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Llanwern Leisure Hub

Drainage Strategy Report

Prepared for

St Modwen / Miller Homes

Date 5th of August 2025

Project no. 25236-R-601-B



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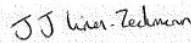
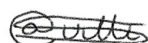
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Llanwern Leisure Hub

Drainage Strategy Report

Document Control

Responsible for	Job Title	Name	Date	Signature
Content	Project Engineer	Joshua Lines-Zechmann	07 th August 2025	
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Approval	Director	Andrew Willis	07 th August 2025	
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Revision History

Revision	Date	Purpose/Status	Approved
0	07/08/24	Issue to Client	ACV
A	17/09/25	Access Ramp for Basin	ACV
B	24/09/25	Introduction Text Revised	ACV
C			
D			
E			
F			

Distribution

	Function Title	Company	Name
1		St Modwen / Miller Homes	
2			
3			

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References

- 1 CIRIA – The SuDS Manual (C753)
- 2 UK SUDS (www.uksuds.com)
- 3 Welsh Water Asset Plans
- 5 Google Maps
- 6 Ordnance Survey Mapping
- 7 BRE Digest 365 Soakaway Design
- 8 National Soil Resources Institute (SoilScapes)
- 10 NRW Online Flood Risk Map

Abbreviations

DCWW	DWR Cymru Welsh Water
A.O.D.	Above Ordnance Datum
FW	Foul Water
SW	Surface Water
SuDS	Sustainable Drainage Systems
l/s	Litres Per Second
NRW	Natural Resources Wales
SAB	Suds Approval Body

1.0 INTRODUCTION

- 1.1 QuadConsult Limited was commissioned by Miller Homes to produce a drainage strategy for the Llanwern Leisure Hub of the Glan Llyn development on the site of the former Llanwern Steelworks.
- 1.2 This report will draw upon information supplied by the Client and that available within the public domain including the local authority Planning Portal.
- 1.3 The aim of this report is to demonstrate that a suitable site-specific surface water drainage strategy can be implemented to service the proposed development.

- 1.4 **Although St Modwen / Miller Homes intend to submit a separate planning application between the leisure hub facilities and detention basin, considering the holistic nature of the proposals, proposed drainage features serving the leisure hub have been outlined within the report for contextual purposes only.**

2.0 SITE LOCATION AND DESCRIPTION

- 2.1 The proposed development is located on the site of the former Llanwern Steelworks which has since been demolished and re-purposed as a new large residential community with associated leisure and school facilities. The site(s) are part of a wider series of development plateaus serviced by new highway infrastructure and a mix of new and old drainage systems including a system of reens and detention basins/ponds.
- 2.2 The Leisure Hub which incorporates a new car park, bowls green and 3 tennis courts is situated centrally within the wider residential plateau just north of the Central Lake grid reference ST 358 869 and postcode NP19 4EW.
- 2.3 A detailed finished topographical survey has been carried out and provided to QuadConsult Limited that confirms the site to range from 6.7m down to 5.8m AOD falling in a Southern direction at an average gradient of 1:300. Several stockpiles of material are also located along the length of the proposed leisure hub location.



Site Location

3.0 EXISTING DRAINAGE

3.1 Land Drainage

The topographic survey identified a drainage ditch running along the eastern boundary of the proposed leisure hub location. We suspect that the ditch is formed as part of the original development which is currently being re-designed.

3.2 Overland Flow & Exceedance Routes

The site is relatively flat and formed by made ground at a shallow gradient falling from North to South. Current runoff would be in the form of sheet flow in an easterly direction.

3.3 Surface Water Drainage Network

The wider site is served by a series of managed reens and waterways that eventually discharge into the estuary and are subject to a tidal lock situation. Surface water attenuation is provided in the form of basins and enlarged reens to accommodate unrestricted flows from the development parcels; surface water pumps are also believed to be available to further manage attenuation volumes within the system if and when required. The new spine distribution road that serves the individual parcels which the entrance to the Leisure Hub car park is located off, also have a network of surface water carrier drains that discharge direct into the open reen network; spurs have been provided into the parcels at the respective site entrances catering SW discharge. A limited amount of treatment (for highways runoff) in accordance to National SUDs standards is catered for within the aforementioned highways infrastructure. It is proposed that Parcel 4B & 5D is not allowed for within these treatment figures there for the land within the leisure hub will be offered to partially offset the treatment for the highway and proposed leisure hub facilities through the installation of swales and a basin positioned to the North of Central Lake.

3.4 Foul Water Drainage Network

A foul pumping station is located in the centre of the Leisure Hub location which is discharged into the wider adopted DCWW drainage network. The aforementioned spine/distributor road houses a dedicated foul water network with spurs into the respective surrounding land parcels sized to accommodate the proposed development.

3.5 Combined/Other Drainage

No obvious combined sewers are present within or adjacent the site.

4.0 EXISTING FLOOD RISK

NRW development advice mapping confirms the development parcel lies wholly within a Flood Zone 3 defended from sea.

4.1 Flood Risk from Rivers

NRW flood mapping (Refer to Appendix 3) indicates little/no risk of flooding from main Rivers.

4.2 Flood Risk from Sea

NRW flood mapping (Refer to Appendix 3) indicates Flood Zone 3 (defended).

4.3 Flood Risk from Surface Water & Small Watercourses

NRW flood mapping indicate no risk of flooding from these sources.

4.4 Flood Risk from Reservoir

NRW flood mapping (Refer to Appendix 3) indicates no risk of flooding from the Reservoirs.

4.5 Other Flood Risk (Mines, Piped Network, etc)

The development parcels have been assessed for flood risk in the Halcrow Flood Consequences Assessment dated 2005 which confirms the site can be defended and serviced by a managed surface water and flood prevention defences in line with the agreed strategy for the wider development.

5.0 APPLICATION OF DRAINAGE HIERARCHY

5.1 Discharge to Ground

The development plateaus are constructed from made ground sourced from the remediation strategy implemented following the demolition of the former steel works infrastructure. The made ground is therefore deemed to be contaminated requiring the provision of a 600mm clean cap of imported material to protect future homeowners. By definition, discharge of runoff into the ground as a surface water disposal strategy is not considered appropriate due to the ground's potential to leach contaminants into the surrounding watercourses. The shedding of runoff from small hard surfaces (patios, footpaths, etc) onto adjacent landscaped/softscaped areas is however, not viewed as a material hazard.

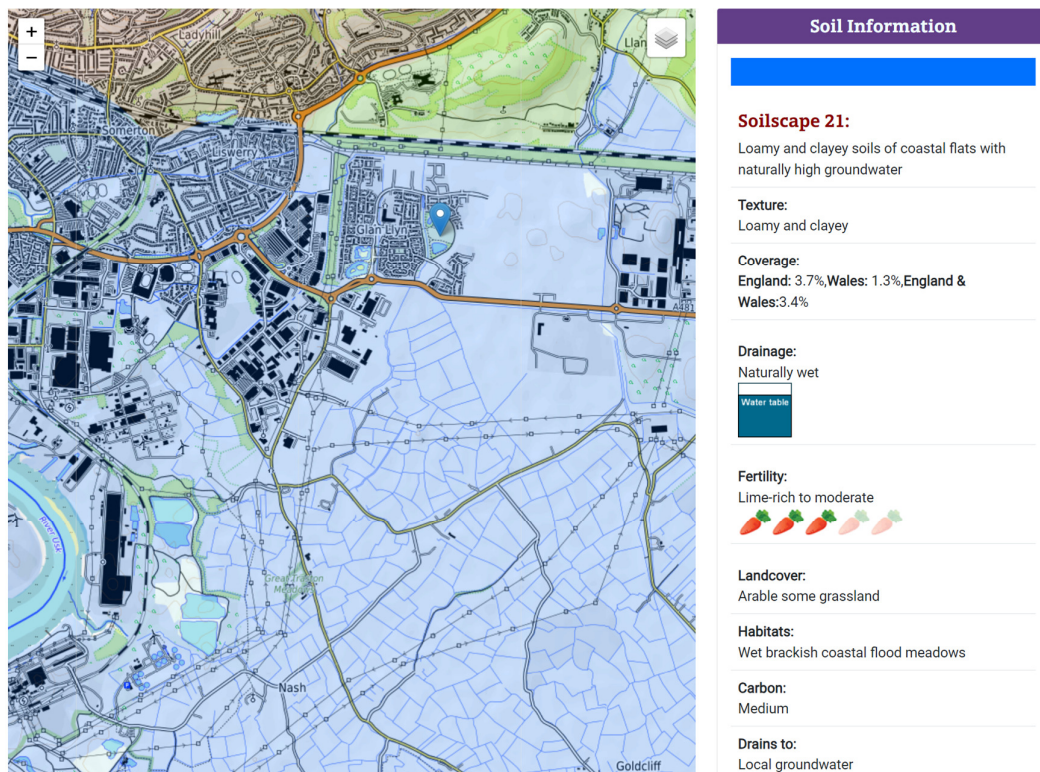


Figure 2 – Soils Map

5.2 Discharge to Surface Water Body

Rodgers Leask alongside Halcrow have developed an approved site wide surface water drainage strategy for the wider site, part of which includes provision of the Central Lake.

QuadConsult Limited propose free discharge into this attenuation facility via 1 no. separate outfalls.

5.3 Discharge to Surface Water Sewer (1. Highway Sewer, 2. Other SW Sewer)

QuadConsult Limited propose for the surface water flows to be directed towards the Central Lake situated to the south of the proposed development.

6.0 PROPOSED DRAINAGE STRATEGY

- 6.1 QuadConsult Limited propose to collect runoff from the site and discharge to a basin located North of the 'Central Lake' situated to the south of the development from where it connects into the wider drainage network.

The flows will be unrestricted in accordance with the overall approved drainage strategy for the Leisure Hub which has been designed to accommodate any storage or discharge requirements.

Runoff from the bowls green will be self-treating with the wider tennis courts incorporating a permeable tarmacadam surface drained through a permeable pipe network located in the subbase below which discharges to the basin to assist with the removal of pollutants and suspended solids in line with CIRIA C753 The SuDS Manual. The car park will be drained through permeable paving, which leads to a bioretention area south of the car park. The proposed SuDS train includes the provision of porous surfacing's in the car park, entrance highway and tennis courts coupled with the introduction of a bioretention area south of the car park, in turn linked to the basin to the north of the Central Lake and located on the southern boundary of the proposed Leisure Hub.

A maintenance ramp shall be provided to the main basin area to ensure adequate access / egress for vehicles and equipment.

6.2 Foul Water

There is no requirement for any foul infrastructure, although the existing pumping station and foul pipe networks are located throughout.

There is a foul manhole located within the footprint on the norther side of the 3rd tennis court which may require relocation. This will be confirmed with the wider drainage strategy.

Other Drainage

A swale has been offered along the western side of the boundary to allow treatment for the roof run offs for the proposed 4C and 5G development. This may also impact the size of the downstream pipe network south of the swale. This will be subject to the design stage of the adjacent parcels.

7.0 COMPLIANCE WITH NATIONAL SUDS STANDARDS

The following sections detail the design principles that will be incorporated in the development proposals for the scheme, and the measures incorporated to satisfy the requirements for future SAB approval.

7.1 Standard S1 – Surface Water Destination

Priority Level 1 – Reuse of Rainwater

The use of SuDS planters, Rain gardens & Rainwater Butts are discounted as the Leisure Hubs drainage is at ground source resulting in no chance for rainwater interception.

Priority Level 2 – Infiltration to Ground -

Infiltration to ground as a form of surface water disposal has been discounted due to the presence of contaminants within the made ground forming the plateau.

Priority Level 3 – Discharge to Water Body

Runoff from parking areas and the tennis courts will discharge primarily to the basin and finally into the 'Central Lake' which in turn forms part of the overall drainage strategy for the overall site. This body of water is owned and managed by the SAB and has been sized to accommodate the predicted runoff for the 100 year + CC even in the tide lock situation.

Priority Level 4 – Discharge to Surface Water Sewer, Highway Drain, or other System -

Discharge from permeable pipe networks below the tennis courts and bowling green will be fed into the surface water drainage infrastructure provided to the east of the Leisure Hub which will discharge immediately into the basin.

Priority Level 5: Discharge to a Combined Sewer

Not required as Level 4 achievable.

7.2 Standard S2 – Surface Water Runoff Hydraulic Control

It is proposed that the attenuation system provided as part of the wider drainage strategy be mobilised for the proposed site development.

First 5mm Interception

Interception mechanisms will be required to ensure compliance with the requirement of zero runoff for the first 5mm rainfall for 80% of storm events during the summer and 50% in winter. The provision of permeable tarmac along with flows through permeable pavement subbase will contribute to the objective of first 5mm interception. Deemed to comply with the SAB standards.

Exceedance/Blockage

Any exceedance flows will follow surface topography. The topography is such that any excess flows will be directed in a southerly direction towards the Central Lake.

7.3 Standard S3 – Water Quality

The proposed SuDS treatment train devices (Permeable tarmac, Permeable paving, and Bioretention / Basin) will deliver the required cleansing and filtration through filter medium of runoff for this leisure hub (low pollution hazard level) development.

7.4 Standard S4 – Amenity

The soft SuDS features, (SuDS Basin, lake as part of wider network) many of which are provided as part of the wider site drainage strategy will be carefully designed and integrated into the landscaping scheme for the development, to promote aesthetics and well-being as well as any designed drainage function.

7.5 **Standard S5 – Biodiversity**

The soft SuDS features (Bioretention/Basin) will be carefully designed with gradients/profiles, planting species and soil properties selected to ensure suitable habitat is delivered to promote biodiversity. These proposals will augment the green infrastructure element of the design proposals to demonstrate a robust response to this Standard.

7.6 **Standard S6 - Construction, Operation and Maintenance and Structural Integrity**

Main Infrastructure maintenance will be undertaken by the Local Authority as primary operator and SAB, with smaller portions of the system maintained by the house owners with relevant schedules provided within house packs. All of the proposed SuDS infrastructure is in accessible areas for ease of maintenance. The surface water network including any land drainage will be designed to be fully roddable and jettable, with suitably positioned rodding eyes and mini-access chambers.

The SuDS devices are low maintenance surface/shallow items with established regular maintenance regimes.

A suitably graded Ramp (max. 1:20) shall be provided for maintenance access to the main basin floor to ensure adequate and safe works to be carried out.

The proposed design solution has been designed in accordance with the SuDS manual and is generally served by shallow SuDS features and accessible details. There are no inherent safety issues with the proposed scheme.

8.0 SUMMARY & RECOMMENDATIONS

8.1 SUMMARY

The proposed development will follow current Welsh Government, Local Authority, and SAB guidance in relation to drainage strategy. Proposed surface water discharge rates should be discussed and confirmed with the SAB at the earliest opportunity to allow detailed design to be progressed. The surface water network will follow the principles set out the CIRIA SuDs Manual (C753) and Local SAB requirements and accord with the design principles set out in the Rodger Leask and Halcrow drainage strategy for the wider development.

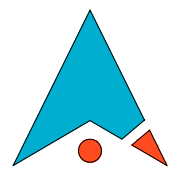
The surface water will be collected, treated, and discharged to a viable outfall (Central Lake) following treatment in the basin at an unrestricted rate, as managed flows and attenuation requirements have previously been provided as part of the wider Rodgers Leask drainage strategy. Where appropriate, surface water elements will be adopted by the local authority through SAB application process.

8.2 RECOMMENDATIONS

The following actions are recommended to allow a robust suitable site-specific surface water drainage strategy can be implemented to service the proposed development.

- CCTV Survey of Drainage networks to confirm as built level, condition and connectivity/final discharge
- Discussion/Pre-Planning application to DCWW to determine capacity and potential connection points.
- Discussion required with SAB to agree proportion of treatment that can be offered to wider schemes based on up-stream basin proposals north of the central lake.
- Pre-SAB application with local authority to initiate dialogue to confirm connection point(s) together with any mitigation measures that may be required.

APPENDIX 1 - EXISTING SITE SURVEY



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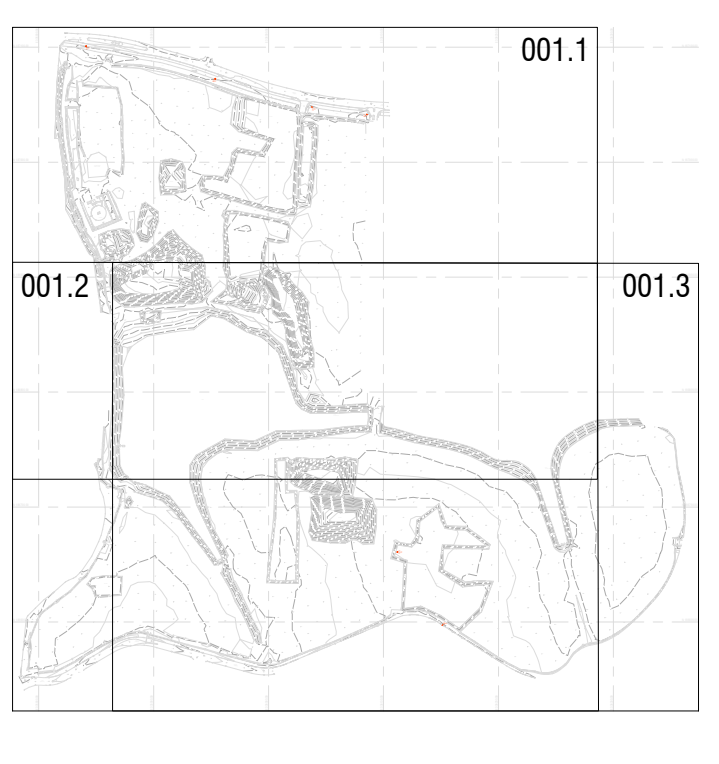
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- GENERAL NOTES**
- The contractor is to check and verify all buildings and site dimensions and levels, including existing sewer invert levels, before works start on site. The contractor is to comply in all aspects with the current building legislation, British Standards, building regulations etc.
 - Positions of existing services/statutory undertakers apparatus adjacent to or crossing proposed excavations are to be checked by the contractor prior to starting work. Utility locations shown are to be verified by the contractor prior to commencement of work.
 - This drawing is to be read in conjunction with and checked against all other drawings, engineering details, specifications and any structural, geotechnical or other specialist document provided.
 - Any anomaly or contradictions between any of the above is to be reported immediately to Corner Point Surveys Ltd.
 - This survey has been undertaken to OS National Grid & Datum (OSTN15) with a calculated local scale factor for this location.

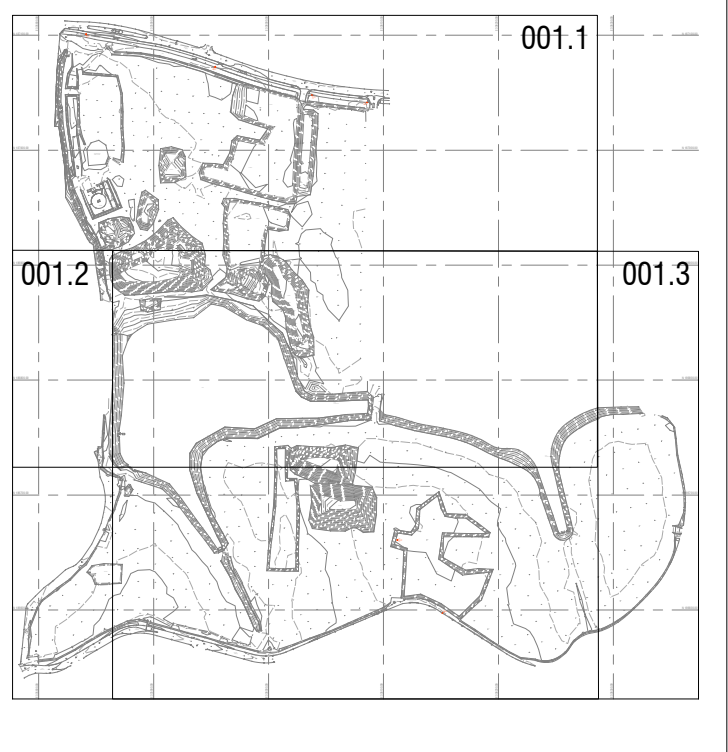
LEGEND		
BUILDING	DR	DR
CANOPY	CPY	DROP KERB
DOORLINE	DRL	EARTH ROAD
DOWNPIPE	DP	ELECTRICITY BOX
EAVES	EV	FIRE HYDRANT
GUTTER	GUT	FOOTPATH
RIDGE	RG	GAS VALVE
ROOF LINE	RPL	GULLY
VENT PIPE	VP	HIGH VOLTAGE OVERHEAD
WINDOW LINE	WOL	INSPECTION CHAMBER
BOUNDARIES	AB	KERB BOTTOM
BRICK SHED	BSH	KERB OUTLET
BRICK WALL	BRW	LOW VOLTAGE OVERHEAD
CHAIN LINK FENCE	CLF	MANHOLE
CLOSE BOARD FENCE	CBF	REFLECTOR POST
CONCRETE PANEL	CPF	ROAD BRN
CORRUGATED IRON	CIF	SLOT DRAIN
GARDEN WALL	GW	STOP TAP
GATE	GW	TACTILE PAVING
GRAVEL HEADWALL	GHW	TELECOM POST
HEADWALL	HW	TRAFFIC LIGHT
HOARDING / HEAS	HF	WATER METER
INTERNAL WALL	IW	STRUCTURE
PALISADE FENCE	PF	COLUMN
PARTITION WALL	PW	CONCRETE PLINTH
POST & RAIL FENCE	PRF	CONTAINER
POST & WIRE FENCE	PWF	RAMP
RETAINING WALL	RW	STEPS
STONE WALL	SW	GENERAL
TOPOGRAPHY	BB	APPROXIMATE
BANK BASE	BB	BED LEVEL
BANK TOP	BT	CONTROL STATION
CLUSTER TREE	CLT	CORNER LEVEL
HEDGE	HE	DIAMETER
TREE	TR	EAVES LEVEL
TRUNK DIA / SPREAD	TR	FRESH FLOOR LEVEL
VEGETATION	VEG	HEIGHT
WATERCOURSE	WC	INVERT LEVEL
FLUMINARE	FLU	RISE LEVEL
ACD DRAIN	ACD	SPOT LEVEL
BOLLARD	BD	UNABLE TO LIFT
BT MANHOLE	BT	UNABLE TO SURVEY
CABLE TV	CTV	WATER LEVEL



Rev	Date	Description	By
Dimensions to be verified on site. This drawing should not be scaled. Use figures dimensions only. Any discrepancies should be referred to the Engineer prior to work being put in hand. This drawing is copyright.			
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Client  ST. MODWEN HOMES			
Project LLANWERN 4B 4C 5D			
Title TOPOGRAPHICAL SURVEY SHEET 1/3			
Drawing Details INFORMATION			
Surveyed by	Drawn by	Checked by	Date
JPW	JPW	ACV	NOV24
Project No	Drawing No	Revision	
S24104	001.1	0	

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DOOR	DR	DR
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EAVES	EV	FIRE HYDRANT
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TRUNK DIA / SPREAD	Φ	FRESH FLOOR LEVEL
VEGETATION	VEG	HEIGHT
WATERCOURSE	WC	INVERT LEVEL
FLUMINATURE	FL	RISE LEVEL
ACD DRAIN	ACD	SPOT LEVEL
BOLLARD	BD	UNABLE TO LIFT
BT MANHOLE	BT	UNABLE TO SURVEY
CABLE TV	CAV	WATER LEVEL



Rev	Date	Description	By
1	11/11/24	Issue for construction	JPW

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ST. MODWEN
HOMES

Project: LLANWERN 4B 4C 5D
Title: TOPOGRAPHICAL SURVEY SHEET 2/3

INFORMATION				
Surveyed by	Processed by	Checked by	Date	Scale & A4 size
JPW	JPW	ACV	NOV24	1:500
Project No	Drawing No		Revision	
S24104	001.2		0	

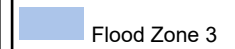
APPENDIX 2 – FLOOD RISK MAP



TAN15 Defended Zones

 Sea

Rivers and Sea



 Flood Zone 2

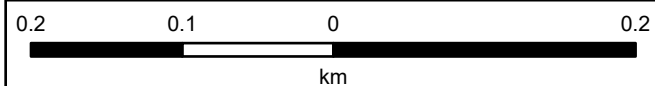
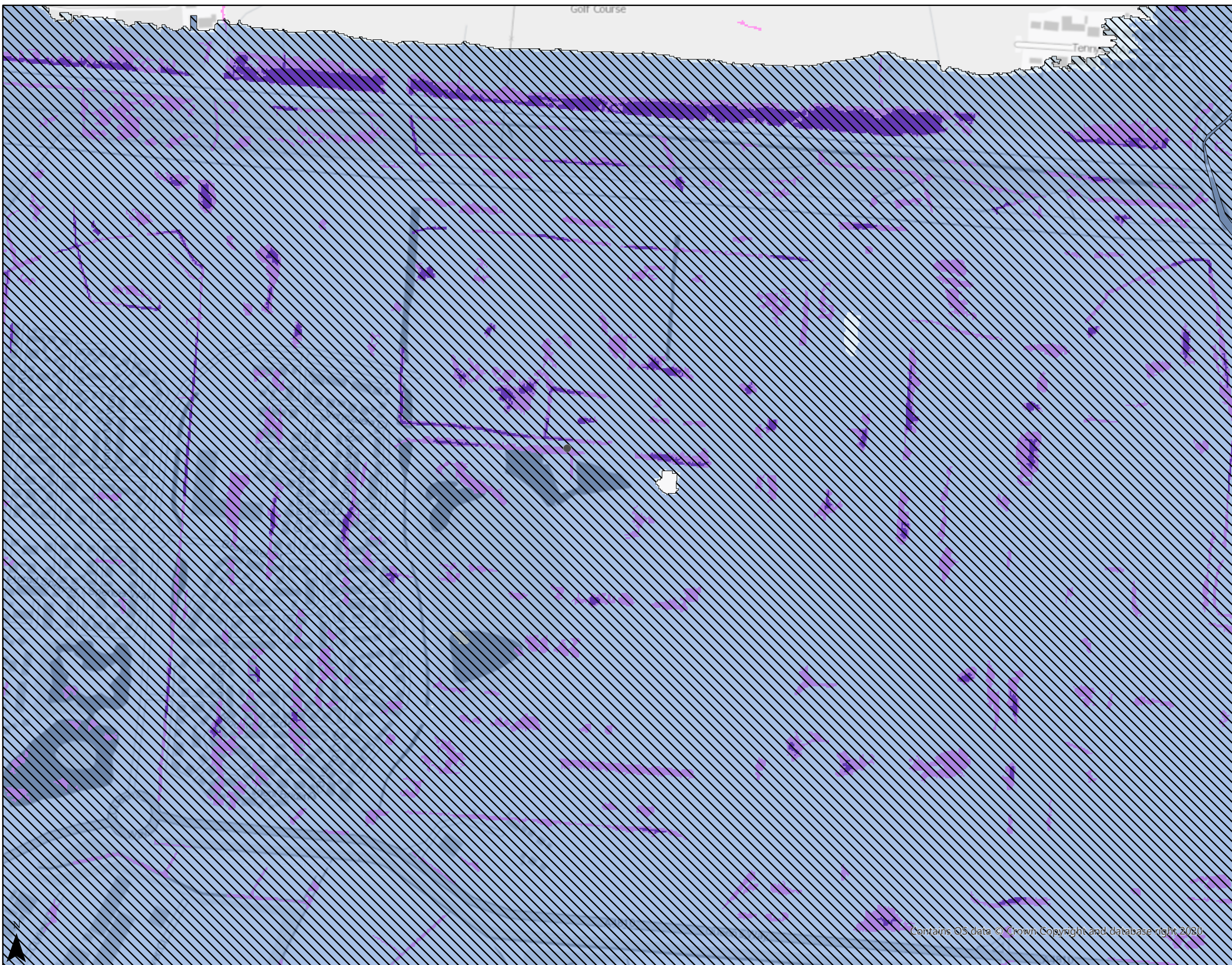


 Flood Zone 2

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Scale at A3: 1:5,000

Date: 05/08/2025



British National Grid

Disclaimer

<https://naturalresources.wales/flooding/disclaimer-for-our-flood-and-coastal-erosion-risk-maps/?lang=en>

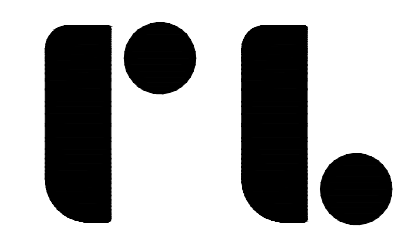
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APPENDIX 3 – PROPOSED SITE LAYOUT



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Responsibility is not accepted for errors made by others in scaling from this drawing. Use only figured dimensions and report any discrepancies or omissions to the Architect immediately.

P01 17.07.2025	First Issue
P02 08.08.2025	SuDs features added to suit engineering
P03 28.08.2025	Redline amended
P04 05.09.2025	Redline amended
P05 16.09.2025	Engineering updated



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Registered Office (England No. 0465820)

Project Name
LEISURE HUB DEVELOPMENT
LLANWERN
GLAN LYNN, NEWPORT

Client Name
MILLER HOMES
-

Drawing Title
PROPOSED SITE PLAN
-

Scale
1/500 • A0

Project No.
9630

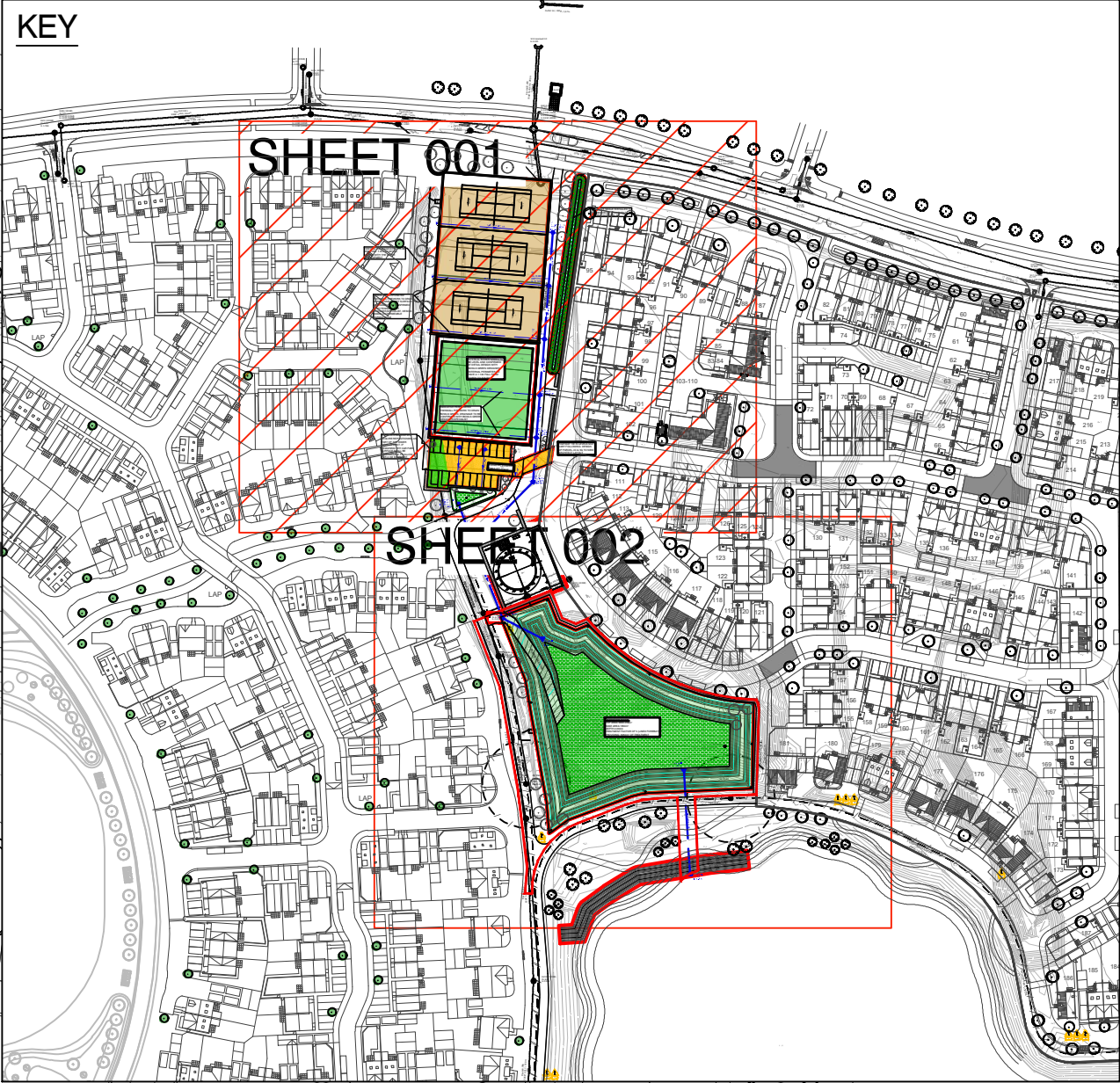
Status
S4
Issued for stage approval

Purpose Of Issue
-

Project **Org** **Year** **Level** **Form** **Role**
9630 • RLA • 25 • XX • DR • A

Number	Revision
2200	P05

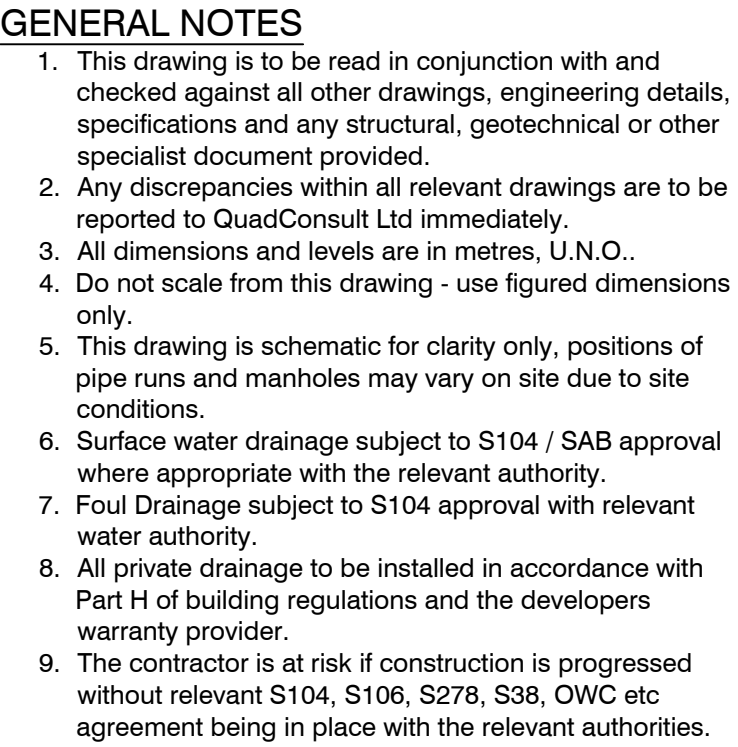
APPENDIX 4 – PROPOSED DRAINAGE STRATEGY PLAN



- GENERAL NOTES**
1. This drawing is to be read in conjunction with and checked against all other drawings, engineering details, specifications and any structural, geotechnical or other specialist document provided.
 2. Any discrepancies within all relevant drawings are to be reported to QuadConsult Ltd immediately.
 3. All dimensions and levels are in metres, U.N.O..
 4. Do not scale from this drawing - use figured dimensions only.
 5. This drawing is schematic for clarity only, positions of pipe runs and manholes may vary on site due to site conditions.
 6. Surface water drainage subject to S104 / SAB approval where appropriate with the relevant authority.
 7. Foul Drainage subject to S104 approval with relevant water authority.
 8. All private drainage to be installed in accordance with Part H of building regulations and the developers warranty provider.
 9. The contractor is at risk if construction is progressed without relevant S104, S106, S278, S38, OWC etc agreement being in place with the relevant authorities.

- LEGEND**
- PROPOSED BIORETENTION
 - BASIN
 - PERVIOUS PAVING
 - NON-PERVIOUS PAVING
 - PROPOSED ADOPTABLE SW SEWER
 - GULLY CATHPIT
 - SWALE
 - TENNIS COURTS
 - BOWLING GREEN

A	17.09.25	RAMP ACCESS PROVIDED TO BASIN	RWP	
0	07.08.25	FIRST ISSUE	JLZ	
Rev	Date	Description	By	
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Project				
LLANWERN LEISURE HUB				
Title				
GENERAL ARRANGEMENT 1 OF 2				
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JLZ	JLZ	ACV	04/08/25	1:250
Drawing No				
25236-C-001-A				



LEGEND

	PROPOSED BIORETENTION
	BASIN
	PERVIOUS PAVING
	NON-PERVIOUS PAVING
	PROPOSED ADOPTABLE SW SEWER
	GULLY CATHPIT
	SWALE
	TENNIS COURTS
	BOWLING GREEN

A	17.09.25	RAMP ACCESS PROVIDED TO BASIN	RWP
0	07.08.25	FIRST ISSUE	JLZ
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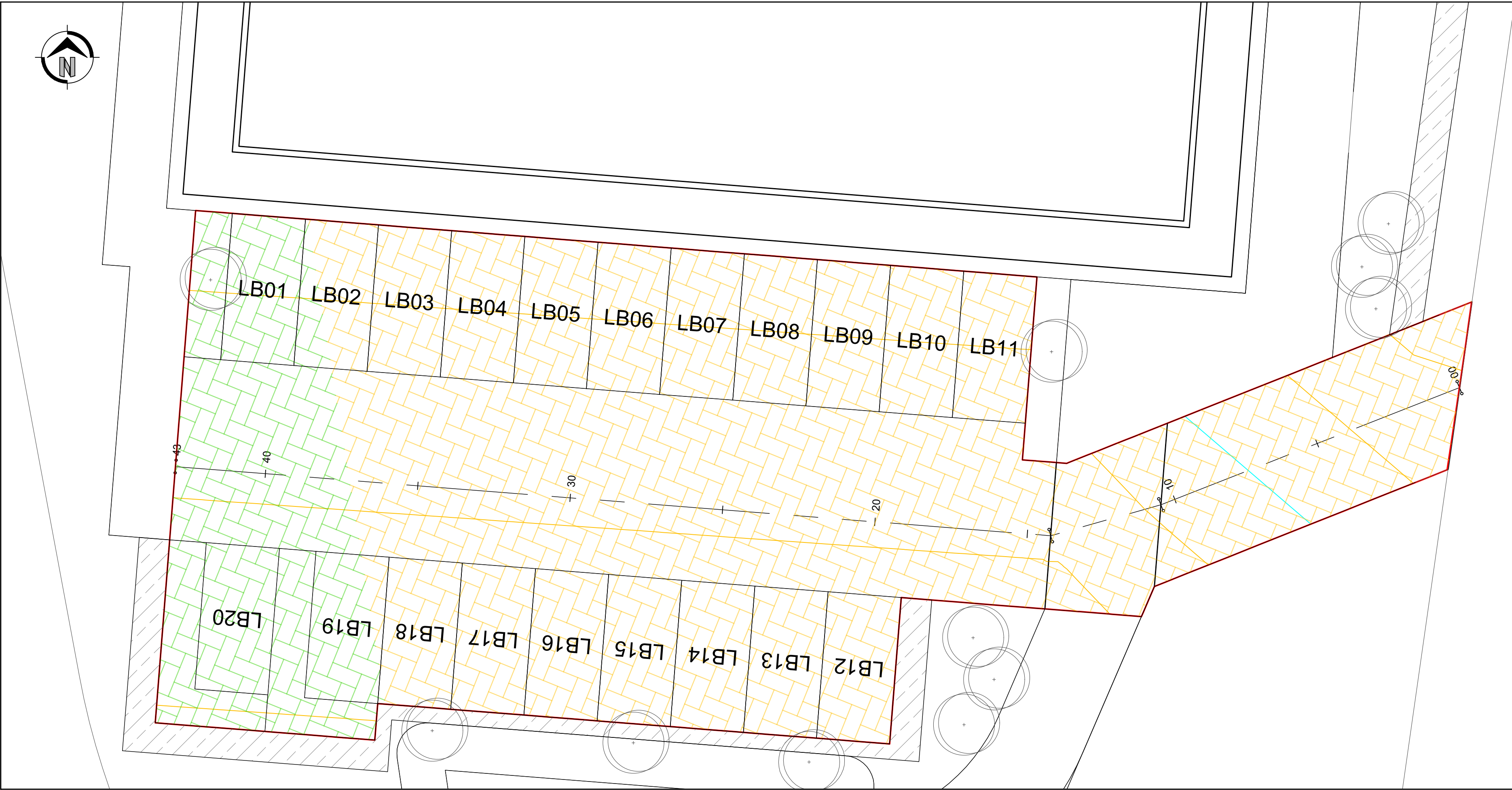
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Project	LLANWERN LEISURE HUB
Title	GENERAL ARRANGEMENT 2 OF 2

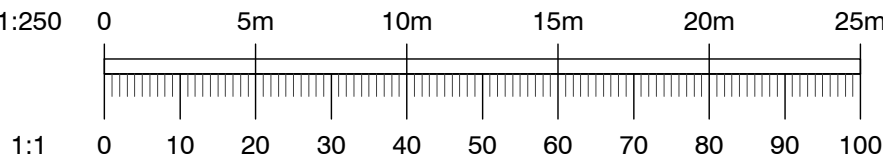
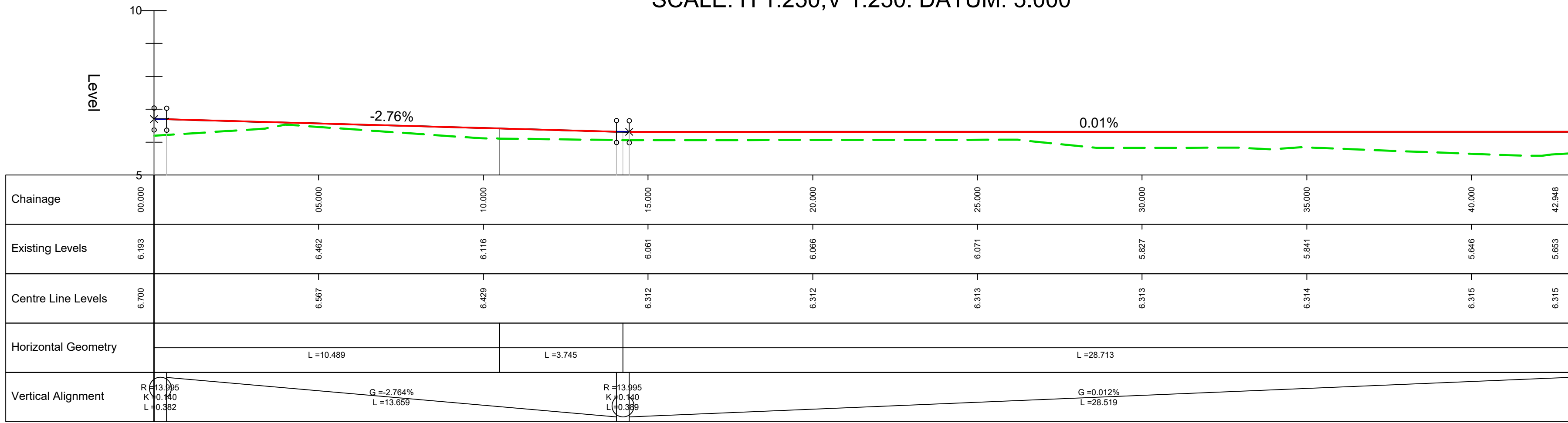
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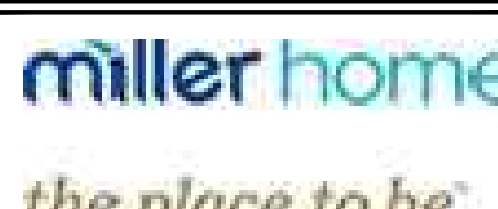
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SCALE 1:250

ENTRANCE INTO CAR PARK
SCALE: H 1:250,V 1:250. DATUM: 5.000

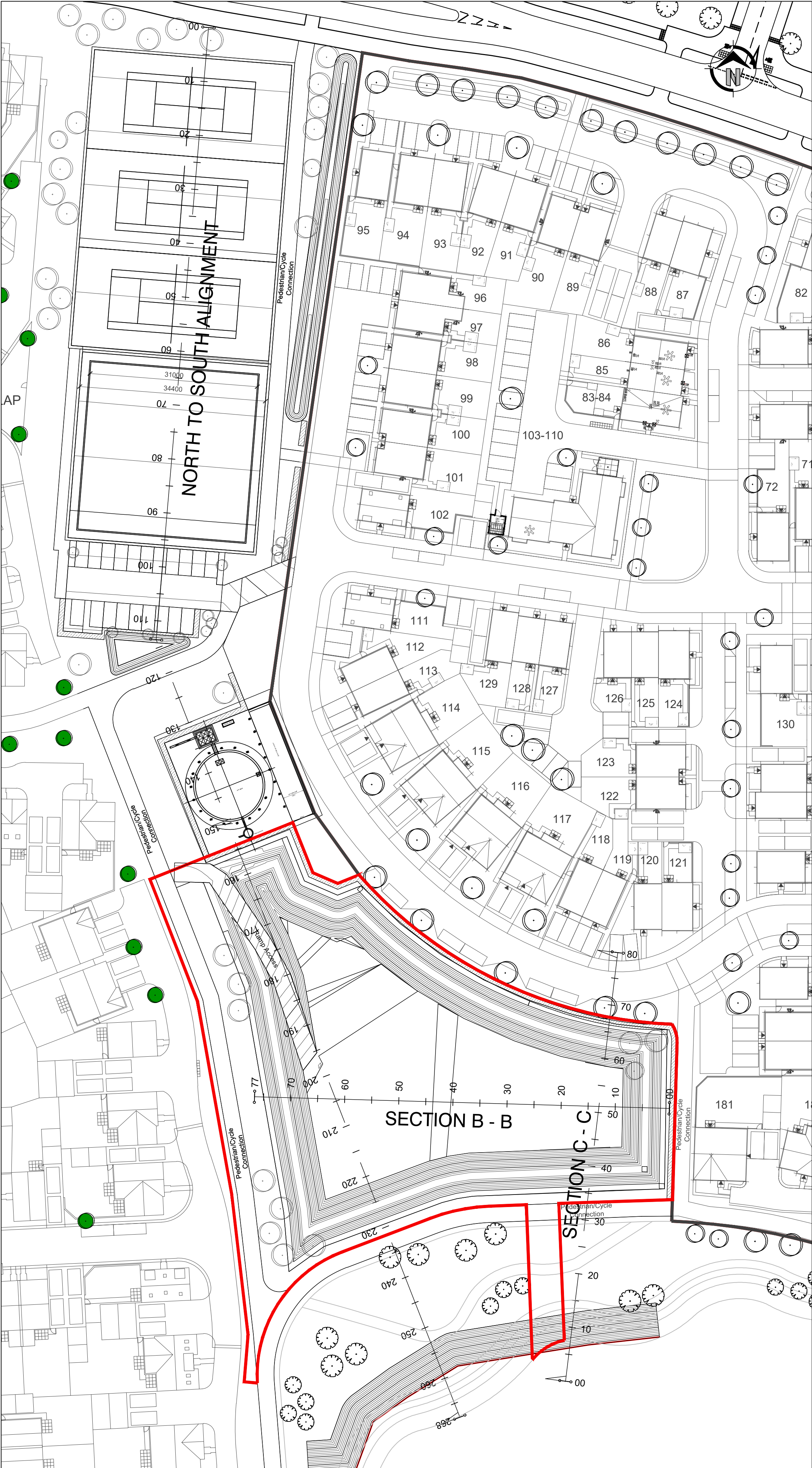


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 5. This drawing is schematic for clarity only, positions of pipe runs and manholes may vary on site due to site conditions.
 6. Surface water drainage subject to S104 / SAB approval where appropriate with the relevant authority.
 7. Foul Drainage subject to S104 approval with relevant water authority.
 8. All private drainage to be installed in accordance with Part H of building regulations and the developers warranty provider.
 9. The contractor is at risk if construction is progressed without relevant S104, S106, S278, S36, OWC etc agreement being in place with the relevant authorities.

- LEGEND**
- PERVIOUS PAVING
 - NON-PERVIOUS PAVING

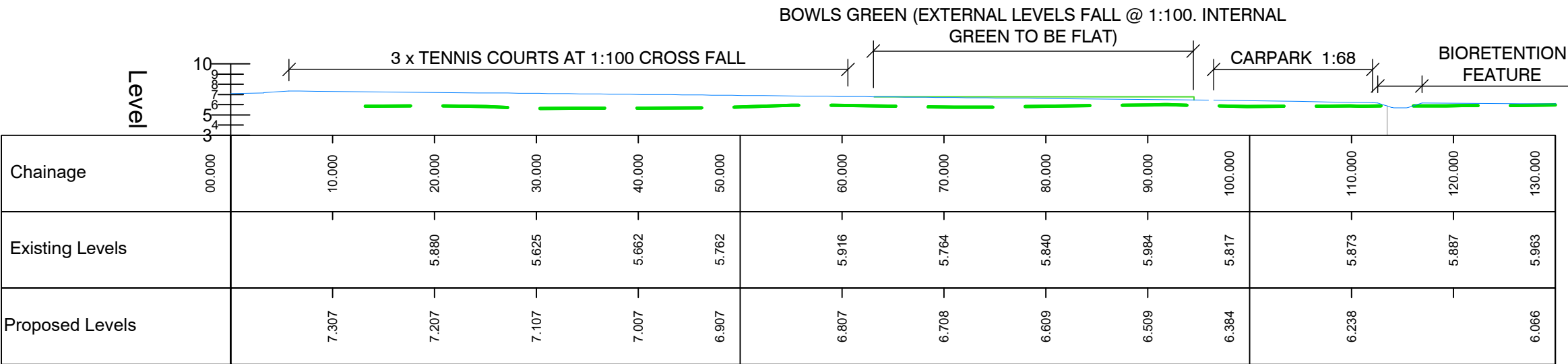
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Client 			
Project LLANWERN LEISURE HUB			
Title CAR PARK LAYOUT			
Drawing Status PRELIMINARY			
Designed by	Drawn by	Checked by	Date
JLZ	JLZ	ACV	04/08/25
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25236-C-003-A			

File name: 25236-C-003-Car Park Layout A.dwg

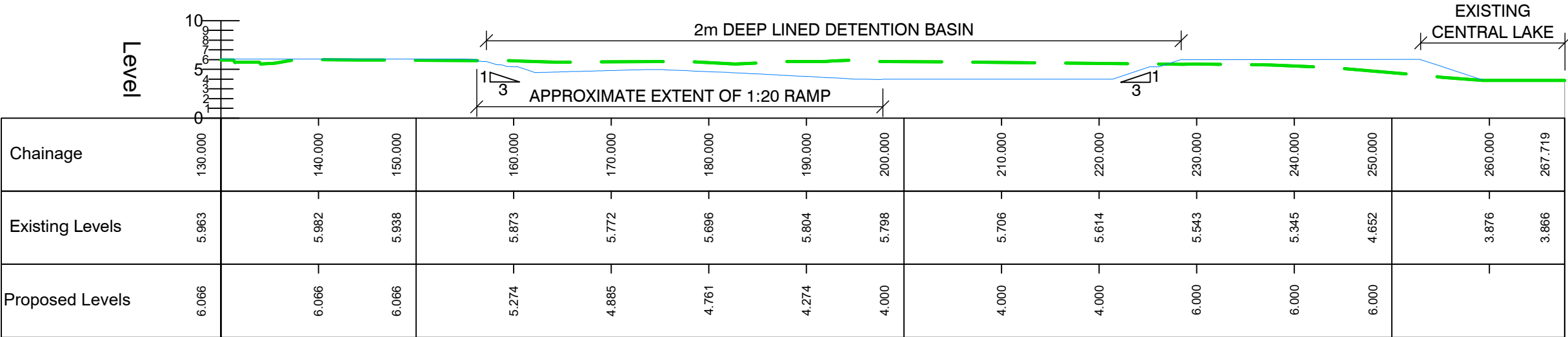


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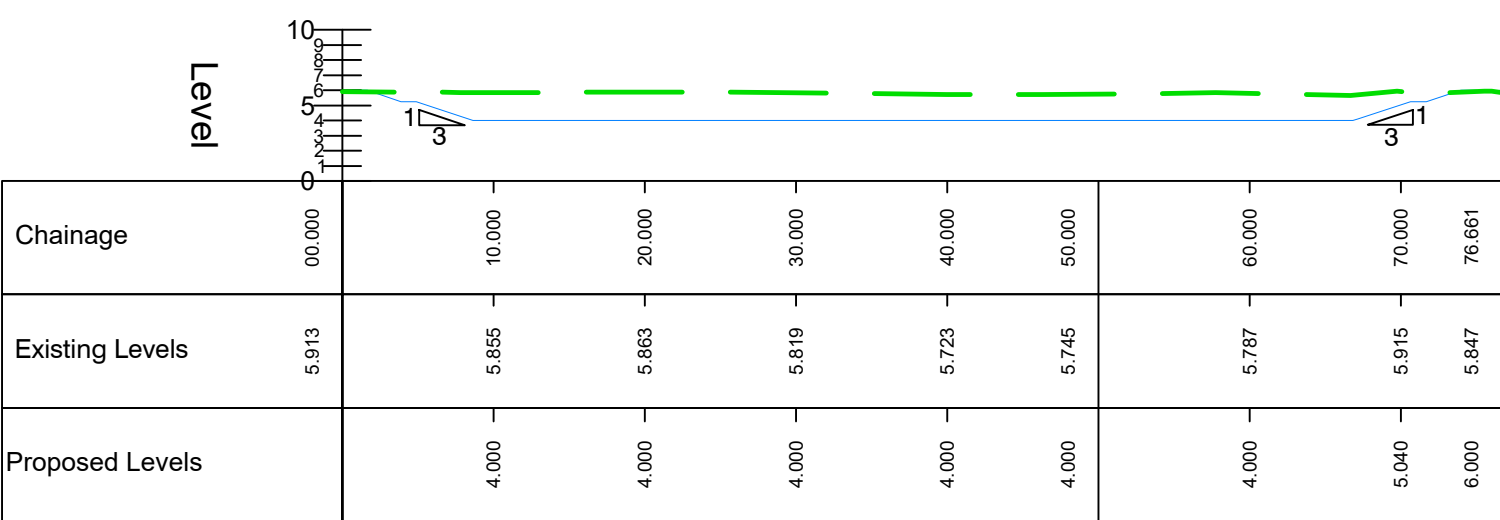
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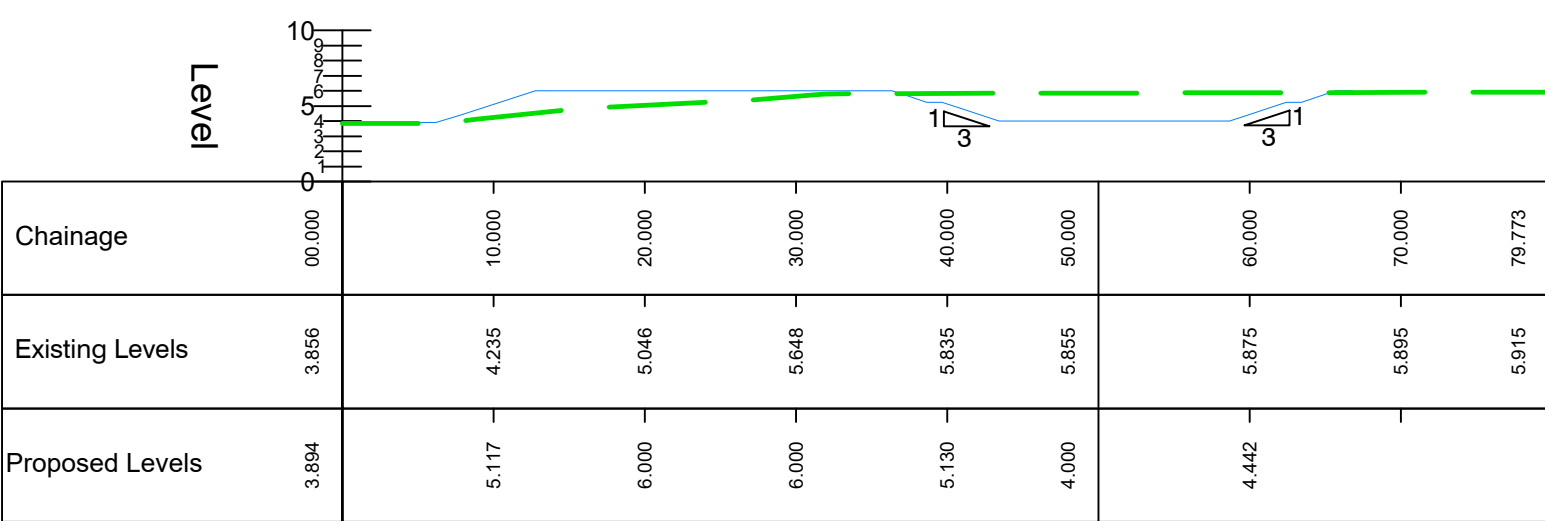
NORTH-SOUTH - LONGSECTION
SCALE: H 1:500,V 1:500. DATUM: 0.000



SECTION B - B - LONGSECTION
SCALE: H 1:500,V 1:500. DATUM: 0.000



SECTION C - C - LONGSECTION
SCALE: H 1:500,V 1:500. DATUM: 0.000



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LEGEND

- Existing Ground Level
- Proposed ground level

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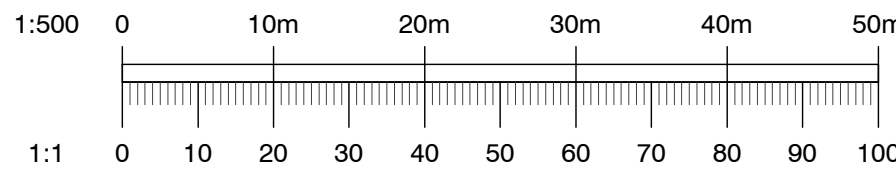
PLAN & SITE SECTIONS

Drawing Status

PRELIMINARY

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JLZ	JLZ	ACV	AUG '25	1:500
Drawing No				

25236-C-004-A



APPENDIX 5 – PROPOSED POLLUTION REMOVAL CALCULATIONS

POLLUTION REMOVAL & WATER QUALITY MANAGEMENT SCHEDULE

CIRIA 753 The SuDS Manual Chapter 26, provides design advice to meet water quality standards by adopting the SuDS train treatment mechanism and thereby reduce the risk of pollution by evaluating potential pollution hazards at the outset.

Runoff from roofing and pedestrian areas is viewed as low risk (Table 4.3) and the proposed site layout provides the opportunity to introduce SuDS into the scheme to reduce potential contaminant risk still further. For example, the use of porous paving reduces flow velocities and increase retention times promoting a level of absorption into the upper soils (intergranular flow) prior to discharge potential to ground (fracture flow).

We propose to apply a simple qualitative method to assess the risk (Simple Index Approach) and proposed mitigation measures as defined in Table 26.1 CIRIA SuDS Manual.

Total SuDS Mitigation Index = Mitigation Index₁ + 0.5 Mitigation Index₂

Site Discharge - Assuming a roof/hard surface split of 30/70 and using a weighted mean:

Roof 0.3 (30%)	Pollution Hazard Level (Low)	Total Suspended Solids (0.2)	Metals (0.2)	Hydrocarbons (0.05)
Weighted value		0.06	0.06	0.015
Residential highways and parking (70%)	Pollution Hazard Level (Low)	Total Suspended Solids (0.5)	Metals (0.4)	Hydrocarbons (0.4)
Weighted value		0.35	0.28	0.28
Total hazard Index		0.410	0.340	0.295

Comparing against the mitigation indices shown below.

SuDS Individual Component Mitigation Indices

	Suspended Solids	Metals	Hydrocarbons
Pervious Pavement	0.7	0.6	0.7
Pond	0.7	0.7	0.5
SWALE	0.5	0.6	0.6
Bio Retention	0.5	0.6	0.6

The outline drainage scheme proposes a multi staged treatment for the majority of the site where practical, creating a SuDS Management Train improving treatment locally.

Typical Pollutant Removal Calculation for **Porous Surface + Pond**

TSS $0.7 + 0.5(0.7) = 1.05 \geq 0.410$ therefore OK
 Metals $0.6 + 0.5(0.7) = 0.95 \geq 0.340$ therefore OK
 Hydrocarbons $0.7 + 0.5(0.5) = 0.95 \geq 0.295$ therefore OK

Typical Pollutant Removal Calculation for **Bio Retention + Pond**

TSS $0.5 + 0.5 (0.7) = 0.85 \geq 0.410$ therefore OK
Metals $0.6 + 0.5 (0.7) = 0.95 \geq 0.340$ therefore OK
Hydrocarbons $0.6 + 0.5 (0.5) = 0.85 \geq 0.295$ therefore OK

Typical Pollutant Removal Calculation for **SWALE + Pond**

TSS $0.5 + 0.5 (0.7) = 0.85 \geq 0.410$ therefore OK
Metals $0.6 + 0.5 (0.7) = 0.95 \geq 0.340$ therefore OK
Hydrocarbons $0.6 + 0.5 (0.5) = 0.85 \geq 0.295$ therefore OK

Typical Pollutant Removal Calculation for **Paving Sub Base + Pond**

TSS $0.5 (0.7) + 0.5 (0.7) = 0.80 \geq 0.410$ therefore OK
Metals $0.5 (0.6) + 0.5 (0.7) = 0.75 \geq 0.340$ therefore OK
Hydrocarbons $0.5 (0.7) + 0.5 (0.5) = 0.70 \geq 0.295$ therefore OK

APPENDIX 6 – SURFACE WATER MAINTENANCE SCHEDULE

Maintenance Plan for the surface water system.

To ensure the surface water systems to function as intended it is important appropriate maintenance arrangements are in place.

The surface water from the proposed development will be maintained in accordance with CIRIA C753 Chapter 32.

Storm Water Maintenance Management Schedule (CIRIA C753 – The SuDS Manual)

Operation and maintenance activity	SuDS component												
	Pond	Wetland	Detention basin	Infiltration basin	Soakaway	Infiltration trench	Filter drain	Modular storage	Pervious pavement	Swale/bioretention/ trees	Filter strip	Green roofs	Proprietary treatment systems
Regular maintenance													
Inspection	■	■	■	■	■	■	■	■	■	■	■	■	■
Litter and debris removal	■	■	■	■	□	■	■	□	■	■	■		□
Grass cutting	■	■	■	■	□	■	■	□	□	■	■		
Weed and invasive plant control	□	□	□	□		□	□		□		□	■	
Shrub management (including pruning)	□	□	□	□					□	□	□		
Shoreline vegetation management	■	■	□										
Aquatic vegetation management	■	■	□										
Occasional maintenance													
Sediment management¹	■	■	■	■	■	■	■	■	■	■	■		■
Vegetation replacement	□	□	□	□						□	□	■	
Vacuum sweeping and brushing									■				
Remedial maintenance													
Structure rehabilitation /repair	□	□	□	□	□	□	□	□	□	□	□	□	
Infiltration surface reconditioning				□	□	□	□		□	□	□		

Key

- will be required
- may be required

Notes

- 1 Sediment should be collected and managed in pre-treatment systems, upstream of the main device.

Proposed Site SuDS Features

1. Porous Surfacing
2. Bioretention
3. Piped Network Elements
4. Detention Basin

The maintenance management will be highlighted in 3 categories: -

Regular Maintenance

Regular maintenance comprises tasks that are likely to be required regularly to maintain and observe the drainage system typically on a monthly programme.

- Inspection - (Elements - 1, 2, 3, 4)
- Litter and Debris Removal - (Elements - 1, 2, 3,4)
- Grass Cutting - (Elements – 2,4)
- Shrub Management - (Elements – 2,4)

Occasional Maintenance

Occasional maintenance comprises tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the regular tasks, typically annually.

- Sediment management - (Elements - 1, 2, 3,4)
- Catchpit / Silt trap cleaning - (Elements - 3)
- Pipe jetting if required - (Elements – 1, 3)
- Vegetation Replacement - (Elements – 2, 4)
- Vacuum Sweeping and Brushing - (Elements - 1)

Remedial Maintenance

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

- Structure Rehabilitation / Repair - (Elements - 1, 2, 3, 4)

Site Specific Maintenance Plan

1. Permeable Surfacing

Maintenance to be carried in accordance with CIRIA SuDS Manual (Chapter 20 & Table 20.1.5) and to include but not limited to the following actions: -

- Annual visual inspections to be undertaken of the porous system with litter and debris removed.
- Brush / Vacuum, replacing any lost jointing material every year. Sediment management to be undertaken at the same time. Upstream chamber of discharge pipe to be inspected and cleaned yearly.
- Remedial maintenance will be undertaken intermittently following the outcome of monthly inspections if required. This may consist of the following items –
 - Weed control
 - Replacement of damaged blocks
 - Repair any rutting
 - Cleaning for aesthetics of the paving blocks
 - De-icing during winter months
 - Inspection of ponding during or following heavy rainfall

2. Bioretention

Site specific method statement

Maintenance to be carried in accordance with Ciria SuDS Manual (Chapter 18 & Table 18.3) and to include but not limited to the following actions: -

- Quarterly visual inspections to be undertaken along with litter and debris removed. planting inspection to be undertaken at the same time but will be less frequent during winter months.
- Remedial maintenance will be undertaken intermittently following the outcome of quarterly inspections if required. This may consist of the following items –
 - Weed control
 - Replacement of damaged planting
 - Structure Rehabilitation / Repair
 - Surface Reconditioning

3. Piped Network

- Gully / catchpit / channel drain cleaning and pipe jetting to be undertaken typically every year. If a blockage is present and flooding occurs, cleaning and clearing the blockage should be undertaken immediately. If item is defective, this should also be repaired or replaced.

4. Detention Basin/ Pond

Site specific method statement

Maintenance to be carried in accordance with Ciria SuDS Manual (Chapter 22 & Table 22.1) and to include but not limited to the following actions: -

- Monthly visual inspections to be undertaken along with litter and debris removed. planting inspection to be undertaken at the same time but will be less frequent during winter months.
- Remedial maintenance will be undertaken intermittently following the outcome of Annually inspections if required. This may consist of the following items –
 - Weed control
 - Replacement of damaged planting
 - Structure Rehabilitation / Repair
 - Surface Reconditioning
 - Removal of Sediment
 - Erosion repair
 - Repair of inlet and outlets