	0.351	0.067	0.1714	
240 minute winter	CMH	Hydro-Brake®	Outlet 2	1.0				24.4

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Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.38%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S01	10	24.686	0.086	15.9	0.1541	0.0000	OK
15 minute winter	S02	11	24.582	0.182	34.2	0.3414	0.0000	OK
240 minute winter	S03	232	24.543	0.243	8.0	0.2754	0.0000	SURCHARGED
240 minute winter	S04	232	24.543	0.343	7.7	0.3884	0.0000	SURCHARGED
240 minute winter	Inlet	232	24.544	0.448	7.4	0.0000	0.0000	OK
240 minute winter	Outlet	232	24.543	0.543	4.4	0.6144	0.0000	SURCHARGED
240 minute winter	CMH	232	24.543	0.593	3.5	0.6711	0.0000	SURCHARGED
15 minute summer	Outlet 2	1	22.840	0.000	1.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S01	1.001	S02	15.7	0.648	0.313	0.5180	
15 minute winter	S02	1.002	S03	33.2	0.999	0.899	0.6584	
240 minute winter	S03	1.003	S04	7.7	0.734	0.200	0.7131	
240 minute winter	S04	1.004	Inlet	7.4	0.634	0.171	0.5677	
240 minute winter	Inlet	Flow through pond	Outlet	4.4	0.047	0.000	27.3611	
240 minute winter	Outlet	1.006	CMH	3.5	0.391	0.062	0.1714	
240 minute winter	CMH	Hydro-Brake®	Outlet 2	1.1				27.9

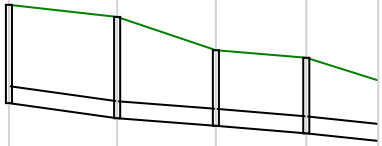
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Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.38%

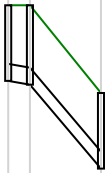
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S01	11	24.699	0.099	20.4	0.1780	0.0000	OK
15 minute winter	S02	11	24.681	0.281	43.8	0.5267	0.0000	SURCHARGED
240 minute winter	S03	232	24.666	0.366	10.4	0.4140	0.0000	SURCHARGED
240 minute winter	S04	236	24.666	0.466	9.8	0.5270	0.0000	SURCHARGED
240 minute winter	Inlet	236	24.666	0.571	9.6	0.0000	0.0000	OK
240 minute winter	Outlet	236	24.666	0.666	5.6	0.7531	0.0000	SURCHARGED
240 minute winter	CMH	236	24.666	0.716	3.6	0.8098	0.0000	SURCHARGED
15 minute summer	Outlet 2	1	22.840	0.000	1.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S01	1.001	S02	20.2	0.662	0.402	0.6080	
15 minute winter	S02	1.002	S03	41.6	1.046	1.124	0.7788	
240 minute winter	S03	1.003	S04	9.8	0.729	0.254	0.7131	
240 minute winter	S04	1.004	Inlet	9.6	0.592	0.222	0.5677	
240 minute winter	Inlet	Flow through pond	Outlet	5.6	0.044	0.000	39.0858	
240 minute winter	Outlet	1.006	CMH	3.6	0.347	0.064	0.1714	
240 minute winter	CMH	Hydro-Brake®	Outlet 2	1.2				30.1

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Node Name		S01	S02	S03	S04	Inlet
A4 drawing Hor Scale 1500 Ver Scale 100 Datum (m) 19.000						
Link Name		1.001	1.002	1.003	1.004	
Section Type		225mm	225mm	225mm	225mm	
Slope (1:X)		107.3	195.9	179.3	142.7	
Cover Level (m)		25.900	25.740	25.300	25.200	24.900
Invert Level (m)		24.600 24.400	24.400 24.300	24.300 24.200	24.200 24.100	
Length (m)		21.468	19.585	17.931	14.275	

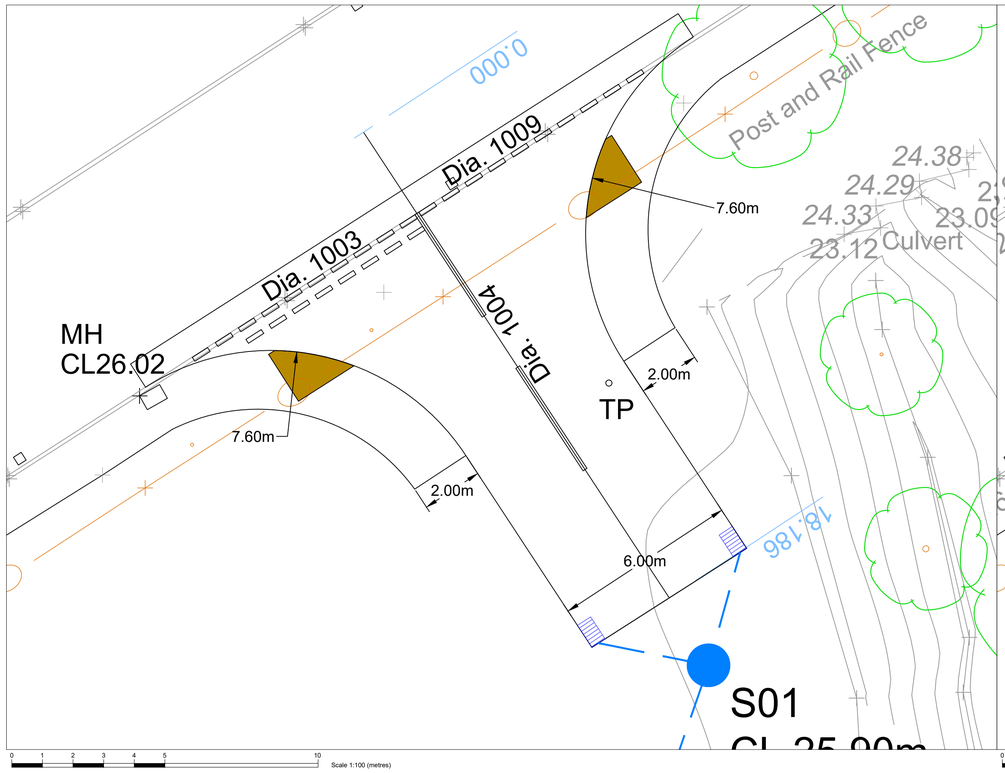
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Node Name	Outlet CM1	Outlet 2
A4 drawing Hor Scale 1500 Ver Scale 100 Datum (m) 18.000		
Link Name	1.1.007	
Section Type	225mm	
Slope (1:X)	12.7	
Cover Level (m)	25.000	23.840
Invert Level (m)	23.950	22.840
Length (m)	14.092	

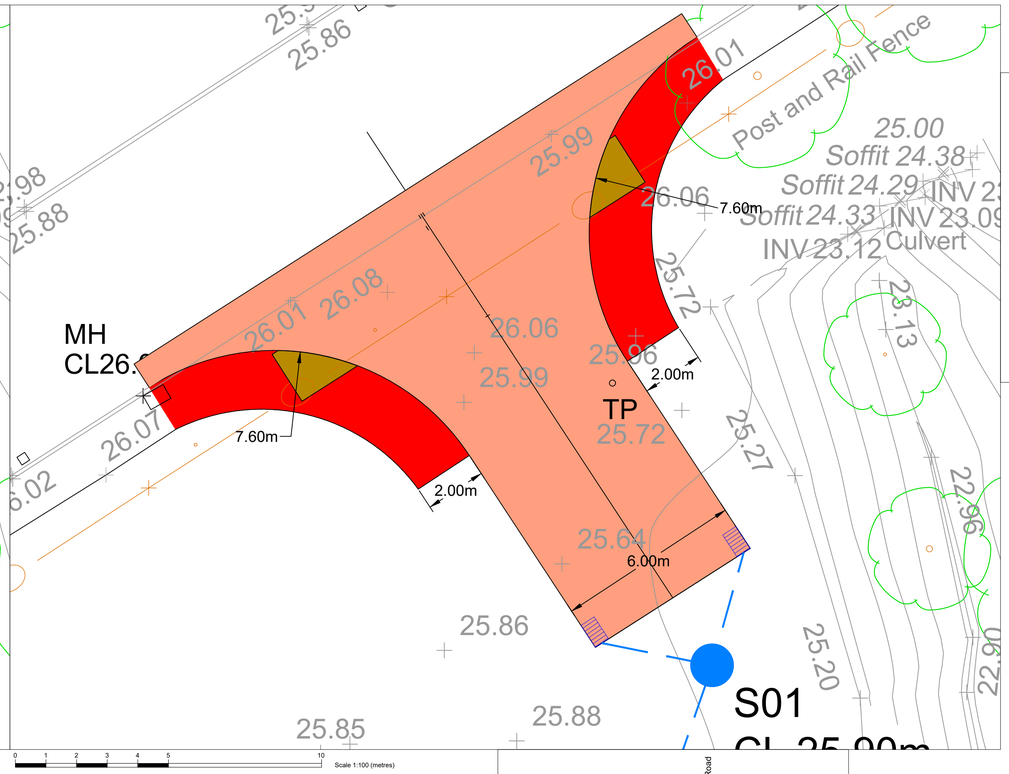
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Appendix F – Drainage Drawings

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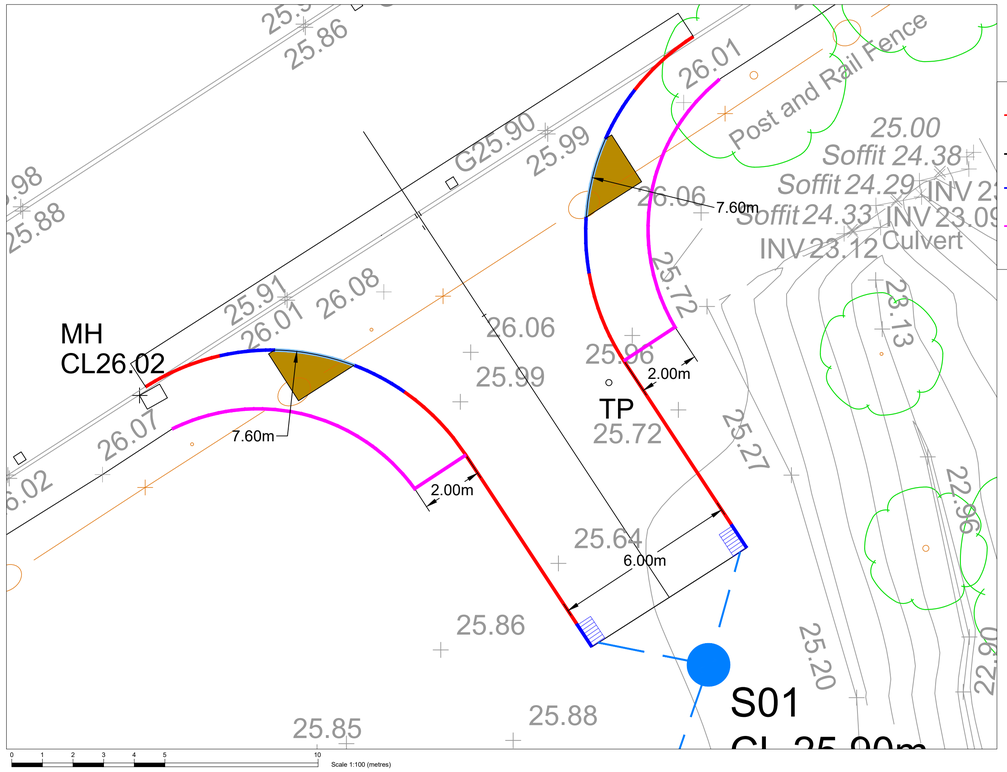


Access General Arrangement

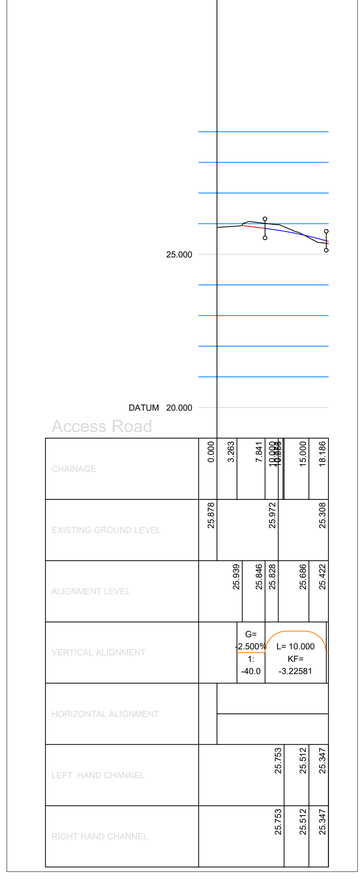


Surfacing Details

Access Road	45mm Close Graded Asphalt Surface 55mm-6mm Dense Asphalt Biner 140mm-32mm dense Asphalt Base 300mm Type 1 Sub-base to Cl 803 To Be Adopted
New Footpath	20mm-6mm Dense Asphalt Surface 60mm-20mm Dense Asphalt Base 100mm Type 1 Sub-base to Cl 803 To Be Adopted
Tactile Paving	80mm Thick Concrete Block Paver Surface Course (blocks to be Brindle in Colour) 30mm Sand ST4 Concrete



Kerbing Details



Scale 1:500 (metres)

north

Rev.	Description	Drawn	Date

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Project
Bridge Road North
Wrexham

Drawing
Access Layout
and Construction

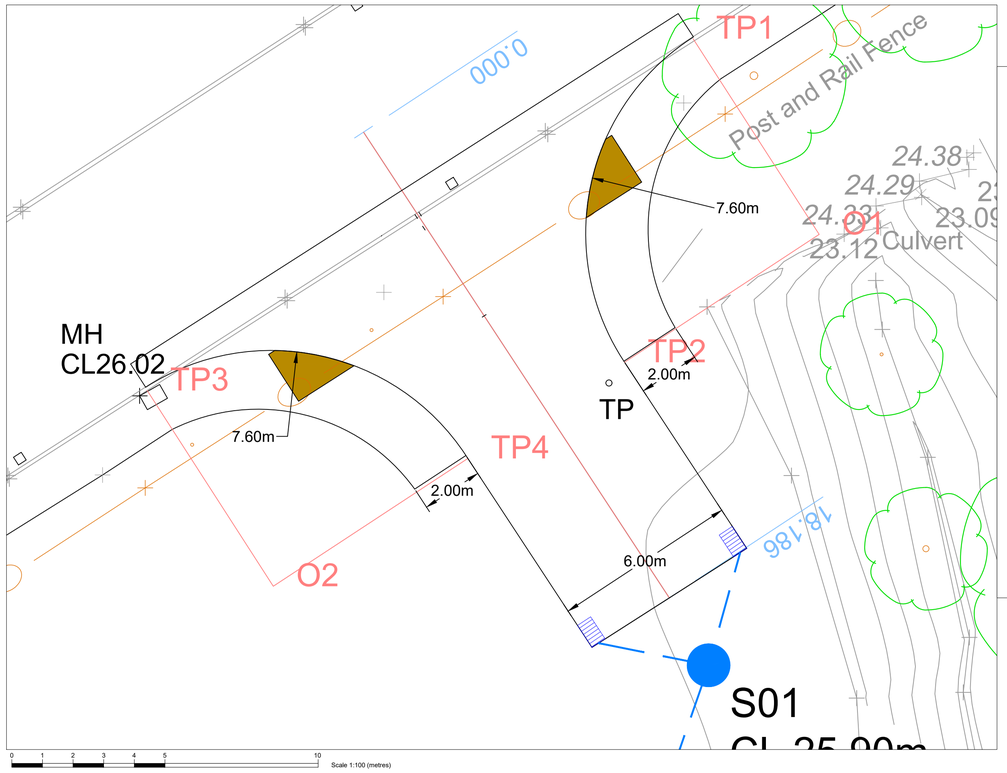
Status
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Scale 1:100/500 Sheet A1

Drawn GM Check DC Date 5/8/24

Drawing No: 315341 RC001 Rev 1

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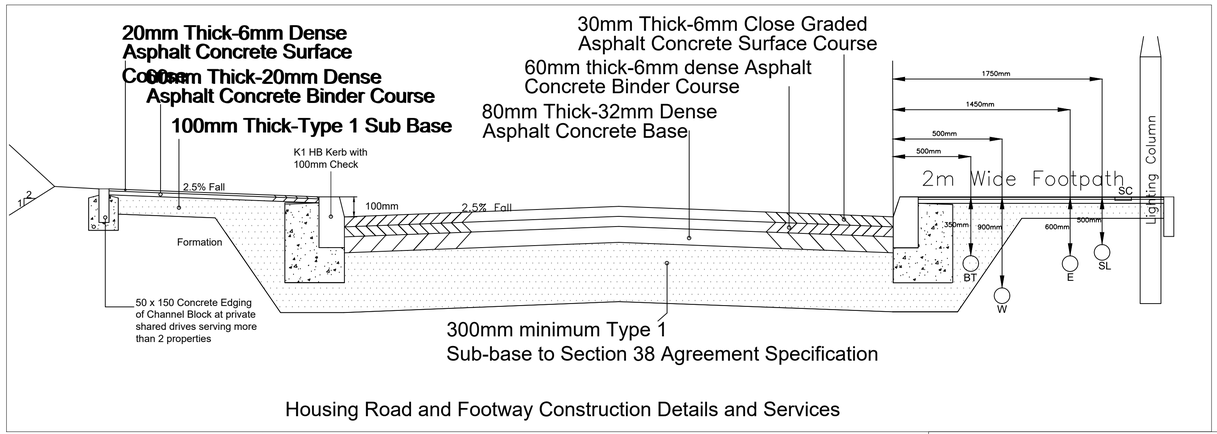


Setting Out

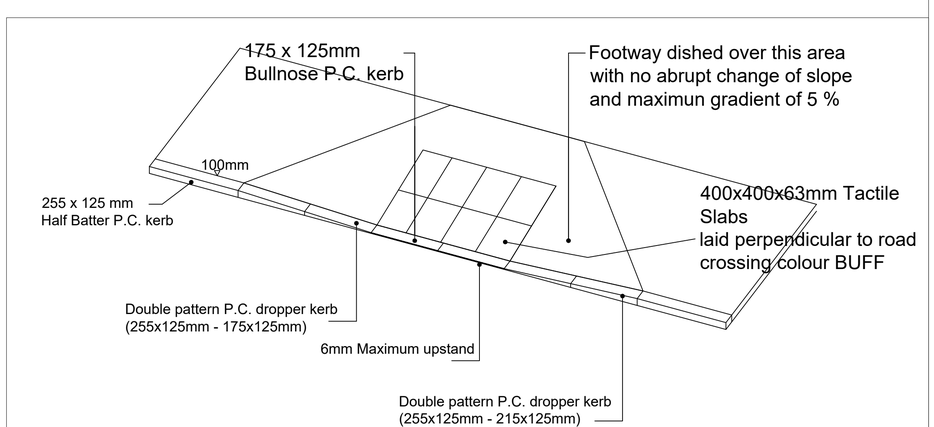
ALIGNMENT ROAD1					
LOCATION	CHAINAGE	EASTING	NORTHING	LEVEL	BEARING
SP1-1	0.000	338019.143	349550.008	26.616	57.20679
EP1-1	203.661	338190.346	349660.312	26.828	57.20679

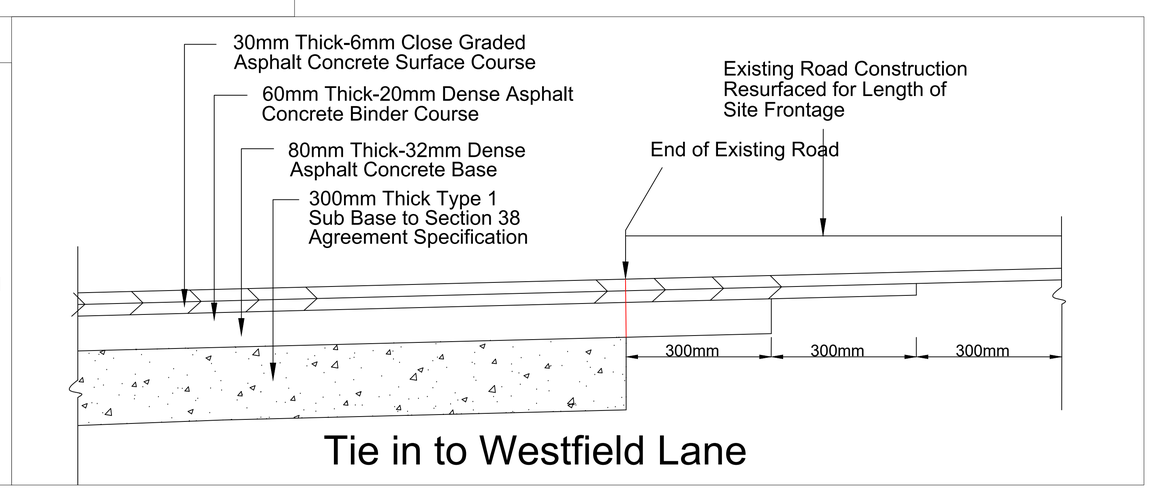
JUNCTION DETAILS RH Side				
Curve 2	E	N	Level	Radius
Centre O2 :	338114.170	349598.310		7.600
Start TP3:	338110.055	349604.700	26.062	
End TP4:	338120.523	349602.482	25.776	

JUNCTION DETAILS LH Side				
Curve 1	E	N	Level	Radius
Centre O1 :	338131.992	349609.793		7.600
Start TP1:	338127.876	349616.182	26.043	
End TP2:	338125.640	349605.621	25.770	



Housing Road and Footway Construction Details and Services





Tie in to Westfield Lane

north

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Wrexham

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Setting Out
and Construction Details

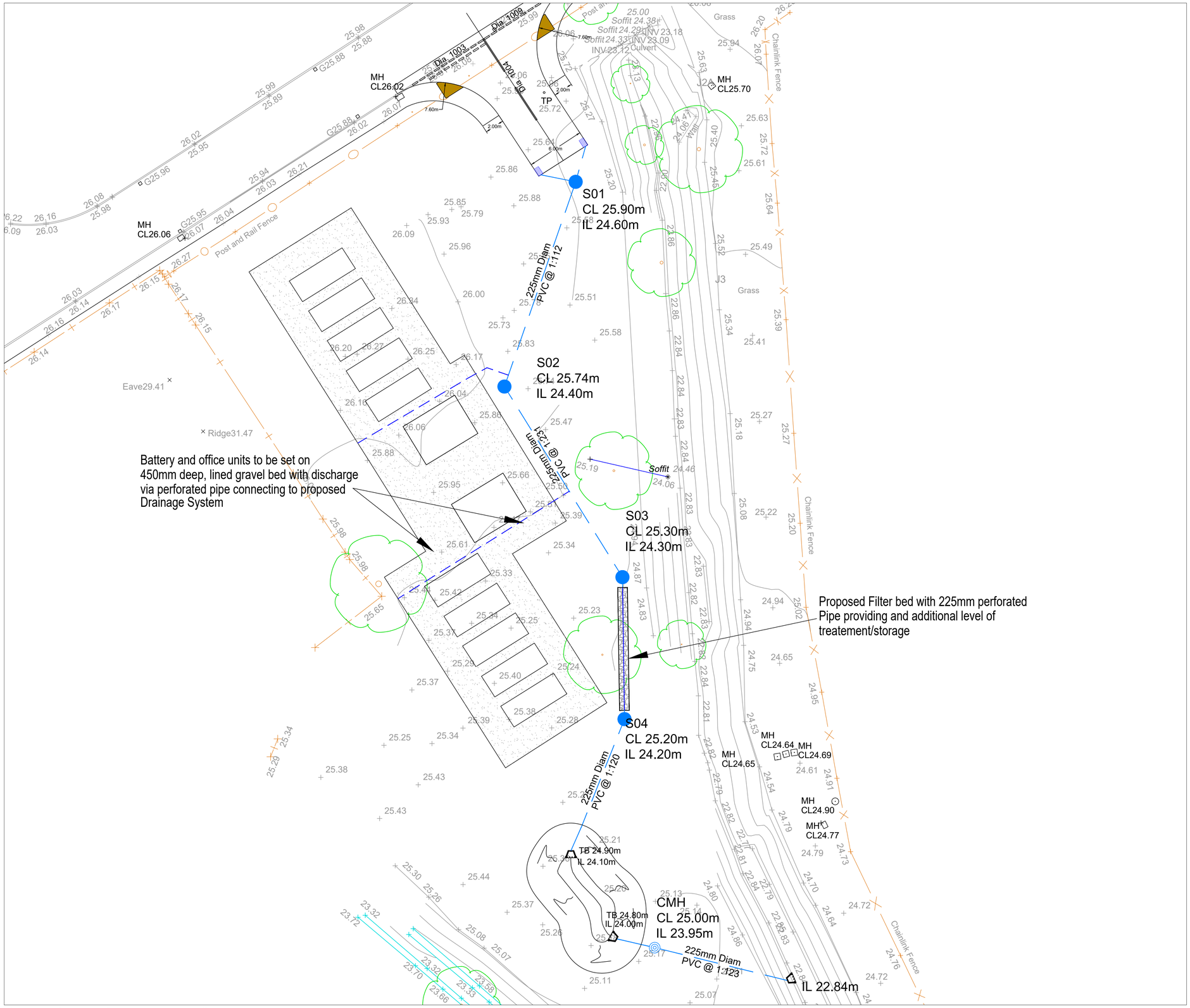
Status
ISSUE

Scale 1:100/500 Sheet A1

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- Road Gully
- S? Surface Water Manhole
- Proposed Surface Water Sewer at varying depth and diameter
- Filter Bed/Strip
- Perforated Pipe
- CMH Control Manhole

north

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Project
Bridge Road North
Wrexham

Drawing
Drainage Layout

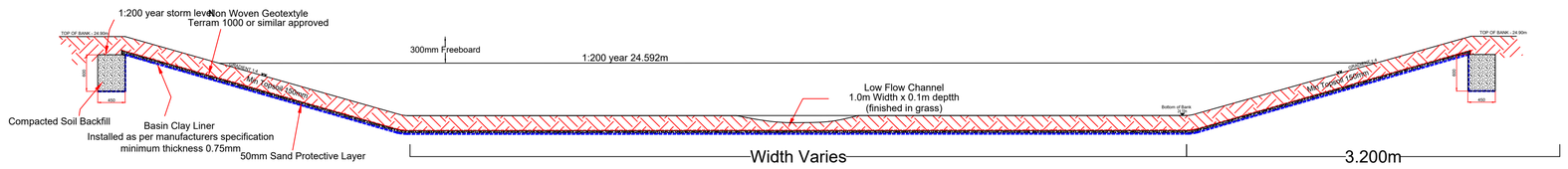
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Scale 1:200 Sheet A1

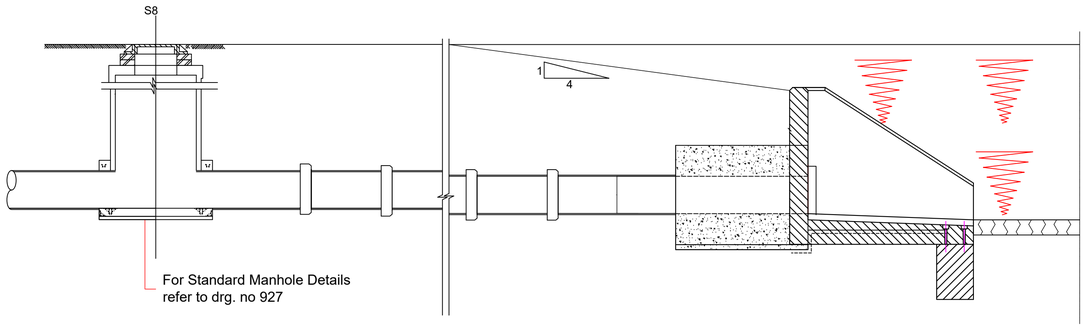
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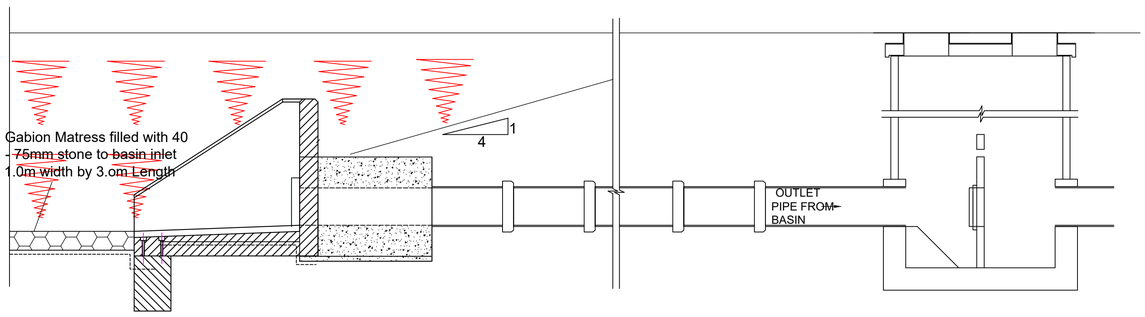
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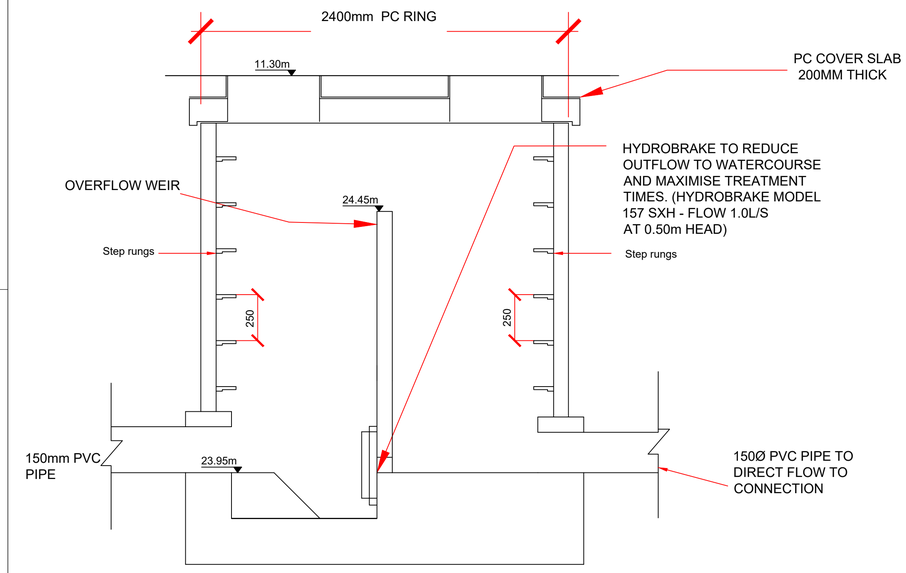
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DETENTION BASIN CROSS SECTION







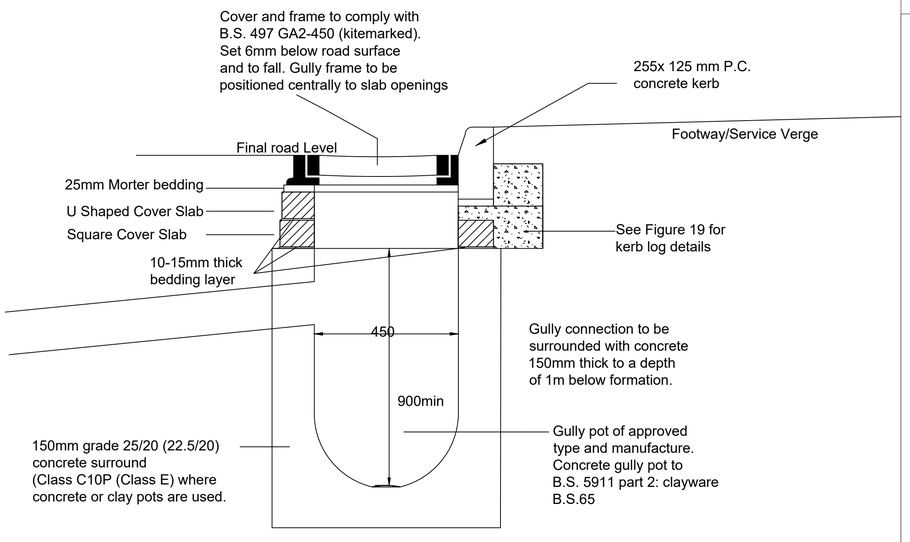
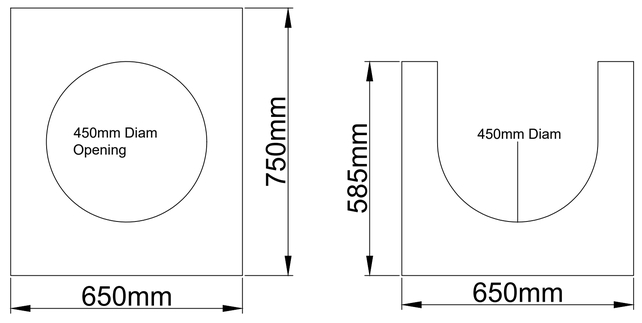


Figure 16 - Typical Road Gulley and Filter Drain



100mm thick Concrete Slab
Square to BS5911 - 6

100mm thick Concrete Slab
U Shaped to BS5911 - 6

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Scale 1:50/25 Sheet A1

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Drawing No: 315341 RC004 Rev 1

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Gary Mackintosh
Site name:	Bridge Road North
Site location:	Wrexham

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:	53.03982° N
Longitude:	2.92432° W
Reference:	3373553403
Date:	Aug 23 2024 10:22

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 0.53

Methodology

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

Soil characteristics

	Default	Edited
SOIL type:	1	1
HOST class:	N/A	N/A
SPR/SPRHOST:	0.1	0.1

Hydrological characteristics

	Default	Edited
SAAR (mm):	684	684
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

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.

(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.

(3) Is SPR/SPRHOST ≤ 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):	0.09	0.09
1 in 1 year (l/s):	0.08	0.08
1 in 30 years (l/s):	0.15	0.15
1 in 100 year (l/s):	0.19	0.19
1 in 200 years (l/s):	0.21	0.21

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 G – Maintenance Plan

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See a Difference.

Project No: 315341

Drainage Maintenance Plan: BESS Bridge Road North, Wrexham

Prepared for:

Hero Future Energies

Spaces-London Ealing Aurora,
71-75 Uxbridge Road,
London, UK
W5 5SL

Contents Amendment Record

This report has been issued and amended as follows:

Revision	Description	Date	Signed
1.0	First Issue	05/09/2024	Josh Rigby

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Acknowledgement

Appointment

This report has been prepared for the sole and exclusive use of Hero Future Energies in accordance with the scope of work presented in Mabbett & Associates Ltd (Mabbett) Letter Agreement (315341/LA/080524/1.0), dated 08 May 2024. This report is based on information and data collected by Mabbett. Should any of the information be incorrect, incomplete, or subject to change, Mabbett may wish to revise the report accordingly.

Mabbett was instructed to complete a Drainage Maintenance Plan (DMP) on Land south of Bridge Road North, Wrexham Industrial Estate, Wrexham, LL13 9PS (the site) to inform a planning application for the development of a Battery Energy Storage System (BESS). Planning permission was granted with conditions by Wrexham Council on 1 December 2022, which is highlighted within application number ISY P/2022/0057. This report should be read in conjunction with the Drainage Strategy (315341 BESS Bridge Road, Wrexham_DS_050924).

This report has been prepared and approved by the following Mabbett personnel:

MABBETT & ASSOCIATES LTD



Josh Rigby, BSc (Hons) MCIWEM
Manager | Water Environment Team

1.0 Introduction

1.1.1 This document sets out the principles for the long term management and maintenance of the surface water Sustainable Drainage Systems (SuDS) to be constructed at BESS Bridge Road North, Wrexham.

1.1.2 The purpose of this document is to set out the basis of the development SuDS Maintenance Plan and to ensure that the adopting management company is entrusted with a robust inspection and maintenance programme, ensuring the optimum operation of the surface water drainage network is continually maintained for the lifetime of the development and to prevent the increased risk of flooding both on and offsite in accordance with the National Planning Policy Framework (NPPF).

1.1.3 The activities listed in this document are generic to the relative SuDS types and represent the minimum maintenance and inspection requirements, however additional tasks or varied maintenance frequency may be instructed by the maintenance company as required. Specific maintenance needs of the SuDS elements should be monitored and maintenance schedules adjusted to suit requirements.

1.1.4 All those responsible for maintenance should follow relevant Health and Safety legislation (Health and Safety at Work Regulations, 1999) for all activities listed within this report including lone working, if relevant) and risk assessments should always be undertaken.

1.1.5 Any contractor employed by the Management Company shall carry out periodic maintenance of all such SuDS in accordance with the schedules listed in this report. Inspection checks shall be carried out by a qualified and competent person, at the minimum intervals listed within the schedules and the appropriate work carried out.

2.0 Drainage Layout & Design

2.1.1 The storm water drainage strategy for the proposed development utilises SuDS features to intercept and convey all pluvial surface water runoff. The design of the system aims to attenuate runoff and encourage infiltration.

2.1.2 Surface water runoff will be discharged to Redwither Brook along the eastern boundary of the site at a rate of 1l/s. Surface water runoff up to the 1 in 100 year plus 40% climate change allowance event will be attenuated on site. A total attenuation volume of 30.1m³ will be required to achieve the discharge rate and will be provided in the form of permeable surfacing, a filter drain and a basin, which can be seen on the 315341 RC003 Drainage Layout (Appendix A).

2.1.3 Therefore the proposed storm water system consists of the following SuDS components:

1. Permeable Surfacing;
2. Filter drain;
3. Detention basin;
4. Automatic actuating valve; and
5. Manholes, Inspection Chambers, Pipe Work, Drainage Channels & Gullies.

2.1.4 There are three categories of maintenance activities referred to in this report:

- Regular maintenance (including inspections and monitoring)

  Consists of basic tasks done on a frequent and predictable schedule, including vegetation management, litter and debris removal, and inspections;

- Occasional maintenance

  Comprises tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the routine tasks (sediment removal is an example); and

- Remedial maintenance

  Comprises intermittent tasks that may be required to rectify faults associated with the system, although the likelihood of faults can be minimised by good design. Where remedial work is found to be necessary, it is likely to be due to site-specific characteristics or unforeseen events, and as such timings are difficult to predict.

3.0 Maintenance Requirements

3.1 Permeable Surfacing

3.1.1 Permeable surfacing such as the gravel placed under the proposed BESS buildings, should be inspected and maintained to ensure that surface water is appropriately infiltrating and released to the watercourse in a controlled way.

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional Maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required - once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm 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 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 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

3.2 Filter Drains

3.2.1 Filter drains are trenches filled with gravel used for temporary subsurface storage for the filtration, attenuation and conveyance of surface water runoff. Filter drains should be inspected and maintained to ensure that the system is appropriately storing and releasing the surface water, the maintenance is described more below.

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 devices	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

3.3 Detention Basins

3.3.1 Detention basins are depressions that is designed for temporary storage during a rainfall event which can then infiltration to the ground. Maintenance is described below.

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove litter and debris	Monthly
	Cut grass - for spillways and access routes	Monthly (during growing season), or as required
	Cut grass - meadow grass in and around basin	Half yearly (spring – before nesting season, and autumn)
	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 banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), then annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
	Manage wetland plants in outlet pool – where provided	Annually (as set out in Chapter 23)
Occasion Maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every 2 years, or as required
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial Actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

3.4 Automatic Actuating Valve

3.4.1 The automatic actuating valve has been proposed as a precaution in the event of a fire occurring onsite. In the unlikely event of a fire, the valve would be triggered to lock ensuring that no firewater is discharged to the watercourse and remains within the drainage system. The valve should be inspected and maintained to ensure that the valve will lock in the event of a fire. Any proposed valve will be supplied with the manufacturers recommend maintenance procedures and these should be followed in preference to the below. The table below sets out the recommended maintenance.

Maintenance Schedule	Required Action	Typical Frequency
Remedial actions	Replace valve if appears faulty upon inspection	As required
Monitoring	Survey and test the valve	6 Monthly

3.5 Manholes, Inspection Chambers, Pipe Work, Drainage Channels & Gullies

3.5.1 The surface water drainage system should be inspected and maintained periodically, primarily to check for silt sedimentation within the system or ingress of any detritus or debris which would decrease system performance. The table below sets out the recommended maintenance actions and frequency.

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Remove manhole and chamber covers to sewers and flow control on network– inspect to ensure water is flowing freely and that the water flow route is unobstructed.	6 Monthly Undertake inspection after leaf fall in autumn
	Remove debris and silt as required.	Monthly
Remedial actions	Re-line or replace pipework if unable to clear blockages by jetting	As required
Monitoring	Survey inside of pipework for sediment build-up and remove if necessary	6 Monthly

4.0 Maintenance Requirements

4.1.1 Most spillages on development sites are on or in construction compounds that do not pose a serious risk to the environment if they enter the drainage in a slow and controlled manner with time available for natural breakdown in a treatment system.

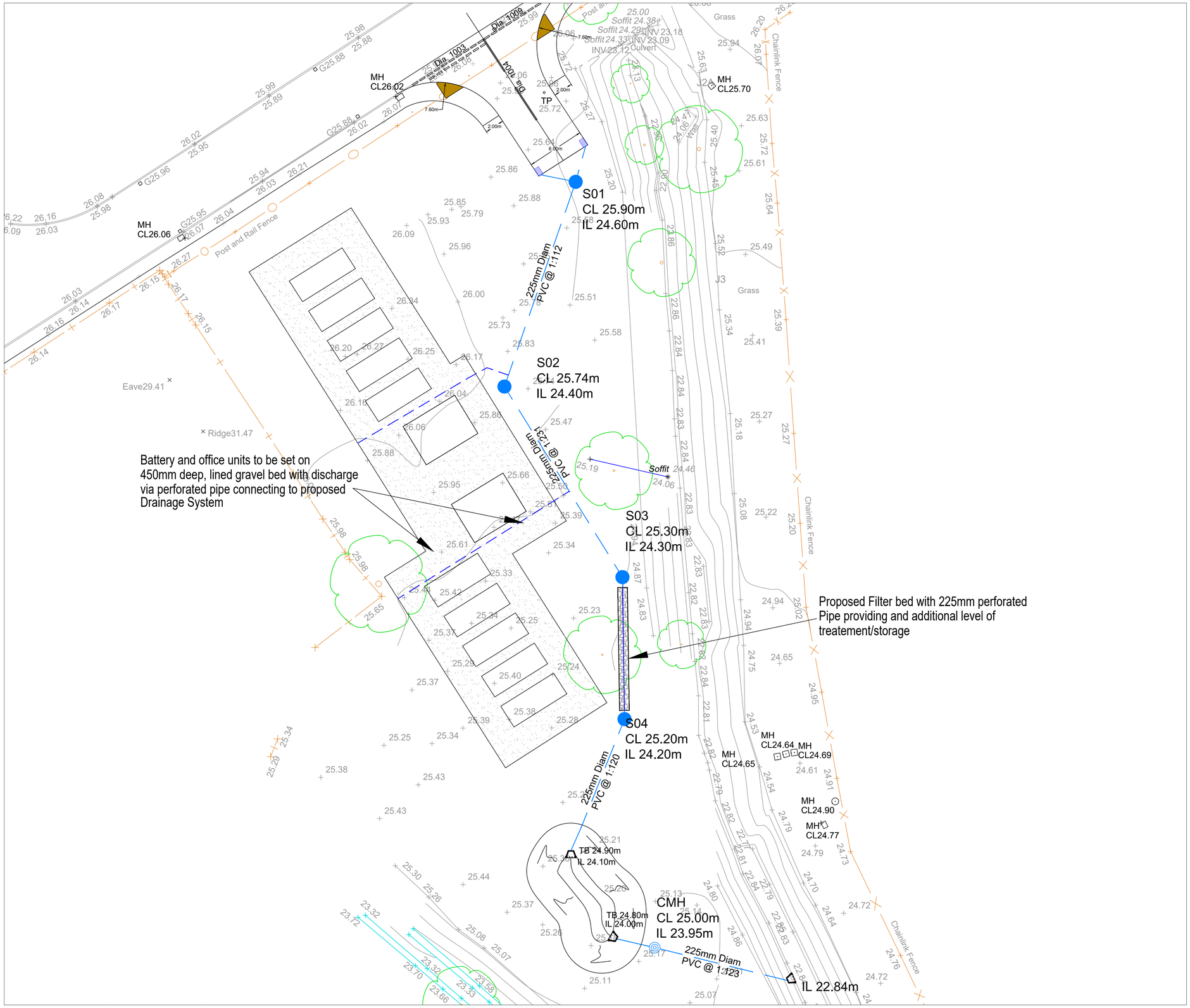
4.1.2 Therefore, small spillages of oil, milk or other known organic substances should be removed where possible using soak mats as recommended by the Environment Agency with residual spillage allowed to bio-remediate in the drainage system.

4.1.3 In the event of a serious spillage, either by volume or of unknown or toxic compounds, then isolate the spillage with soil, turf or fabric and block outlet pipes from chamber(s) downstream of the spillage with a bung(s). (A bung for blocking pipes may be made by wrapping soil or turf in a plastic sheet or close woven fabric.)

4.1.4 Contact the Environment Agency immediately.

Appendix A – Drainage Layout

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- S? Surface Water Manhole
- Proposed Surface Water Sewer at varying depth and diameter
- Filter Bed/Strip
- Perforated Pipe
- CMH Control Manhole

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Project
Bridge Road North
Wrexham

Drawing
Drainage Layout

Status
ISSUE

Scale 1:200 Sheet A1

Drawn GM Check DC Date 5.8.24

Drawing No: 315341 RC003 Rev 1