



N59 Pedestrian Bridge: OPW Section 50 Report

N59 Oughterard, Co. Galway

AtkinsRéalis Ltd

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Basis of Report

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Acronyms and Abbreviations

1D	One Dimensional (modelling)
2D	Two Dimensional (modelling)
AEP	Annual Exceedance Probability
CFRAM Study	Catchment Flood Risk and Management Study
DEM	Digital Elevation Model
DTM	Digital Terrain Model
DS	Downstream
FRA	Flood Risk Assessment
FSU	Flood Study Update
FSU-3v	Flood Study Updated - 3 Variable Equation
FSU-SC	Flood Study Update – Small Catchment Equation
GIS	Geographical Information System
GEV	Generalized Extreme Value
GLO	Generalized Logistic
GSI	Geological Survey of Ireland
HEFS	High-End Future Scenario
LA	Local Authority
LIDAR	Light detection and ranging
mOD	Meters above Ordnance Datum (Malin)
MRFS	Mid- range future scenario
NIFM	National Indicative Fluvial Mapping
OPW	Office of Public Works
OSi	Ordnance Survey Ireland
PFRA	Preliminary Flood Risk Assessment
SFRA	Strategic Flood Risk Assessment
SSFRA	Site Specific Flood Risk Assessment
SuDS	Sustainable Drainage Systems
UAV	Unmanned Aerial Vehicle
US	Upstream



1.0 Introduction

SLR Consulting (SLR) has been appointed by AtkinsRéalis Limited to prepare a Section 50 Application, as required by the Office of Public Works (OPW), to install a new pedestrian bridge approximately 150 m downstream of an existing vehicle road bridge over the Owenriff River (Corrib), in Oughterard Town, Co. Galway. The location of the existing and proposed pedestrian bridge is shown on Figure 1.

The new pedestrian bridge will be a single span steel structure. An approach ramp/path will be constructed outside of the channel, on either side to form new pedestrian links.

This Section 50 application includes a hydraulic report for the Owenriff River.

Figure 1-1 Bridge Location



According to the OPW Section 50 Guidelines, a proposed bridge must be capable of operating under the fluvial flood flow associated with the 1% Annual Exceedance Probability (AEP) event, while maintaining a freeboard of at least 300 mm. The Guidelines also require that any changes in the catchment's hydrological characteristics due to climate change are considered as part of the assessment also.

Therefore, the proposed pedestrian bridge will be tested against the fluvial 1% AEP flows with 20% climate change allowance for the predicted Mid-range Future Scenario (MRFS) out to 2100.

Photos of the existing road bridge and location of the proposed pedestrian bridge are provided in Appendix A. The design drawings for the proposed bridge are included in Appendix B.



2.0 Hydrology Analysis

2.1 Flood Index

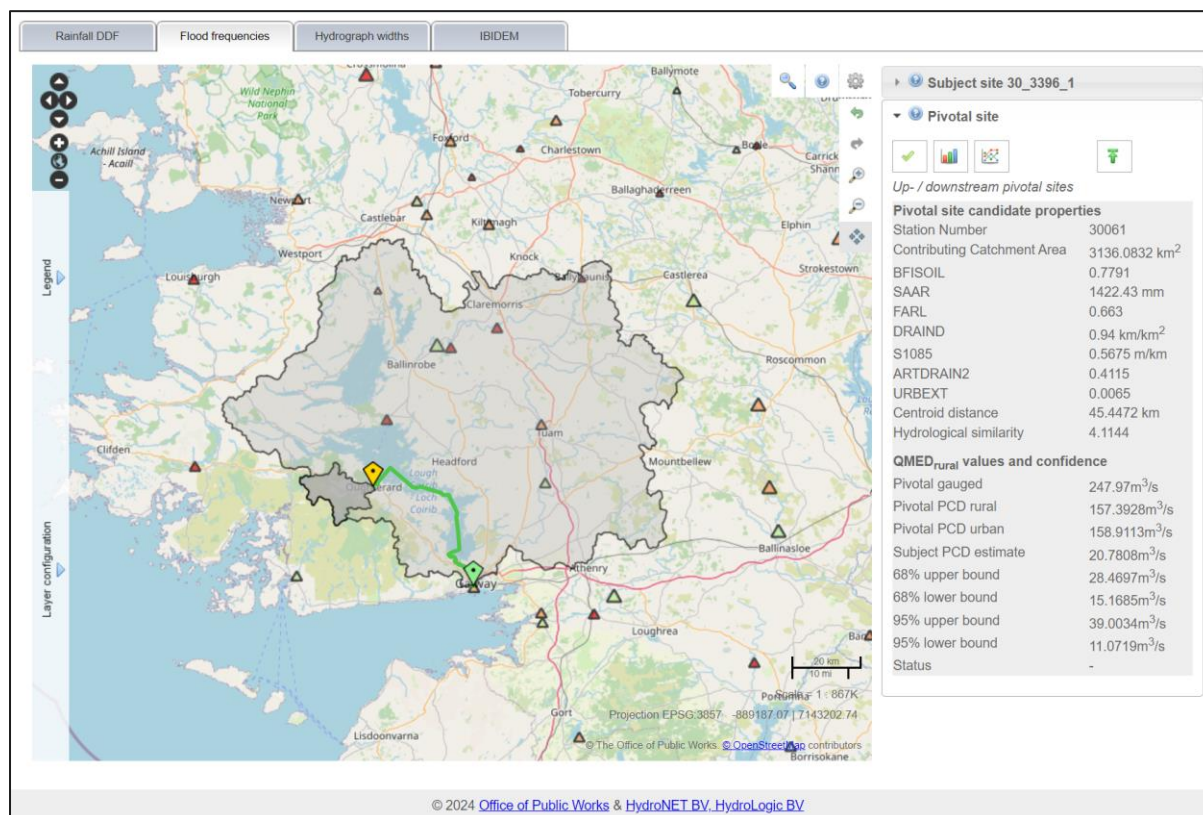
The estimation of the flood index (median flow) has followed the OPW Flood Studies Update (FSU) methods and processes as set out in the FSU Web Portal (<https://opw.hydro.net.com/>).

The principal flood estimation method set out in the FSU is a statistical method, using donor (pivotal) gauged sites and pooling groups of hydrologically similar catchments in order to estimate the peak flowrates of probabilistic events.

The proposed bridge is located approximately 0.5 km upstream of the hydrometric gauging station 30101 Oughterard D/S. This gauged station couldn't be used as a donor site since the FSU Web Portal does not have it in its database. Also, the subject station has only 23 years of recorded AMAX data. However, the median flow for this station has been compared against the median flow calculated at the location of the proposed bridge.

Figure 2-1 shows an extract from the OPW's Flood Studies Update (FSU) Portal which presents the catchment area and catchment characteristics of the FSU Node closest to the site, Node 30_3396_1. The node is located approximately 20 m downstream of the proposed bridge. The total catchment area to this node is c. 66 km². For this exercise, gauged station 30061 Wolfe Tone Bridge has been used as a pivotal site.

Figure 2-1 Catchment Area (source: FSU Web Portal)



2.2 Growth Factors and Peak Runoff

The growth factors have been determined using the pooling method and GLO distribution as recommended in the Western CFRAM Unit of management 30 – Corrib Hydrology Report. The proposed bridge will be tested against the flow rate related to the 1% AEP MRFS event



as required by the OPW. This relates to the uplift in flow rates for 20% by 2100. The growth factors and peak runoff rates are listed in Table 2-1 below.

Table 2-1 Growth Factors and Peak Flows

Annual Exceedance Probability (AEP)	Growth factors	Peak flow at location of the bridge (m ³ /s)	Peak flow at location of the bridge with MRFS (m ³ /s)	Peak Flow at 30101 Oughterard DS
50%	1.00	32.7	39.2	27.88
1%	2.31	75.4	90.5	N/A

The calculated Q_{med} at the location of the proposed pedestrian bridge is slightly higher than the Q_{med} at the gauged station 30101 Oughterard DS. For this exercise, the calculated peak flow has been applied to ensure a conservative approach and to incorporate additional safety into the design.

3.0 Hydraulic Analysis

Hydraulic modelling has been carried out in a software HEC-RAS 6.4.1.

A 1D modelling approach has been used for this exercise. It is a common practice to use one-dimensional (1D) models for the analysis of bridge/culvert structures and to determine water elevation along the analysed reach.

The topography data from which the cross sections have been extracted from was provided by the client.

The hydraulic modelling has been carried out as 'Steady flow'. The modelled extent of the Owenriff River is 470 m long, and it is presented by 18 cross sections as shown on Figure 3-1 below.

For this assessment, both the existing and proposed scenario have been modelled to determine the impact of the proposed pedestrian bridge on the flood levels, if any.

The peak flow for the 1% AEP MRFS event has been used for upper external boundary condition. Downstream boundary condition has been defined as Normal depth, with value of 0.0041 m/m. The Manning's roughness coefficient was taken as $n = 0.040$ within the channel and 0.065 outside of the channel's banks.

Manning's values are in line with Chow's (1959) recommendations.



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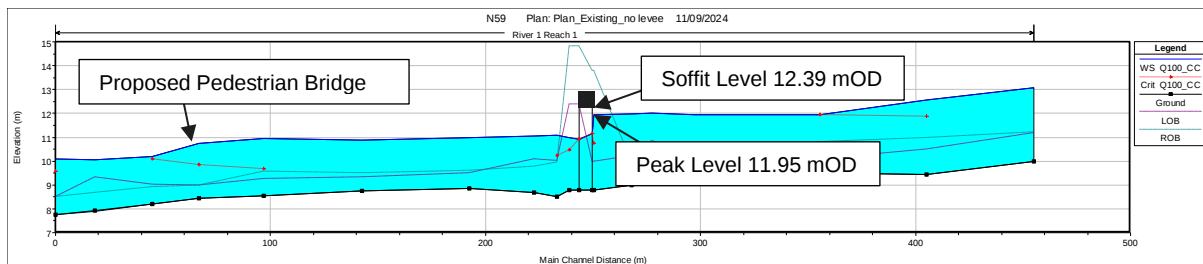
The longitudinal section with water levels for the 1% AEP MRFS for the existing scenario is shown on Figure 3-2. It can be observed that the water does not remain within the main channel under these flow conditions.

The invert level at the upstream end of the existing bridge is 8.77 mOD with the peak water level 11.95 mOD.

The soffit level of the existing bridge is 12.39 mOD, which gives the freeboard level of 440 mm.

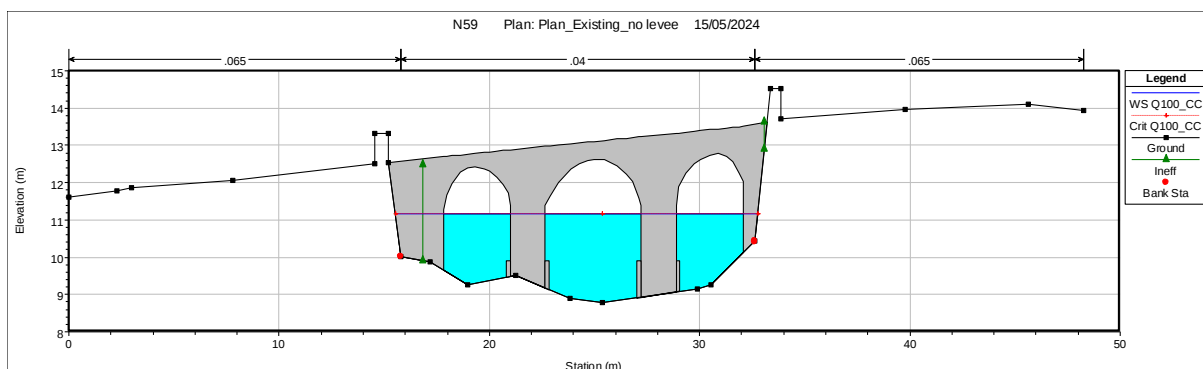
The modelled 1% AEP MRFS flood level at the location of the proposed pedestrian bridge is 10.75 mOD.

Figure 3-2 Longitudinal Section - 1% AEP MRFS Existing Scenario



Cross section showing upstream end of the bridge for the existing scenario is shown on Figure 3-3.

Figure 3-3 Cross Section of Existing Road Bridge - 1% AEP MRFS Existing Scenario at Upstream side of Bridge



3.2 Post Development Scenario

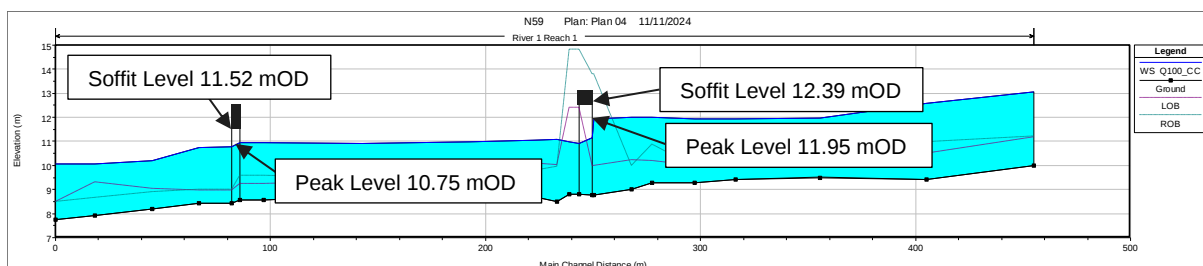
The longitudinal section with water levels for the 1% AEP MRFS with the proposed pedestrian bridge scenario is shown on Figure 3-4. It can be observed that the surface water profile is the same as for the existing scenario. Therefore, it is demonstrated that the proposed pedestrian bridge will have no effect on the flood conveyance in the river because the bridge abutments will be located outside of the 1% AEP MRFS flood extent.

The invert level at the upstream end of the proposed bridge is 8.44 mOD with the peak water level 10.75 mOD for the 1% AEP MRFS event.

The invert level at the downstream end of the proposed bridge is 8.41 mOD with the peak water level 10.75 mOD.

The soffit level of the proposed bridge is 11.52 mOD, which gives the freeboard of 774 mm.

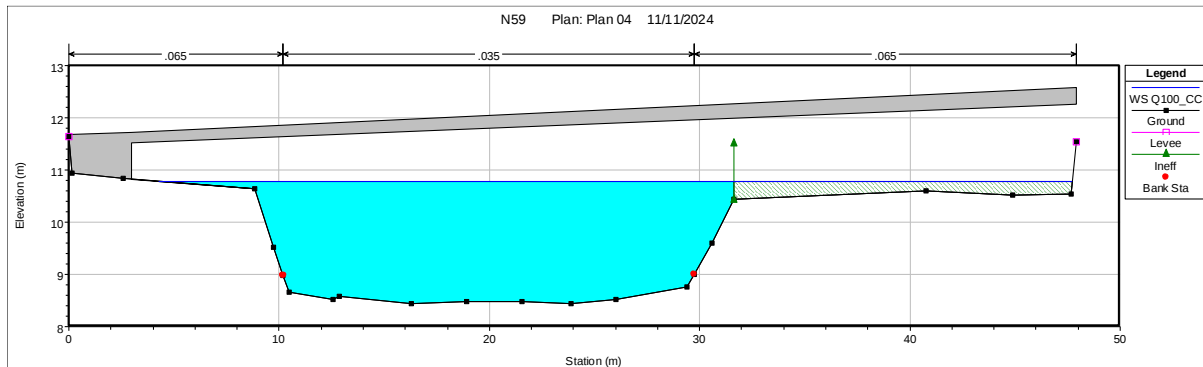
Figure 3-4 Longitudinal Section with Pedestrian Bridge - 1% AEP MRFS Existing



Cross section showing downstream end of the bridge for the post development scenario is shown on Figure 3-5.



Figure 3-5 Cross Section of Pedestrian Bridge Post Development – Downstream 1% AEP MRFS



Comparison of the model flood levels for the existing and post development for the 1% AEP MRFS event is presented in Table 3-1.

Table 3-1 Flood Levels Comparison – Existing and Post Development Scenario

Chainage (m)	Existing Scenario - Flood Level (mOD)	Proposed Scenario - Flood Level (mOD)	Difference in Flood Levels (m)
470	13.06	13.06	0.00
420	12.57	12.57	0.00
370	11.96	11.96	0.00
331	11.95	11.95	0.00
312	11.93	11.93	0.00
292	12.00	12.00	0.00
282	11.99	11.99	0.00
265	11.95	11.95	0.00
Existing Road Bridge US	11.95	11.95	0.00
Existing Road Bridge DS	10.92	10.92	0.00
254	10.97	10.97	0.00
248	11.08	11.08	0.00
237	11.06	11.06	0.00
207	10.98	10.98	0.00
157	10.90	10.90	0.00
111	10.94	10.94	0.00
Proposed Pedestrian Bridge	10.75	10.75	0.00
60	10.20	10.20	0.00
33	10.07	10.07	0.00
15	10.07	10.07	0.00

It can be observed that the flood levels between the pre and post development will remain the same, as the proposed pedestrian bridge is being built outside of the flood extent.



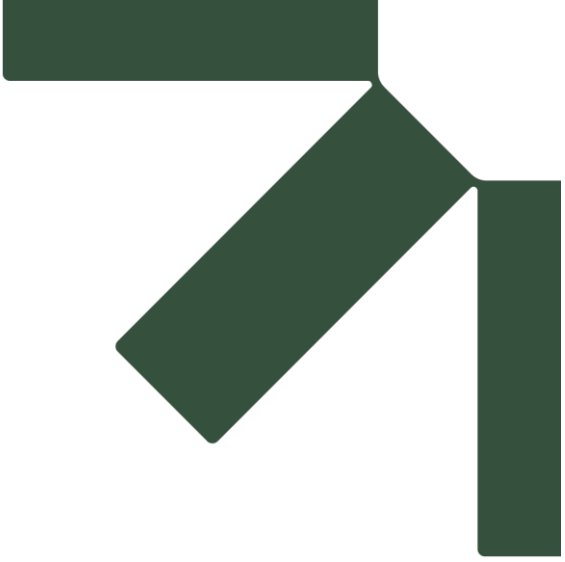
4.0 Conclusion

It is proposed to install a new pedestrian bridge approximately 150 m downstream of an existing vehicle road bridge (N59) over the Owenriff River (Corrib), in Oughterard Town.

The model results indicate that the soffit level of the proposed bridge is at least 772 mm above the peak 1% AEP MRFS flood event in the river. This is in accordance with the OPW requirements which sets the freeboard being at least 300 mm above the flood level.

The proposed pedestrian bridge will be outside of the 1% AEP MRFS flood extent. Therefore, it won't have an effect on the flood levels in the river.





Appendix A Photos at the Site

N59 Pedestrian Bridge: OPW Section 50 Report

N59 Oughterard, Co. Galway

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Plate 1 Existing N59 Road Bridge: Looking Downstream

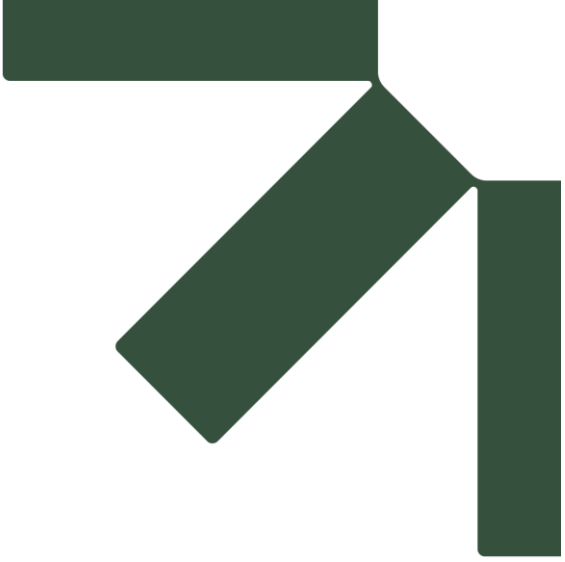


Plate 2 Existing N59 Road Bridge Looking Upstream



Plate 3 The proposed pedestrian bridge will be approximately 150 m downstream of this location





Appendix B Design Drawings

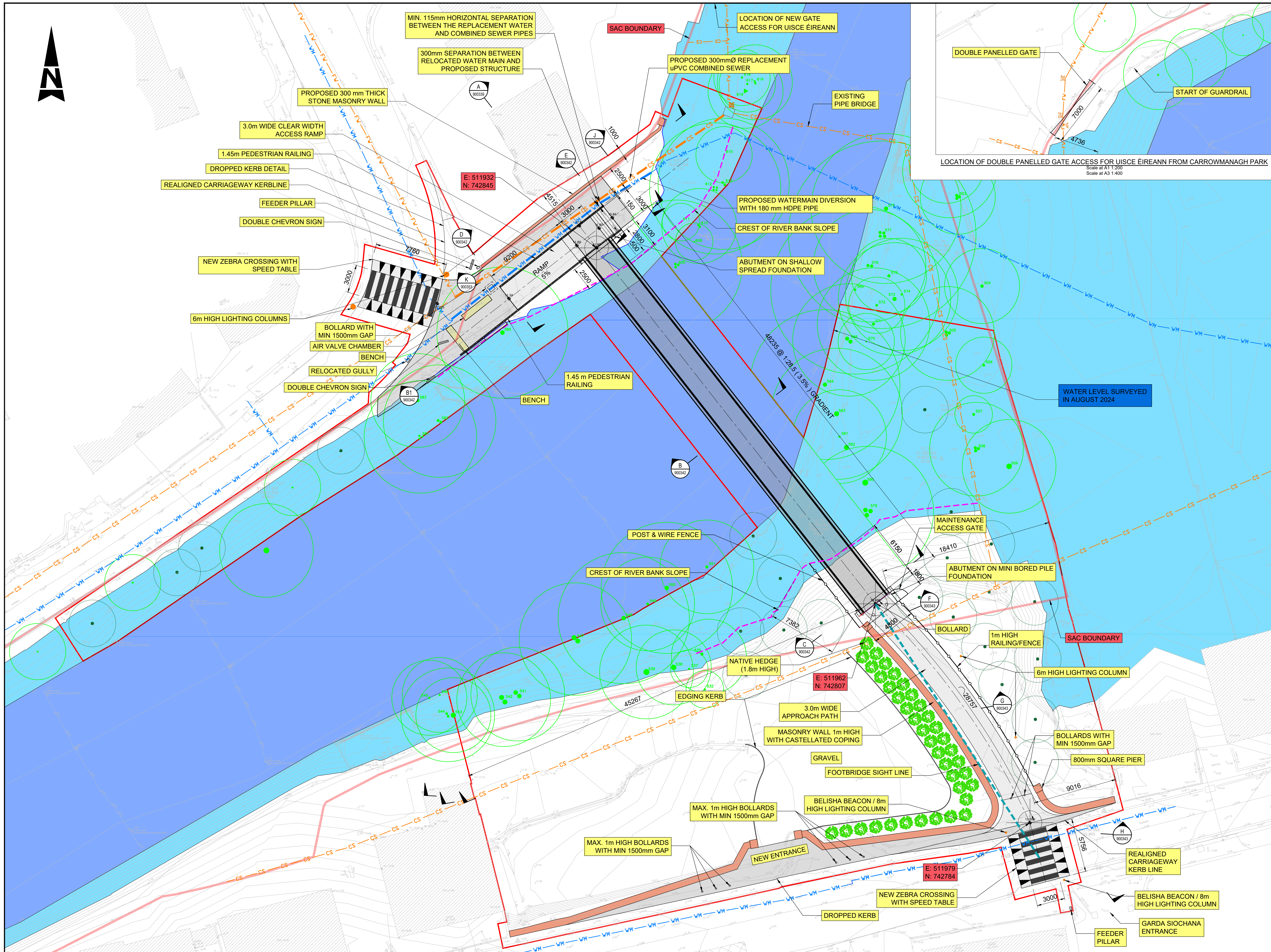
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5. DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE SPECIFICATION

LEGEND:

- WM — EXISTING WATER MAIN
- WM — PROPOSED WATERMAIN DIVERSION
- CS — EXISTING COMBINED SEWER
- CS — PROPOSED REPLACEMENT COMBINED SEWER
- FW — EXISTING FOUL DRAINAGE
- 1% ANNUAL EXCEEDENCE PROBABILITY FLOOD ZONE (MID RANGE FUTURE SCENARIO)
- SITE LAYOUT BOUNDARY
- EXISTING TREE TO BE RETAINED
- PROPOSED TREE

NOTES:

1. THE DESIGN USES THE EXISTING STORM DRAINAGE SYSTEM.
2. ELECTRICAL WIRING, DUCTING & PILLAR DETAILS WILL BE CONFIRMED AT DETAILED DESIGN.

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- Client Critical - Already Marked

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Rev	Description	By	Date	Chk'd	Rev'd	Auth
000	ISSUED FOR PLANNING	KS	06.25	MC	MC	MJ

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Project
N59 OUGHTERARD FOOTBRIDGE

Purpose
PLANNING ISSUE

Title
PROPOSED GENERAL ARRANGEMENT -
LAYOUT PLAN - SHEET 3 of 4

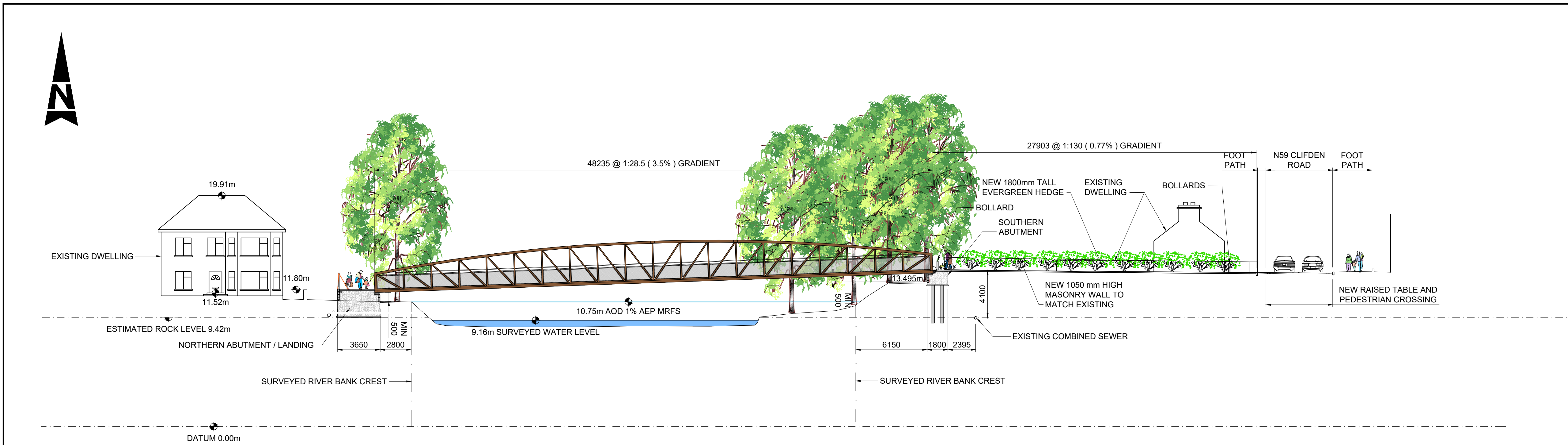
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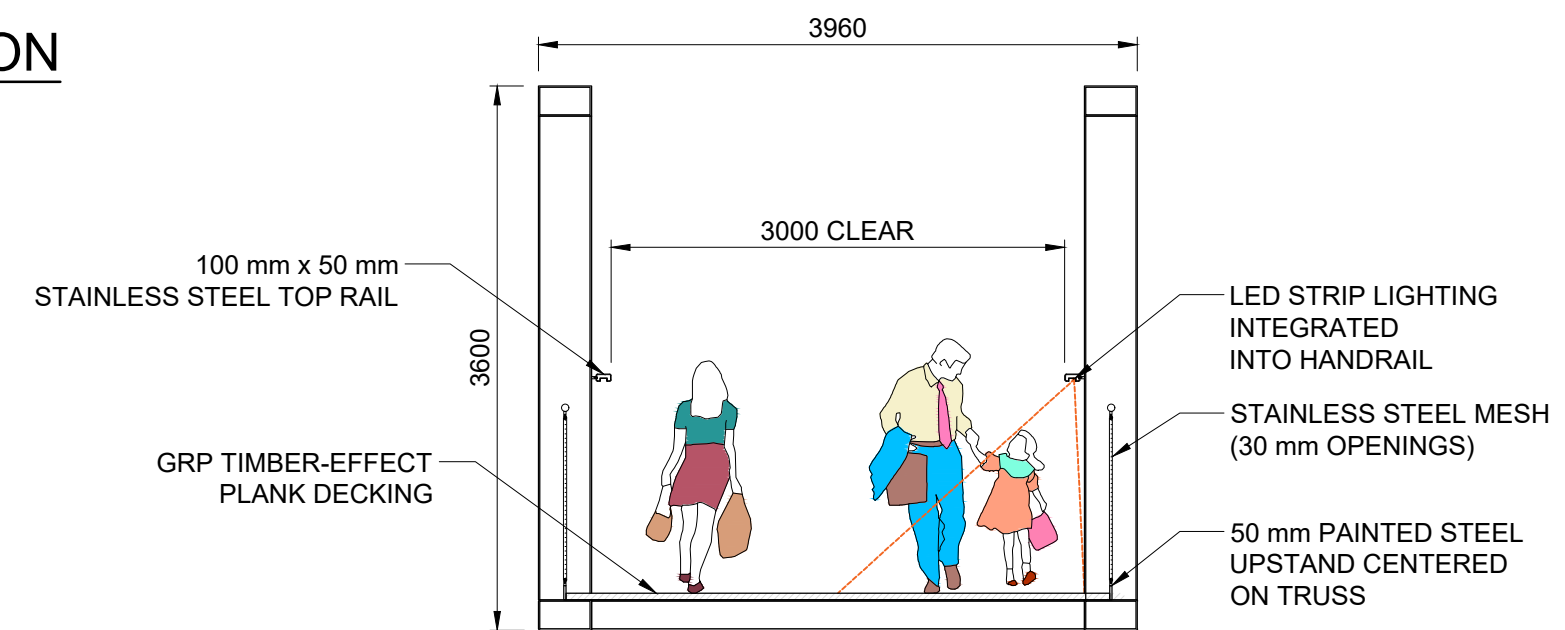
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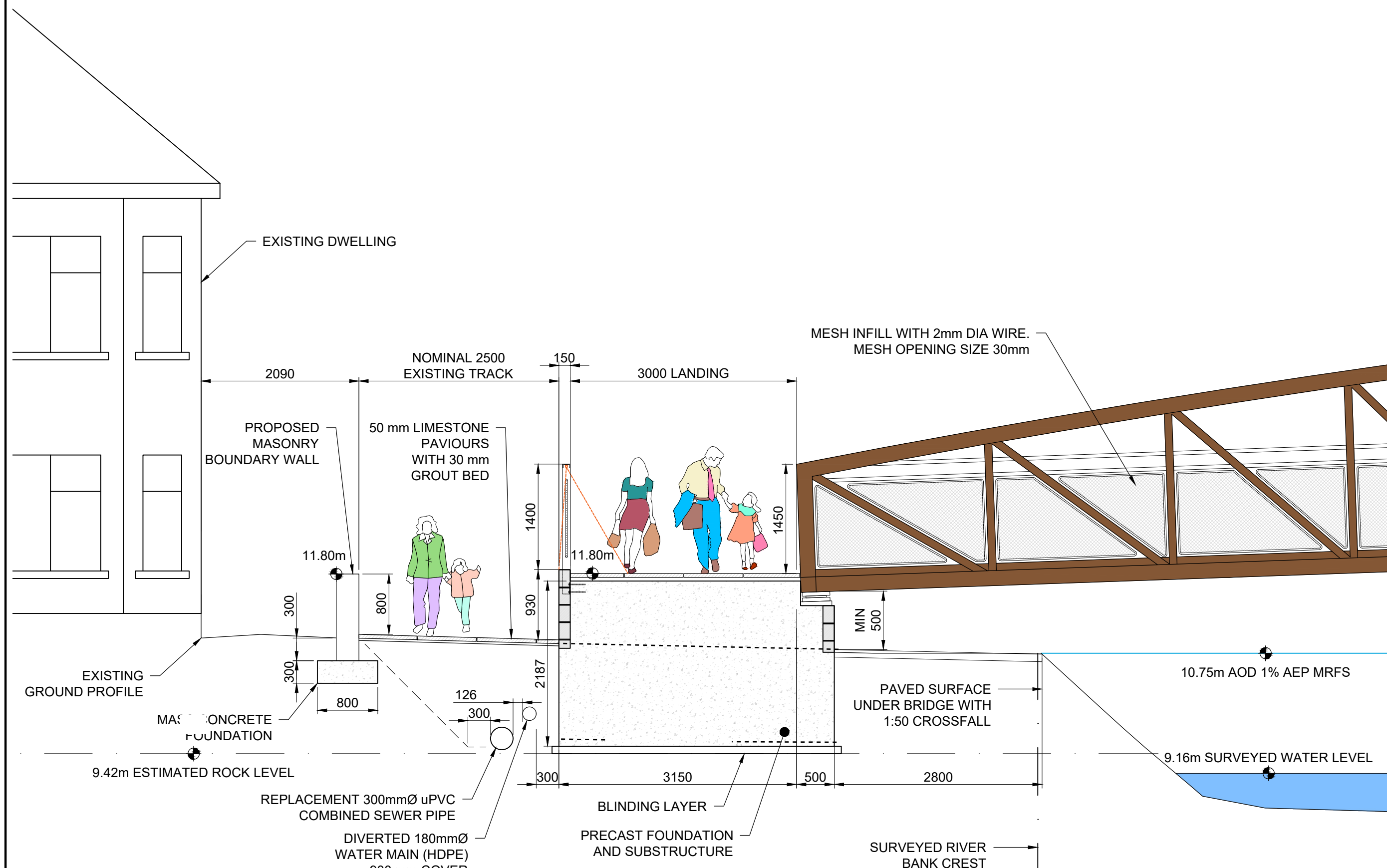
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Scale at A3 1:400



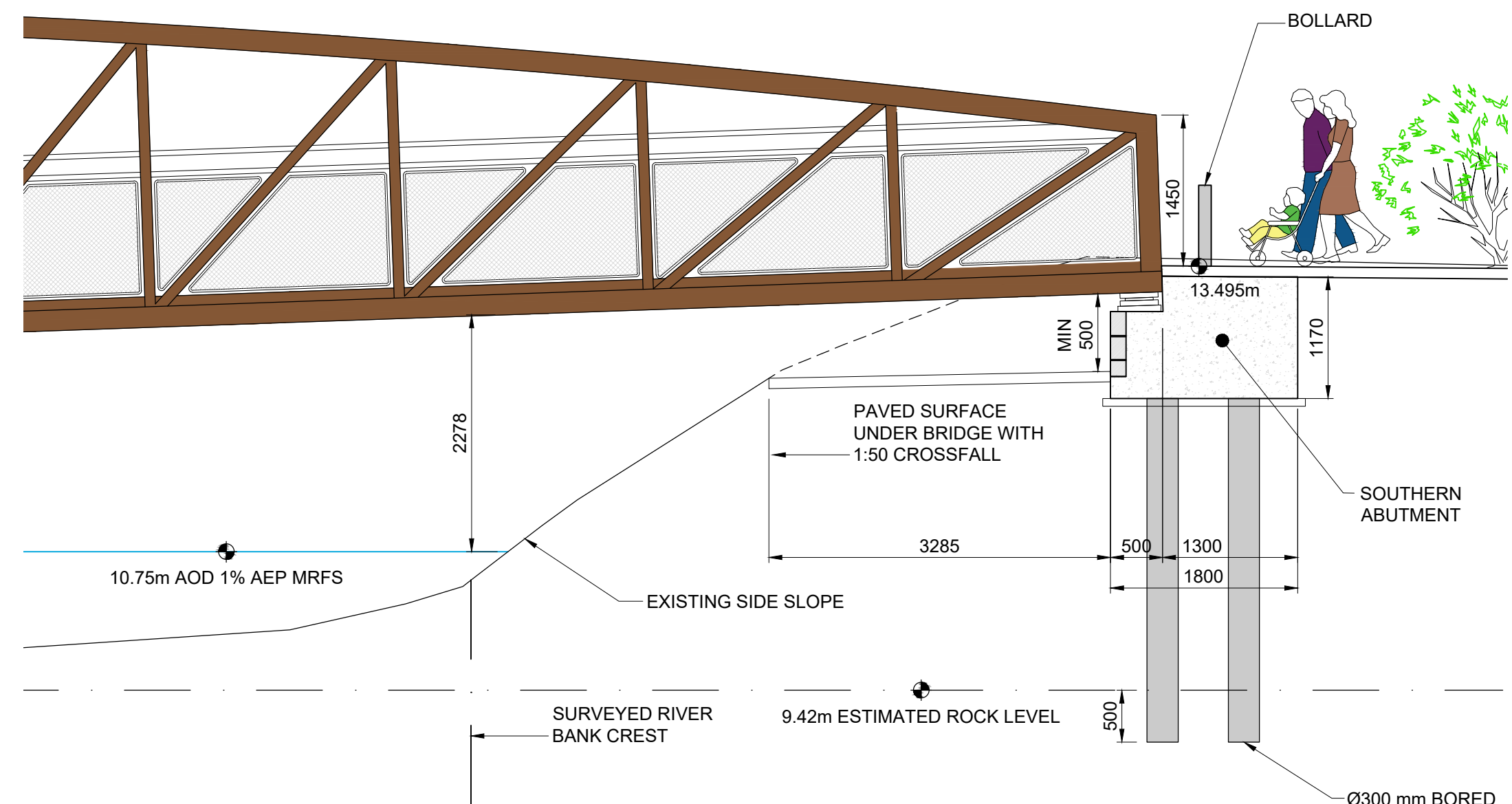
SECTION B: MIDSPAN BRIDGE CROSS SECTION

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Scale at A3 1:100



NORTHERN ABUTMENT LONGITUDINAL SECTION

Scale at A1 1:50
Scale at A3 1:100



SOUTHERN ABUTMENT LONGITUDINAL SECTION

Scale at A1 1:50
Scale at A3 1:100

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6. THE ABBREVIATION "AEP MRFS" MEANS ANNUAL EXCEEDANCE PROBABILITY MID-RANGE FUTURE SCENARIO

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Project
N59 OUGHTERARD FOOTBRIDGE

Purpose
PLANNING ISSUE

Title
PROPOSED GENERAL ARRANGEMENT - SECTIONS - SHEET 1

Original Scale	1:50, 200	Drawn	KS	Checked	AK	Reviewed	MC	Authorised	MJ
Date	01.08.24	Date	01.08.24	Date	01.08.24	Date	01.08.24	Date	01.08.24
Status	CO	Drawing Number	0088798-ATK-XX-XX-DR-CE-900339	Rev	C00				



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