Confey, Co Kildare

Hydraulic Assessment and Downstream Flood Risk Analysis

November 2026

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Abbreviation

AEP	Annual Exceedance Probability
AFA	Area for Further Assessment
CFRAM	Catchment Flood Risk Assessment and Management
DoHELG	Department of the Environment, Heritage and Local Government
DTM	Digital Terrain Model
FB	Freeboard
FFL	Finish Floor Levels
FRA	Flood Risk Assessment
FSR	Flood Studies Report
GSI	Geological Survey of Ireland
LiDAR	Light Detection and Ranging
NIFM	National Indicative Fluvial Mapping
OPW	Office of Public Works
PFRA	Preliminary Flood Risk Assessment
RR	Rainfall-Runoff
RMS	Root Mean Square
SAAR	Standard Average Annual Rainfall (mm)
SFRA	Strategic Flood Risk Assessment
SuDS	Sustainable Urban Drainage System
WL	Water Level

1 Introduction

To address a Further Information request issues under the application ref:26/60878 it is necessary to prepare a Hydraulic Assessment and Downstream Flood Risk Analysis report.

1.1 Terms of Reference

JBA Consulting was appointed to prepare a Hydraulic Assessment and Downstream Flood Risk Analysis, hereafter referred as a Hydraulic Report for a development located on a site in Confey, Leixlip, Co. Kildare. The report was prepared in response to a request by Leixlip and Newbridge SPV Limited.

The Hydraulic Report has been prepared to address the Further Information request issued by Kildare County Council under the application ref: 26/60878. In relation to flood risk, the following point has been provided.

9. Water Services/Flood Risk

(a) The Applicant is requested to submit a hydraulic analysis inclusive of longitudinal and Cross sections of the proposed outfall route through Confey GAA grounds to the River Liffey. The Applicant shall demonstrate that flood risk is not increased for peak rainfall events for land and properties downstream of the discharge point. A CCTV survey and report is also required for any piped or culverted sections of the surface water discharge route.

Response: Regarding the proposed stormwater discharge for the development is spaced over 5no. outfalls along the site's southern boundary to an existing open drainage channel. There are no existing culverts located along this drainage channel, and therefore the drain will discharge directly to the Oranstown Stream without entering an existing culvert system.

The proposed stormwater discharge flows have been incorporated into the post development flood model, and the results confirm that there is no increase in flood levels downstream of the site.

The Confey GAA ground and associated culvert are located to the west of the site and Oranstown Stream. This culvert discharges to the Oranstown Stream from the opposite western bank to the site and has no connection to the proposed development stormwater system. Refer to Section 5.2.3.1 for further details.

If required, a CCTV survey has been undertaken of the Confey GAA culvert under the planning application Ref: 2660746 and contained in the Confey Phase 1A LRD RFI Response document. Again, it is not proposed to discharge to this culvert system.

1.2 Hydraulic Report Analysis and Objectives

This study is being completed to inform the future development of the site as it relates to flood risk. It aims to identify, quantify and communicate to Planning Authority officials and other stakeholders the risk of flooding to land, property and people and the measures that would be recommended to manage the risk.

The objectives of this analysis are to:

- Identify potential sources of flood risk.
- Confirm the level of flood risk and identify key hydraulic features.
- Assess the impact that the proposed development has on flood risk.
- Develop an appropriate flood risk mitigation and management measures which will allow for the long-term development of the site.

Recommendations for development have been provided in the context of the 2009 OPW / DECLG planning guidance, "*The Planning System and Flood Risk Management and Circular PL02/2014*". A review of the likely effects of climate change and the long-term impacts this may have on any development has also been undertaken.

For general information on flooding, the definition of flood risk, flood zones and other terms see 'Understanding Flood Risk' in Appendix A.

1.3 Development Proposal

The proposed development comprises a residential development on an existing greenfield site in the townlands of Newtown and Confey, Leixlip, Co Kildare.

Leixlip and Newbridge SPV Limited, intend to apply for planning permission for a Large-Scale Residential Development (LRD) on a site of approximately 4.26 hectares (gross) at lands located in the townland of Confey, Leixlip, Co Kildare. The main development site is bounded to the north by R149 road, Confey GAA Club to the west, Royal Canal to the south and agricultural lands to the east.

The application site also includes a section of the Royal Canal towpath extending from Cope Bridge to the south-western boundary of the site to facilitate surface improvement works. The proposed development will consist of 125 no. residential units comprising 81 no. houses, 22 no. duplex units and 22 no. apartments. The proposed housing will comprise of 56 no. 3-bedroom houses and 25 no. 4-bedroom houses, in a mix of detached, semi-detached, terraced and end-of-terrace dwellings ranging in height from 1 to 3 storeys.

The proposed duplex accommodation will comprise of 11 no. 2-bedroom units and 11 no. 3-bedroom units, provided in 11 no. buildings ranging in height from 1 to 3 storeys. The proposed apartment accommodation will comprise of 5 no. 1-bedroom units and 17 no. 2-bedroom units, provided in a single apartment building ranging in height from 4 to 5 storeys. All residential units will be provided with private amenity space in the form of private rear gardens and/or balconies, as appropriate. The development will

also provide public and communal open space, including a linear park parallel to the Royal Canal. The proposed development will be served by two new vehicular access points from the R149 and a new pedestrian access via the Royal Canal.

The development will also include 175 no. car parking spaces and 384 no. cycle parking spaces, public, communal and private open spaces, landscaping, boundary treatments, waste management and cycle storage areas, 2 no. ESB substations; Sustainable Drainage Systems (SuDS) areas, and all associated site development works, site services and infrastructure, including connections to the Uisce Éireann water supply and wastewater networks at Confey, Leixlip, Co. Kildare.

The proposed site layout is provided in Figure 1-1 overpage.



Figure 1-1: Proposed Development

2 Site Background

This section describes the receiving environment of the proposed development site in terms of watercourses, geology, and characteristics of the wider geographical area.

2.1 Location

Figure 2-1 shows the location of the study site at Confey, Leixlip which can be accessed by the Confey Road (R149) to the north. The application site is bound by greenfield to the east, Confey GAA Club to the west and the Royal Canal to the south.

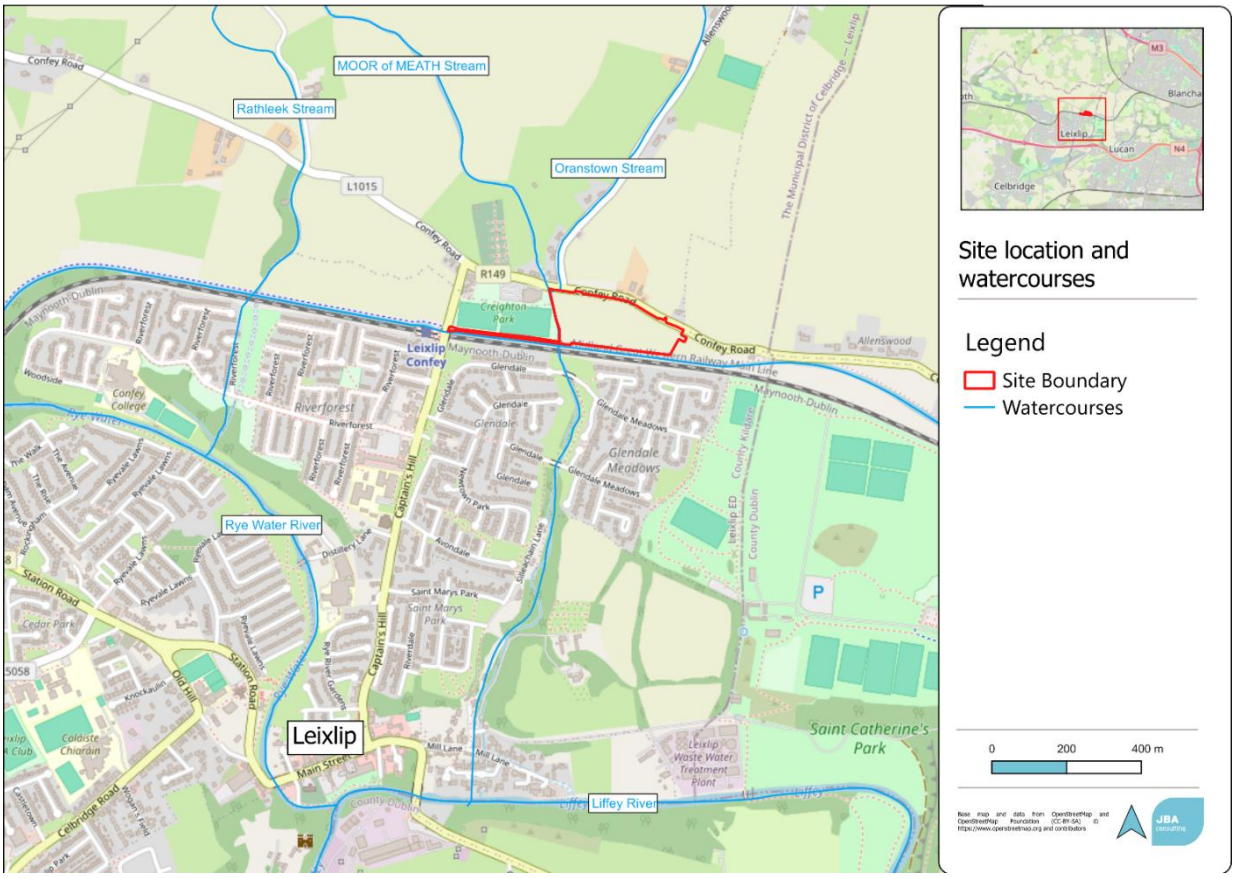


Figure 2-1: Site Location and Watercourses

2.2 Watercourses

The main watercourses in the vicinity of the site are the Oranstown Stream, Moor of Meath stream and the Royal Canal.

The Oranstown stream flows in a southerly direction along the western boundary of the site continuing south where it joins the River Liffey approximately 1.3 kilometres downstream.

The Moor of Meath stream flows in a south easterly direction joining the Oranstown Stream near the northwestern corner of the site.

The Royal Canal runs along the southern boundary of the site.

2.3 Site Geology

The groundwater and geological maps of the site, provided by the Geological Survey of Ireland (GSI), have been studied. The underlying bedrock at the site is composed mainly of the Lucan Formation; dark limestone and shale with the lower portion of the site made up of dark grey to black limestone and shale. The subsoils of the site consist of Limestone till (Carboniferous). Refer to Figure 2-2 below.

The GSI groundwater vulnerability maps were available for review. The site itself has a moderate vulnerability for the majority of the site, with other sections of the site listed as having a high/extreme vulnerability.

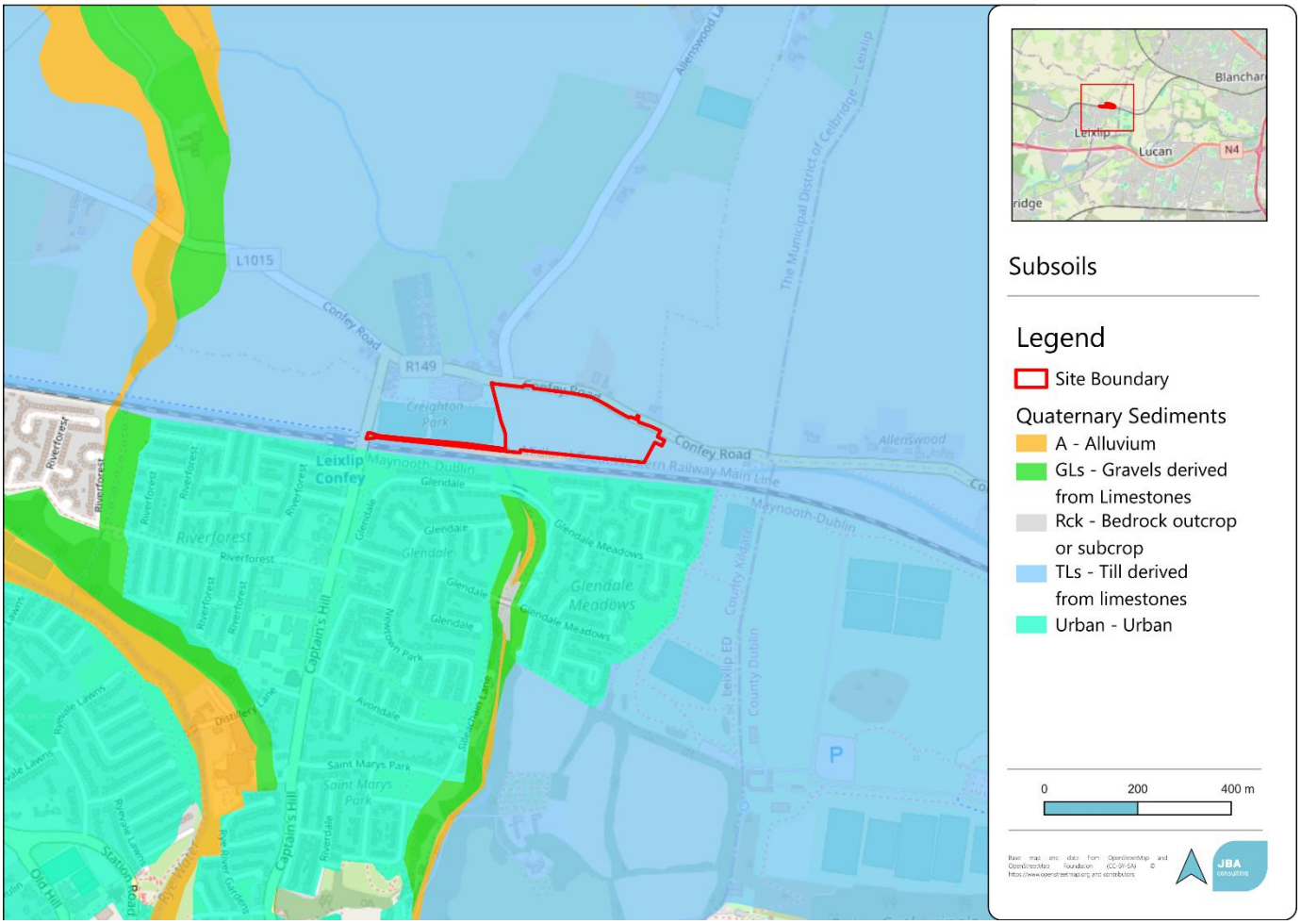


Figure 2-2: Site Subsoils

2.4 Local Topography

The topographical survey delineates a descending gradient from the west to the east of the site and from the north to the south of the site. The highest elevation recorded at 56.60 mOD is positioned in the west of the site. The lowest elevation recorded on site was 52.98 mOD located in the southwest of the site.

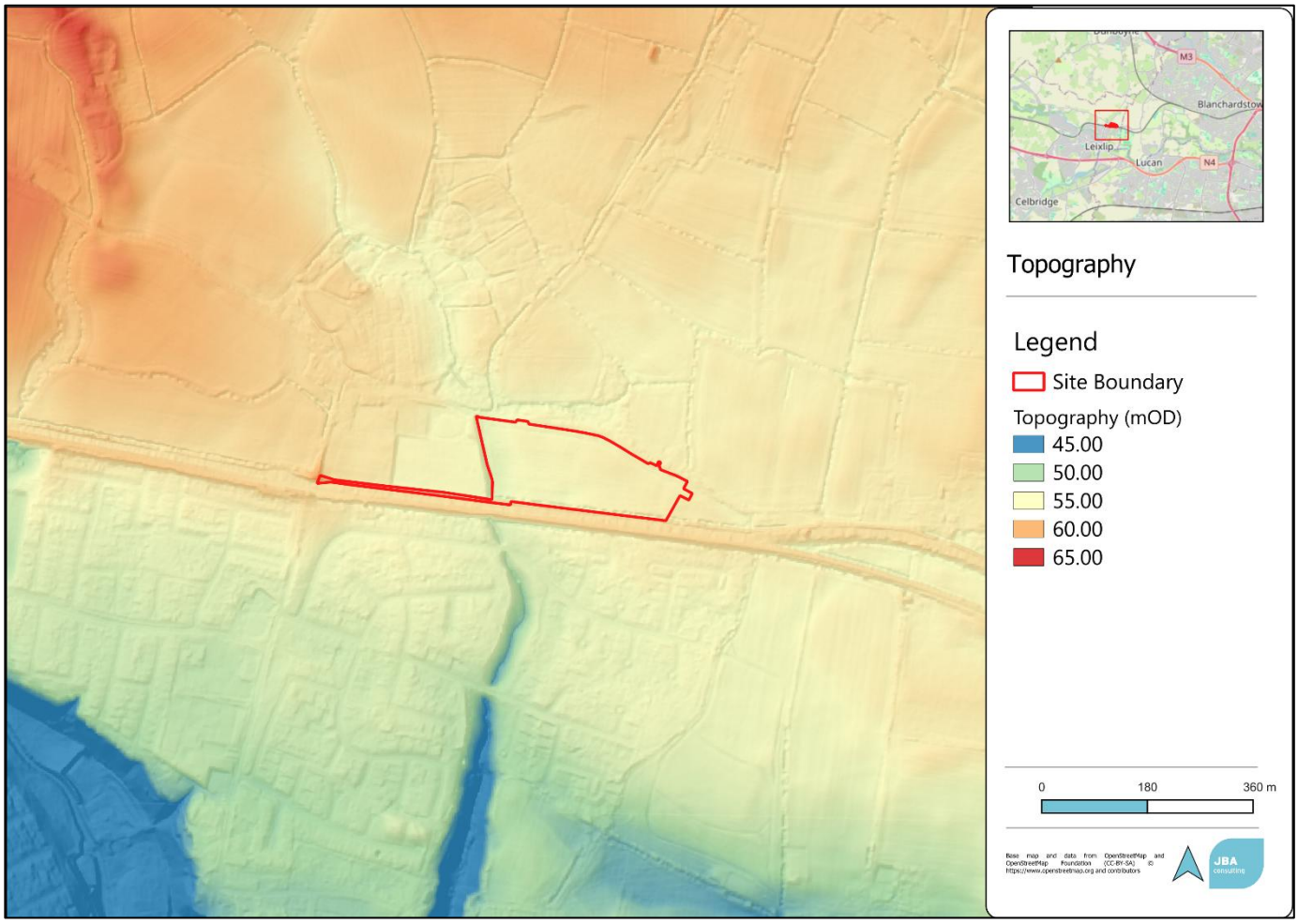


Figure 2-3: Local Topography

3 Flood Risk Identification

An assessment of the potential for and scale of flood risk at the site is conducted using historical and predictive information. This identifies any sources of potential flood risk to the site and reviews historical flood information. The findings from the flood risk identification stage of the assessment are provided in the following sections. Further detail on the Planning Guidelines and technical concepts are provided in Appendix A.

3.1 Flood History

A number of sources of flood information have been reviewed to establish any recorded flood history at, or near the site. This includes the OPWs national flood information portal, www.floodinfo.ie, and general internet searches.

3.1.1 Floodinfo.ie

The OPW have established a National Flood Risk Hazard Mapping website, www.floodinfo.ie, which highlights areas at flood risk through the collection of recorded data and observed flood events. There are two events in the vicinity of the site boundary.

- ID-1514 - Allenswood Road, Leixlip – Stream overflowed its banks and 2 houses were flooded
- ID-1517 - Confey Junction with Allenswood Road – (Same as ID-1514)

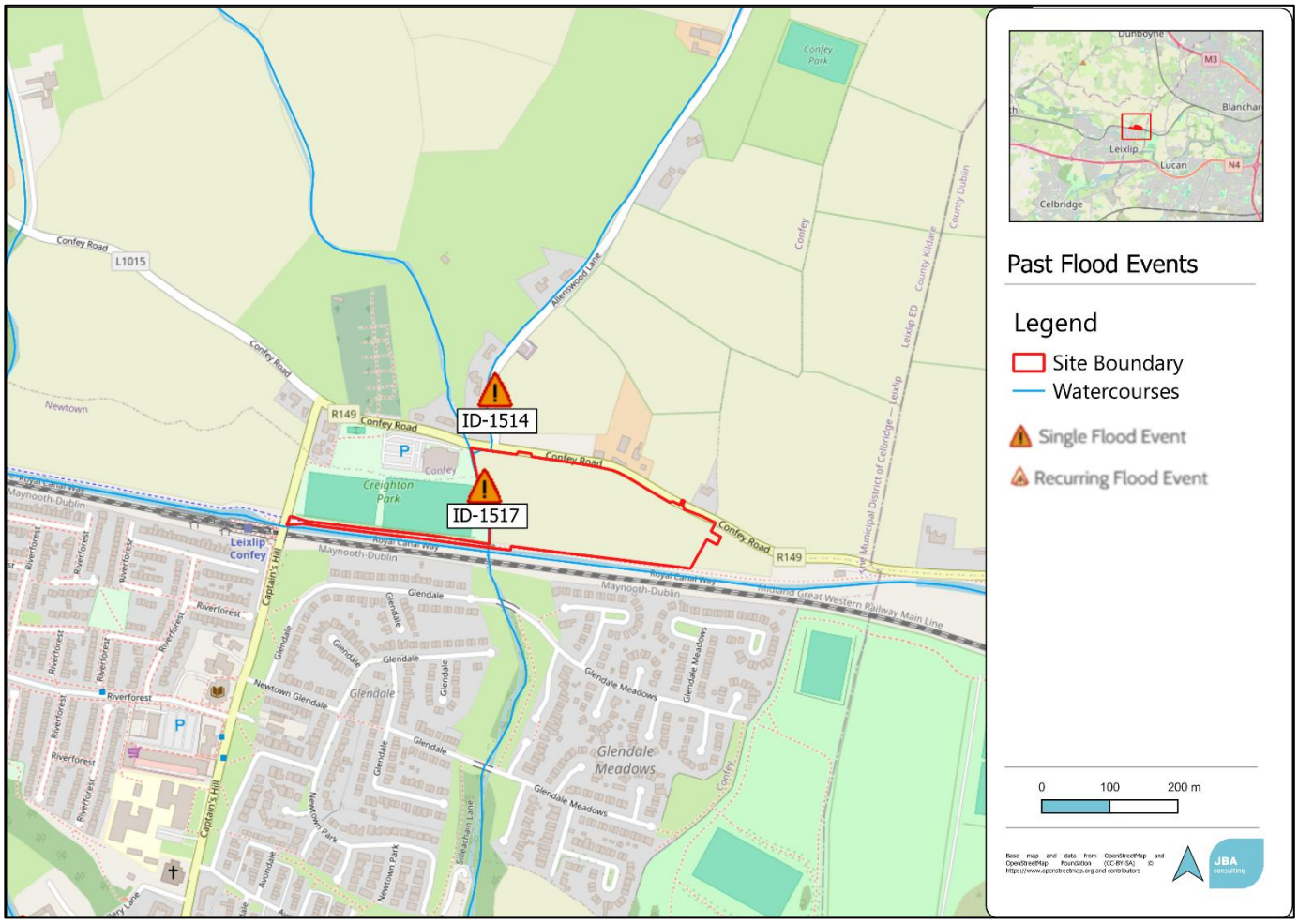


Figure 3-1: Past Flood Events

3.1.2 Internet Searches

An internet search was carried out to find any information regarding flooding specifically of the site and surrounding area. There is a Flood Alleviation Scheme on the River Rye however, there is no reported flooding in or near the site

3.2 Predictive Flood Mapping

The wider area has been a subject to predictive flood mapping or modelling studies and other related studies and plans.

- Eastern Catchment Flood Risk Assessment and Management (ECFRAM) Study

3.2.1 Eastern Catchment Flood Risk Assessment and Management Study (CFRAM)

The primary source of data utilised to identify flood risk to this site is the Eastern CFRAM. Flood maps have been finalised for Leixlip and surrounding areas.

The CFRAM Study consists of detailed hydraulic modelling of rivers and their tributaries. The Oranstown stream and the Moor of Meath stream have been modelled under the Eastern CFRAM and flood extent maps for the fluvial scenario have been completed. The relevant flood maps are available through the CFRAM website.

Review of the Eastern CFRAM flood maps for the two watercourses confirms that the Oranstown stream lies within the site boundary and that the site lies in Flood Zone A/B. Refer to Figure 3-2 for an extract of the flood maps.

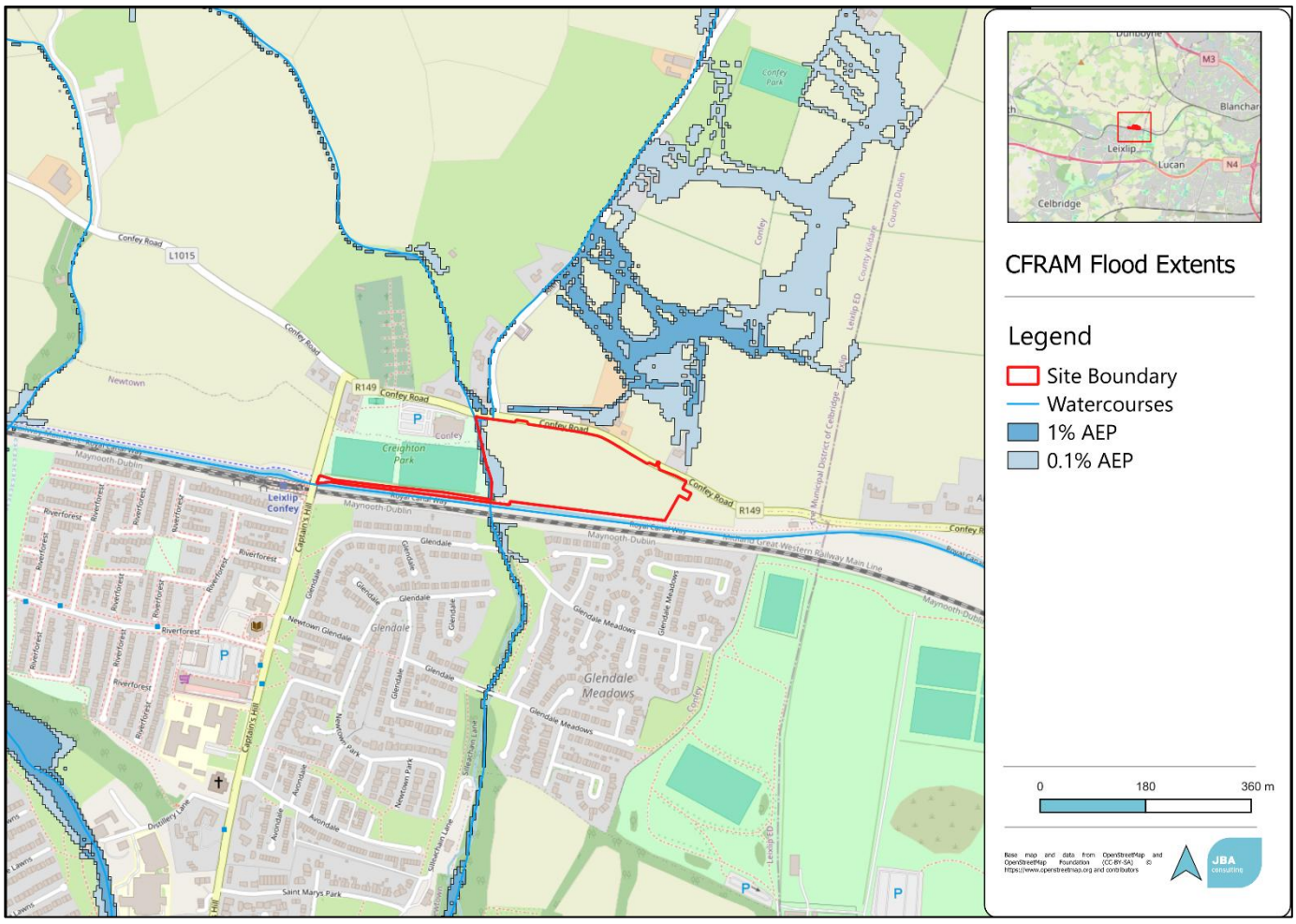


Figure 3-2: CFRAM Fluvial Flood Map

3.3 Development Plans

3.3.1 Kildare County Development Plan 2023-2029

The overarching guidance document governing the development at the site is the Kildare County Development Plan (DP) 2023-2029. The document sets out the overall strategy for proper planning and sustainable development across County Kildare. There is no specific mention of Leixlip within the Kildare County DP, as larger towns are subject to their own Local Area Plans and SFRAs.

The Kildare County DP sets out a number of policies relating to flood risk and stormwater management, which are used to guide development. According to Section 4.2.3 of the Kildare DP, the "minimum finished floor levels for Highly Vulnerable Development should be above the Flood Zone B (0.1% AEP) level plus suitable freeboard. The recommended level of freeboard is 500mm for fluvial flood levels".

It is also required that developments comply with the Inland Fisheries Ireland Guidance: Planning for Watercourses in the Urban Environment (2020), including the maintenance of a minimum riparian zone of "20 metres for river channels less than 10 metres in width". Refer to Appendix B for stated policies and objectives relating to flood risk.

3.3.2 Leixlip Local Area Plan 2020-2023 (extended to 2029 as amended)

The Leixlip Local Area Plan (LAP) sets out an overall strategy for the proper planning and sustainable development of Leixlip in the context of the Kildare County Development Plan 2017 – 2023. Specific policies and objectives area provided in Appendix B. A SFRA was carried out to support the preparation of the LAP and subsequently to support the amendment No. 1, to assess flood risk in the town and inform strategic land-use decisions. The purpose of the SFRA ensures that flood risk management is fully integrated into the LAP. It should be noted that the SFRA is based on the Eastern CFRAM flood maps. The flood maps confirm the flood extents presented in CFRAM flood map presented in Figure 3-2.

The Leixlip LAP identifies the Confey Masterplan has been prepared in accordance with Objective Con 1.1(a) and provides area specific and detailed design guidance for the lands within the masterplan boundary. The masterplan now includes an appropriate phasing and implementation strategy for the overall development of the lands to enable orderly development and ensure adequate infrastructure is provided in tandem with new development and in accordance with the Kildare County Development Plan 2023-2029[1].

[1] Kildare County Council (2024) *Confey Lands Masterplan*. Available from: Confey Masterplan Compressed.pdf [Accessed 29/07/2025]

Figure 3-3 displays the land-use zoning for the masterplan and shows the site to be zoned as 'New Residential'.

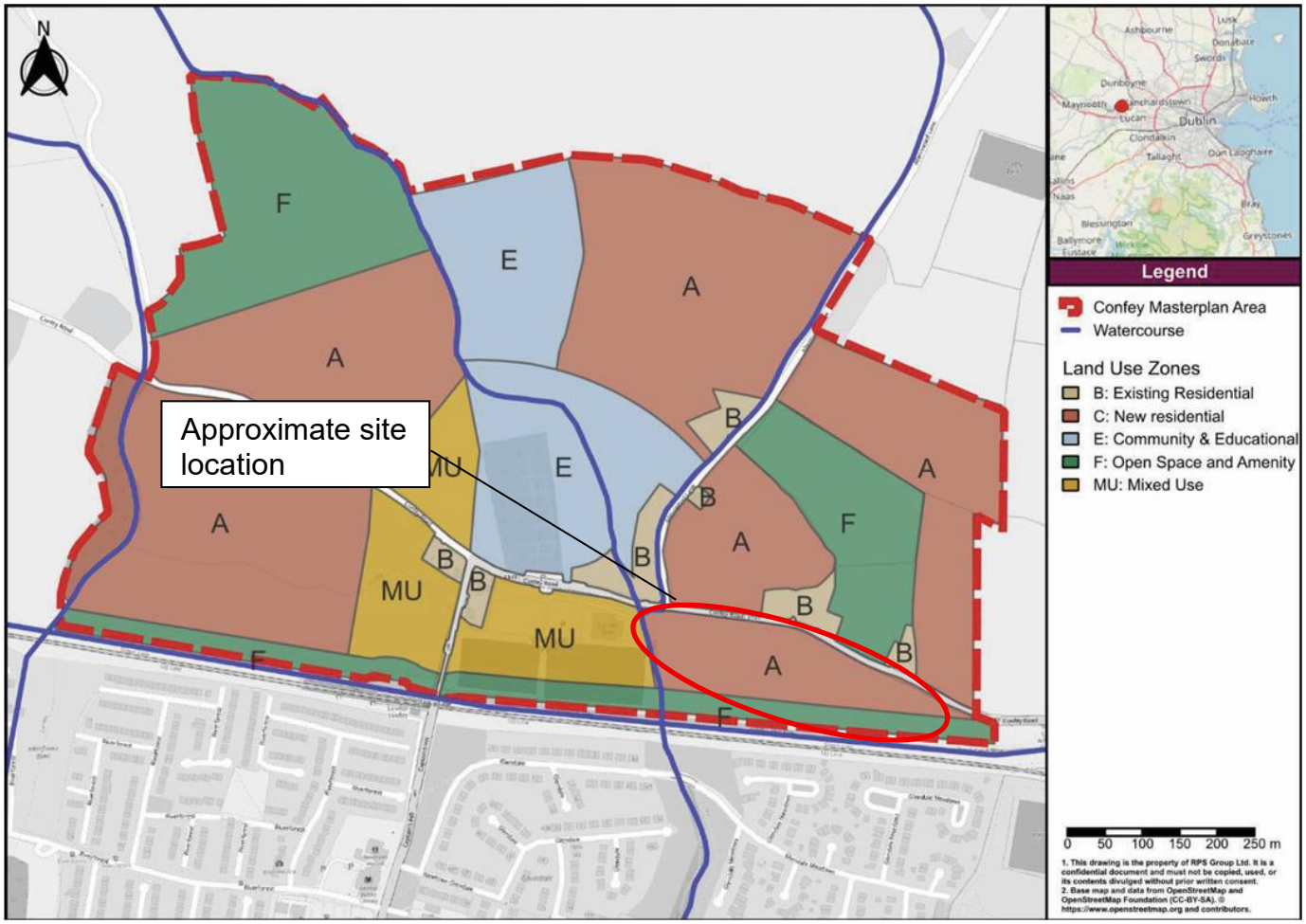


Figure 3-3: Land Use Zones within the Masterplan

3.3.3 Leixlip Flood Relief Scheme

The Leixlip Scheme was initiated in 2004 and was constructed from 2007 to 2010. The Scheme comprises flood defence walls and embankments along the Rye Water and flood defence walls along the Silleachain river. This provides protection against the 1% AEP event for 50 properties against flooding from the Rye Water and Silleachain rivers.

The Oranstown Stream was not considered for the Leixlip Flood Relief Scheme, refer to Figure 3-4.

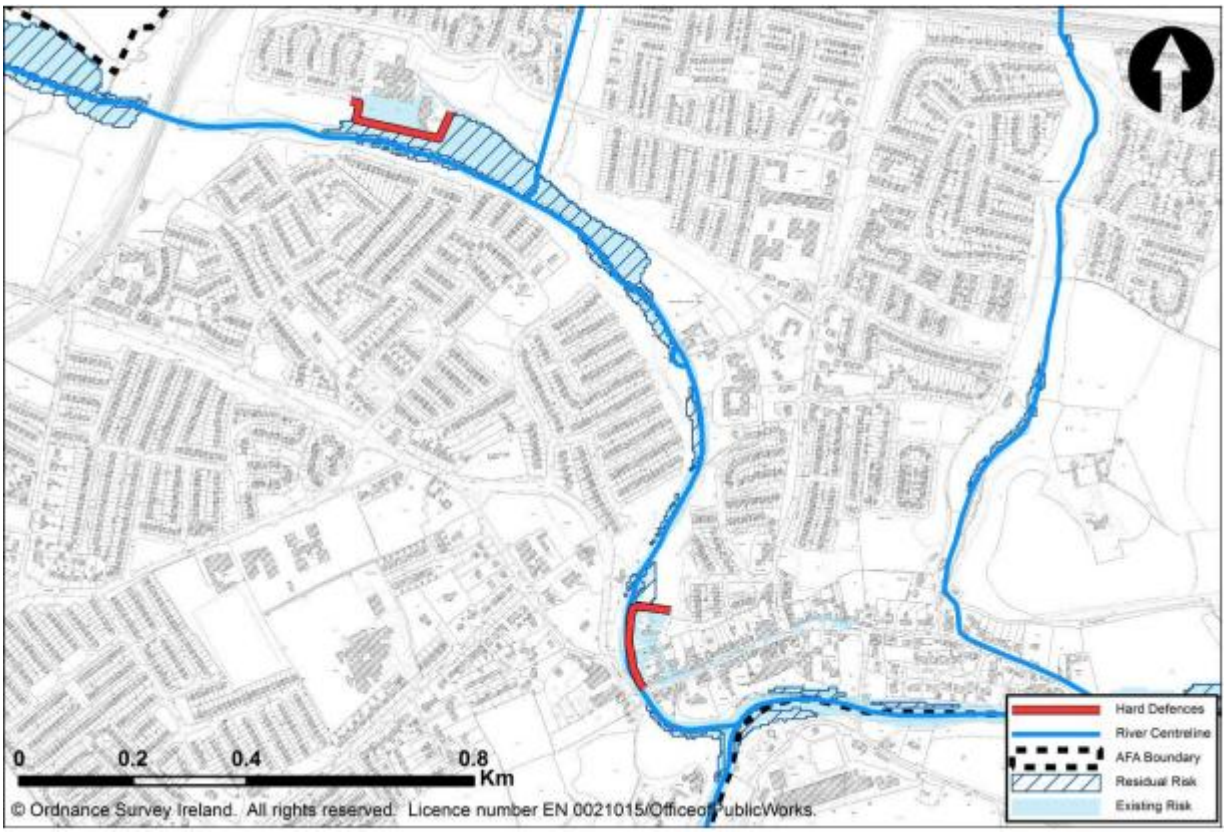


Figure 3-4: Leixlip Flood Relief Scheme

3.4 Sources of Flooding

The initial stage of the Hydraulics Report requires the identification and consideration of probable sources of flooding. Following this initial phase of this Flood Risk Assessment, it is possible to summarise the level of potential risk posed by each source of flood sources are described below.

3.4.1 Fluvial

Based on the reviewed CFRAM Fluvial Flooding maps for both the Current Scenario concerning the Oranstown and the Moor of Meath stream, the site is impacted by the 1% and 0.1% AEP events. The proposed site is situated within Zone A/B. To refine and confirm the flood extents, as well as to conduct residual risk and sensitivity testing, a site-specific hydraulic model was developed, as detailed in Section 4.

3.4.2 Coastal

The site is located inland; therefore, coastal flooding has been screened out at this stage.

3.4.3 Pluvial

Pluvial flooding is the result of rainfall-generated overland flows that arise before run-off can enter a watercourse or sewer. Review of the site topography confirms that there are no local depressions onsite that would be at risk of pluvial flooding. The site is currently well-drained, and a stormwater management system will be incorporated into the planning design.

3.4.4 Groundwater

Groundwater flooding results from high sub-surface water levels that impact upper levels of the soil strata and overland areas that are usually dry. The GSI maps were reviewed and do not indicate groundwater flooding at the site or surrounding area. The GSI groundwater vulnerability for the site is classified as 'Moderate' to 'High' and there is no karst features located in or around the site location. Based on this information, there is a low risk of groundwater flooding at the site.

4 Detailed Flood Risk Analysis

4.1 Flood Risk

As discussed in Section 3, the Oranstown flows along the site's western boundary. through the site boundary. Based on the CFRAM flood mapping the site is located in Flood Zone C, however, to further investigate fluvial flood risk and to confirm residual risk to the site, a detailed investigation using hydraulic modelling has been carried out. The construction and application of the hydraulic model used is discussed in this chapter.

4.2 Hydrology

To assist in the estimation of potential flood risk to the proposed development from the Oranstown flows, Moor Meath and tributary , this section provides flow estimates for the 100-year (1% flood event) and 1000-year (0.1% flood event) flows expected along the Confey Stream along the western boundary of the proposed development.

4.2.1 Catchment Characteristics

The physical characteristics of the catchment influence the hydrology, this includes catchment size, soil type, steepness, and the average rainfall. Table 4-1 outlines the parameters calculated for the site catchment. Figure 4-1 overpage provides the catchment area.

The Confey Stream and River Rye have been considered for the hydrological inflows at the site. The characteristics of the Confey catchment were derived from first principles. The characteristics of the Rye catchment were derived from the FSU (Flood Studies Update) ungauged node database. SAAR and URBEXT have been updated using the latest available datasets.

Table 4-1: Catchment Characteristics

Descriptor	09_584_3	09_346_5
AREA	5.166	3.88
SAAR1991-20	759.5	759.87
FARL	1	1
BFI Soil	0.59	0.6457
URBEXT (CORINE 2018)	0.0563	0
MSL	4.904	3.08
S1085	3.72	3.5322
NETLEN	2.37	3.609
DrainD	1.236	0.928
ArtDrain2	0	0

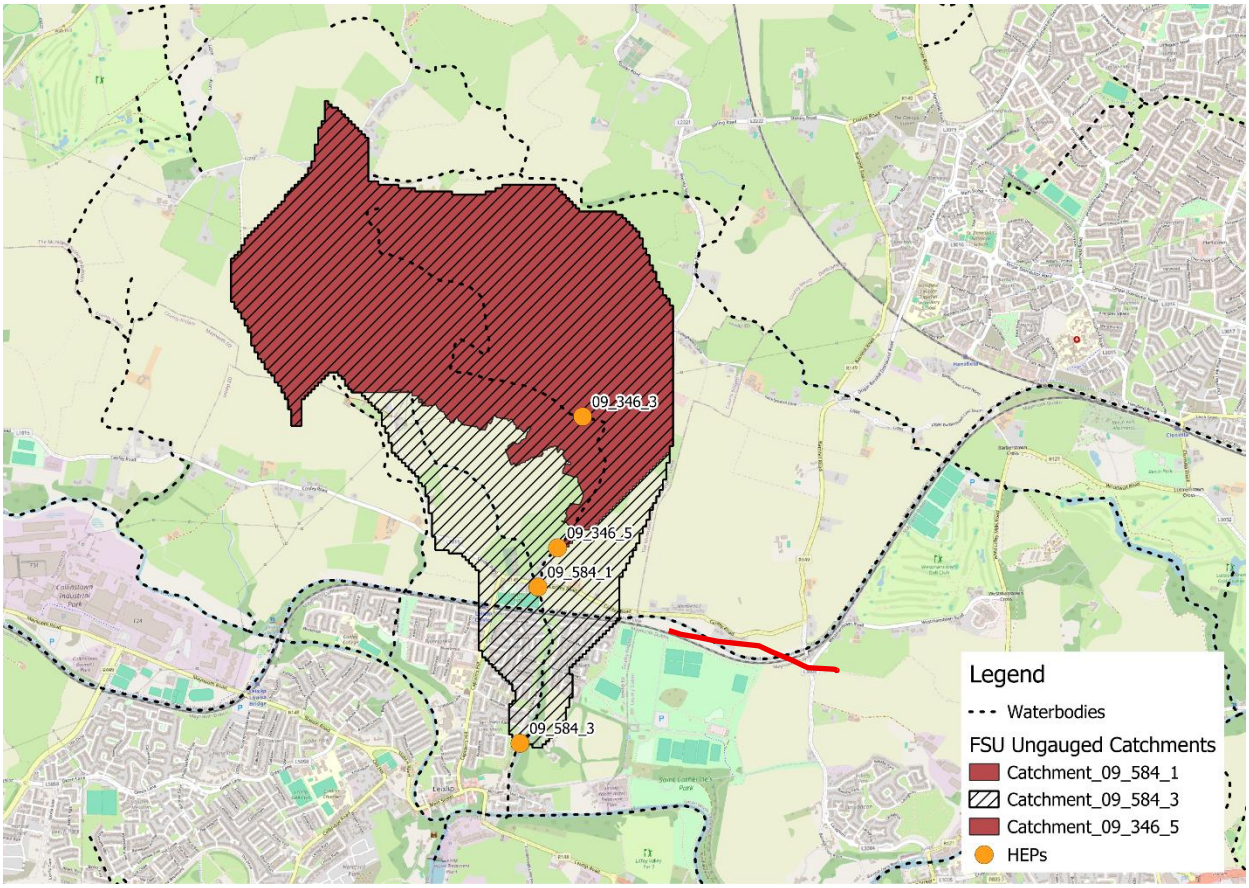


Figure 4-1: Watercourses and Catchment Areas

4.2.2 Flow Estimation

Three flood estimation methods were used to compare under hydrological analysis. These are:

- FSR Rainfall Runoff (RR)
- Flood Studies Update (FSU)
- Flood Studies Update Small Catchments (FSU SC)
- FSSR 16

Table 4-2 outlines the calculations for each method. Climate change was accounted for by increasing the relevant peak flows by 30%, which is based on the High End Future Scenario (HEFS) OPW guidance.

Table 4-2: Flow Estimation Results

Hep Code	Peak flow methods	Qmed (m^3/s)	1% AEP (m^3/s)	0.1% AEP (m^3/s)
09_584_3	FSSR	1.17	5.36	6.75
09_346_5	FSSR	0.69	3.21	4.06

4.3 Hydraulic Modelling

4.3.1 Hydraulic Model Set Up

To assess flood risk at the site, a 1D-2D ESTRY-TUFLOW hydraulic model was developed. This model facilitates the simulation of river channels, streams, floodplains, and hydraulic structures, providing predictions of water levels under various scenarios (see Figure 4-2). The model was constructed in the following stages:

- Model Creation: A 1D-2D ESTRY-TUFLOW model of the Oranstown Stream and wider river system including the surrounding area and the proposed site, was developed using a Digital Terrain Model (DTM) and channel survey data.
- To ensure that potential cross catchment flows have been considered the Confey Stream has been incorporated into the model.
- The Royal Canal has been incorporated into the model,
- Structure Integration: Existing hydraulic structures were incorporated into the model based on survey data and a baseline condition was established.
- Baseline Simulations: Hydraulic simulations were carried out for the baseline condition to determine the existing flood extents and delineate Flood Zones.
- The High End Future Scenario (HEFS) climate change event has been assessed
- Residual Risk Assessment: Additional scenarios were modelled to assess residual risks for the site, refer to Figure 4-3.
- Long sections and photographs have been provided in Appendix D of the Royal Canal Culvert adjacent to the site.

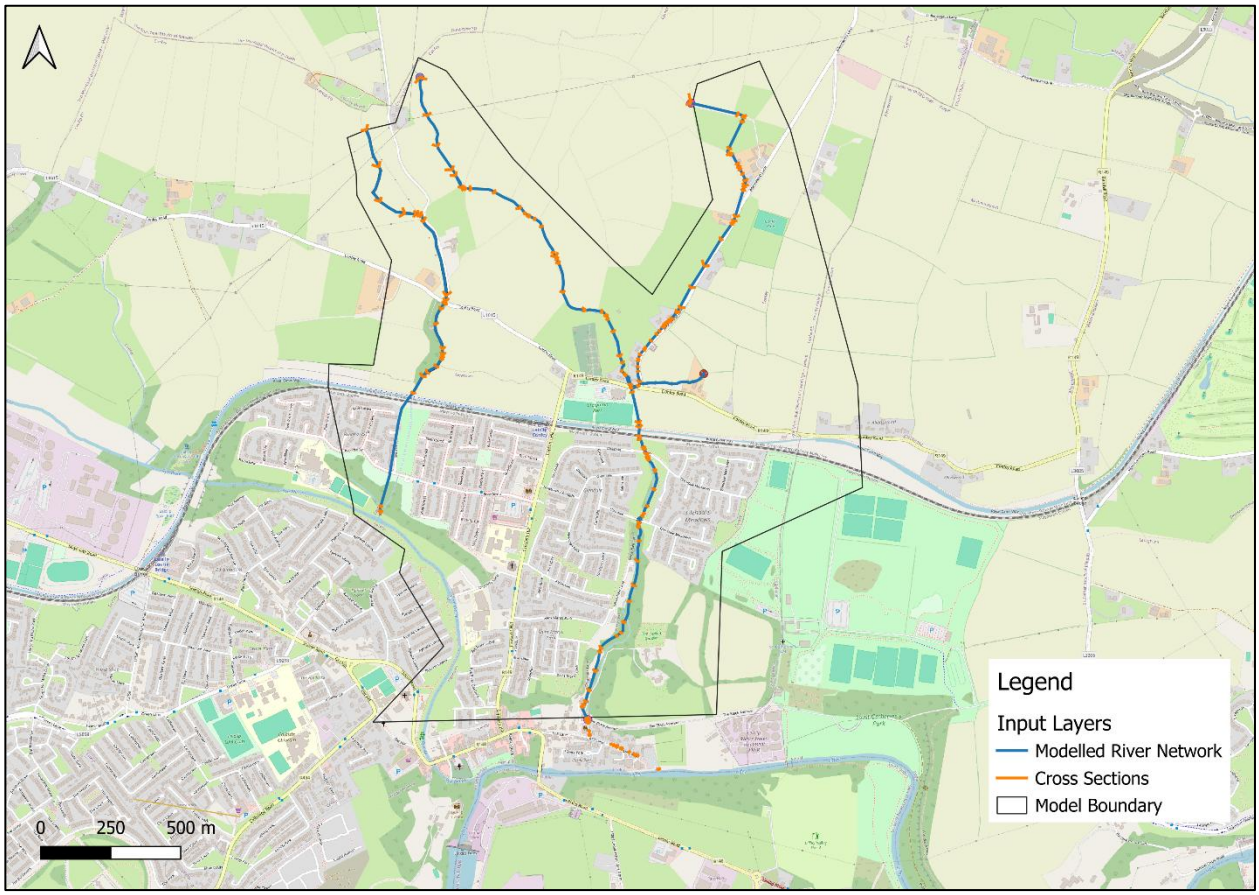


Figure 4-2: Model Schematisation

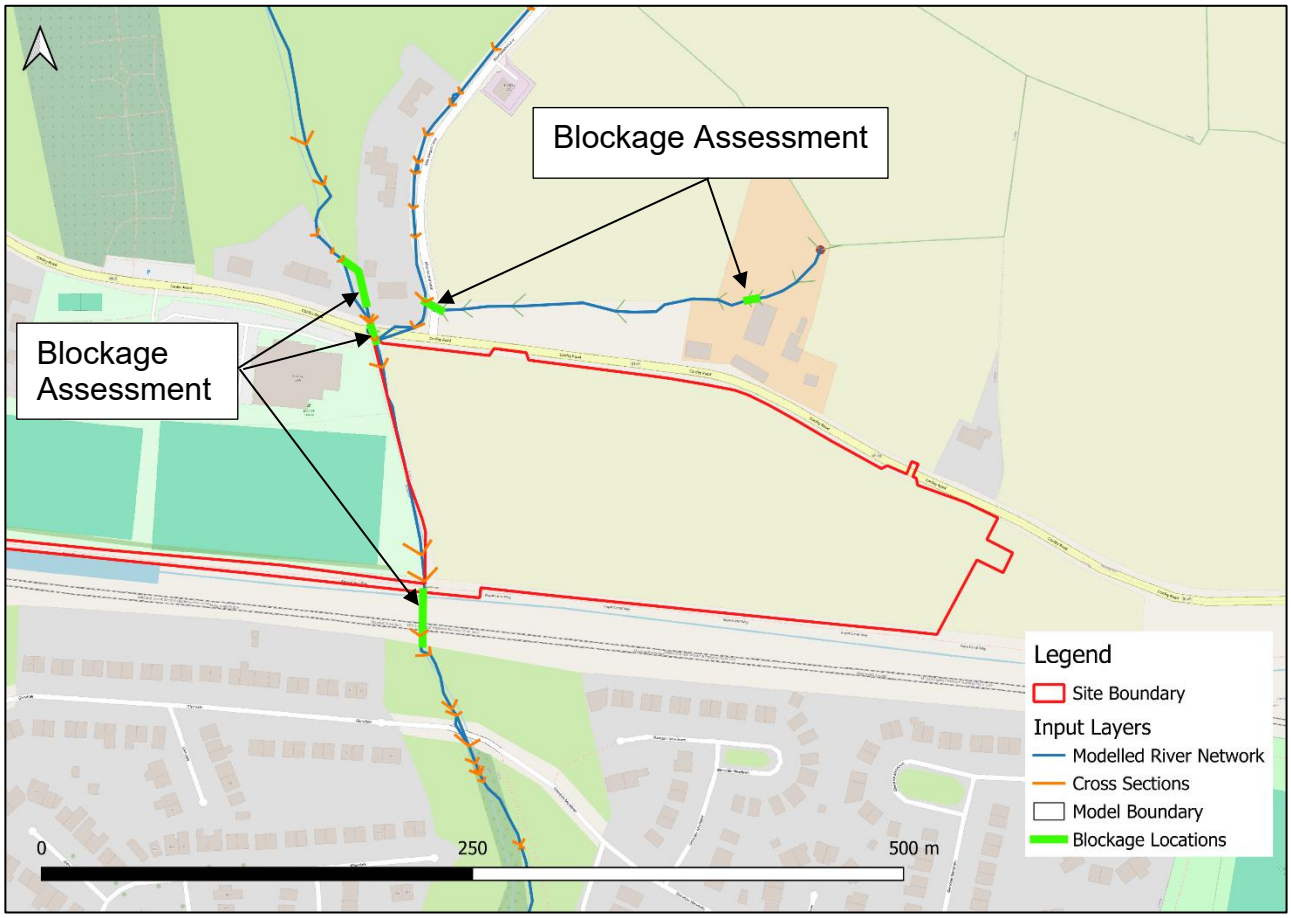


Figure 4-3: Blockage Locations

4.3.2 Model Results - Pre-Development Scenario

Figure 4-4 presents the modelled flood extents for the 1% AEP and 0.1% AEP events, corresponding to Flood Zones A and B, respectively. The results indicate that site is partially located in Flood Zone A/B. The flood levels will be used in Section 5.2 to confirm the appropriate mitigation approach.

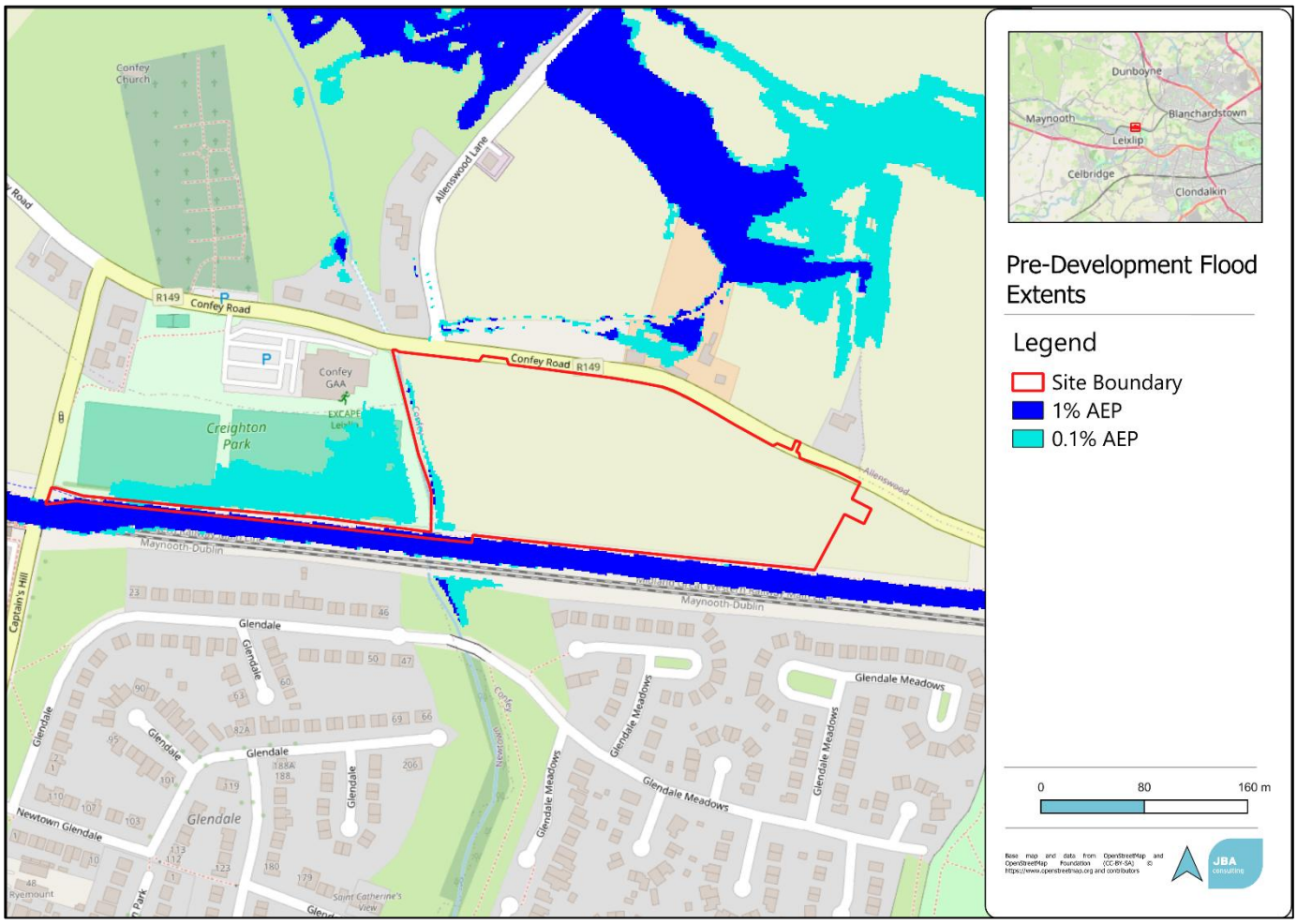


Figure 4-4: Pre-Development Flood Extents

4.3.3 Model Results - Post Development

Figure 4-5 below provides the post-development flood extents. The figure shows that none of the residential units are located in Flood Zone C although a section in the western area of the site is located in Flood Zone/A/B.

The existing and post-development flood levels are provided in Table 7-1 within Appendix C. Cross sections of the Oranstown Stream have also been provided adjacent and downstream of the site with the 0.1% AEP flood level within Appendix C.

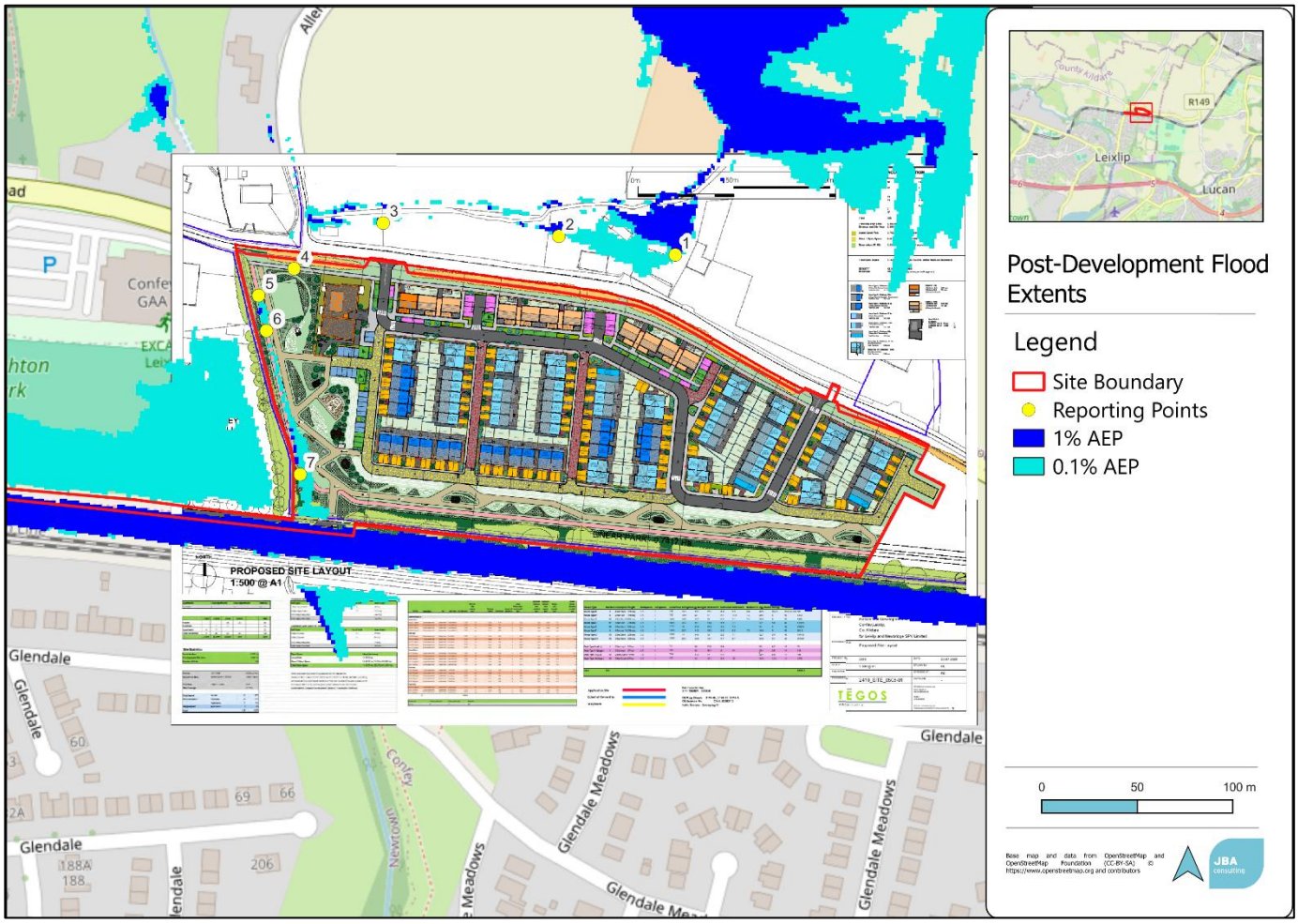


Figure 4-5: Post-Development Flood Extents

5 Flood Risk Analysis and Mitigation

5.1 Flood Risk

A review of the available flood data identified fluvial flooding from the Oranstown Stream as the primary source of flood risk to the site. The Oranstown Stream was modelled under CFRAM, and flood maps show that the site is not at risk of fluvial flooding for the modelled 1% AEP and 0.1 % AEP flood event.

To provide a higher level of assessment and confirmation of flood risk at the site, JBA Consulting has undertaken a detailed Hydraulic Report for the proposed site, and a hydraulic model was developed for the Oranstown Stream as well as other watercourses in the vicinity of the site as part of the investigation. Various scenarios were developed to classify the baseline flood extents, including the 1% AEP and 0.1% AEP flood events.

The study concluded that the site is affected particularly along its western boundary is located in Flood Zone A/B. All residential areas of the site are in Flood Zone C and are not at risk of flooding from the 1% AEP and 0.1% AEP flood events. These findings supersede those from the OPW's CFRAM mapping. It is confirmed access roads are located in Flood Zone C. All proposed development within the 1% AEP and 0.1% AEP flood extents post-development is restricted to landscaping which is considered water compatible.

The proposed development is compliant with the Guidelines however a Justification Test has been undertaken and passed in Section 6 of this Hydraulic Report. All residential areas are located in Flood Zone C.

5.2 Mitigation

5.2.1 Finished Floor Levels (FFL)

All of the proposed highly vulnerable residential development is located in Flood Zone C; and to comply with the Kildare County Development Plan 2023-2029 a minimum freeboard of 500mm is provided above the 1% AEP water level with an allowance for climate change.

The minimum proposed Finish Floor Level (FFL) onsite is provided in Table 5-1. Refer to Figure 4-5 for the reporting point locations. The minimum proposed FFL in units nearest Flood Zone A/B ranges between 55.40mOD - 55.95 mOD providing a minimum freeboard of 1.08 - 2.13 metres over the 0.1% AEP flood event.

However, the river system and associated flood extents are sensitive to the potential blockage of the culvert located under the Royal Canal. This area is generally located in a low point in the wider topography where flood waters can build up during a blockage scenario. In the modelled residual risk scenario, the resulting flood levels during the

1% AEP blockage flood level is 55.08mOD. At a minimum a 300m freeboard will be required above the residual risk event which results in a final FFL requirement of **55.38mOD.**

Table 5-1: Finished Floor Levels

Reporting Point	1% AEP Level (mOD)	0.1% AEP Level (mOD)	HEFS 1% AEP Level (mOD)	Blockage 1% AEP Level (mOD)	Min. FFL (mOD)	Freeboard (m)
1	54.81	54.87	54.85	55.08	55.95	0.87
2	54.22	54.40	54.32	55.08	55.85	0.77
3	54.04	54.22	54.14	55.08	55.64	0.56
4	NA	NA	N/A	55.08	55.85	0.77
5	NA	53.76	53.56	55.08	55.85	0.77
6	53.42	53.72	53.51	55.08	55.85	0.77
7	53.09	53.54	53.22	55.08	55.40	**0.32**

5.2.2 Access

An entrance way will be constructed at the northern boundary of the site from the R149 (Confey Road). The entrance and associated primary and emergency access/egress routes are fully located in Flood Zone C and is at low risk of flooding. Therefore, access to the development during a flood event is not considered to be an issue.

5.2.3 Surface Water Management

The proposed development will increase the hardstanding area onsite and therefore could potentially increase the surface water runoff from the site if not mitigated against. There is no identified pluvial flooding onsite based in the historic flood information and site survey data. The proposed stormwater system will comply with the Kildare Development Plan policies. Refer to the stormwater design and accompanying report contained within the wider planning application for the details.

The proposed stormwater discharge from to the development has been limited to 3.7l/s, outfalls to a point is to a local drainage channel that runs along the southern boundary of the site parallel to the Royal Canal. This drain ultimately discharges into the Oranstown Stream. A specific model has been developed to assess the potential increase in flood risk downstream of the site from the proposed stormwater discharge. The results confirm that there are no flood levels along the Oranstown Stream.

It is noted that the discharge rate has been limited to the greenfield equivalent therefore technically there will be no increase in surface water flows from the development.

Regard potential pluvial flooding, to minimise the risk of pluvial flooding, a threshold of 150mm is required from the FFL to the external ground levels.

5.2.3.1 GAA Ground Drainage Culvert

It has been stated within the FI request that it is proposed to discharge stormwater flows through the Confey GAA grounds. A CCTV survey has been requested for any proposed piped sections of the surface water discharge route.

The Confey GAA ground and associated culvert are located to the west of the site and Oranstown Stream. This culvert discharges to the Oranstown Stream from the opposite western bank and has no connection to the proposed development stormwater system. Refer to Figure 5-1 for the location of the GAA culvert and proposed development.

If required, a CCTV survey has been undertaken of this culvert under the planning application Ref: 2660746 and contained in the Confey Phase 1A LRD RFI Response document.

With reference to the Infrastructure Design Report[1] and stormwater layout drawing[2], the proposed stormwater discharge is spaced over 5no. outfalls along the site's southern boundary to an existing open drainage channel. There are no existing culverts located along this drainage channel, and therefore the drain will discharge directly to the Oranstown Stream without entering an existing culvert system.

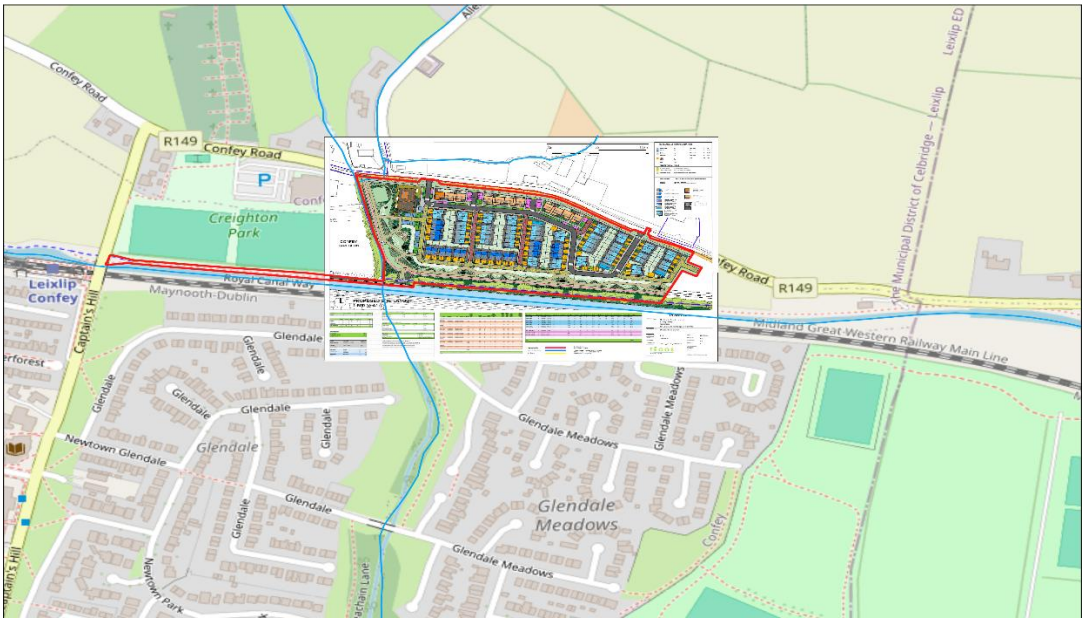


Figure 5-1: GAA Ground Culvert System

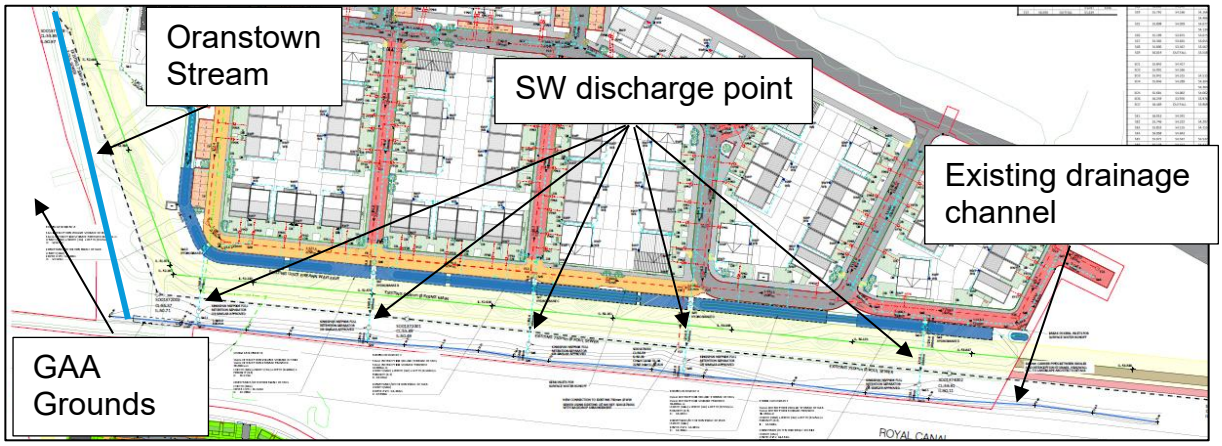


Figure 5-2: Proposed SW Discharge Locations

1 CHC-00-XX-RP-C-00001-S4-P06 (Infrastructure Design Report)
2 CHC-00-GR-DR-C-00200-S4-P03-Drainage layout

5.3 Climate Change

In line with OPW guidelines, an assessment of the flood risk associated with climate change was carried out. The site was evaluated under the High-End Future Scenario (HEFS), which involves the 1% AEP event with a 30% increase in flow.

Table 5-1 confirms that a freeboard of 1.47m to the FFL over the predicted climate change flood levels has been provided.

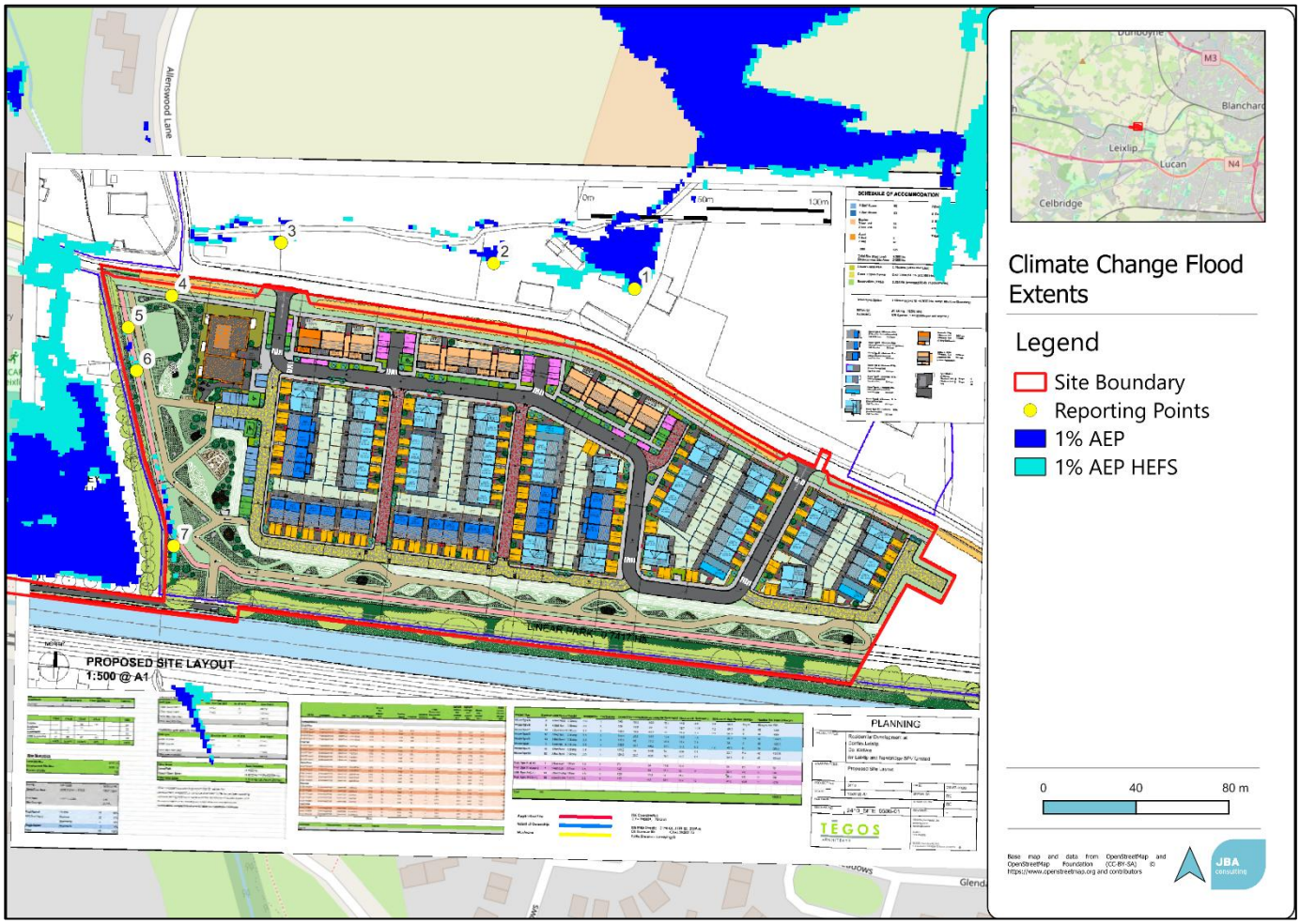


Figure 5-3: Climate Change Flood Extents

5.3.1 River and Stormwater Maintenance measures

As part of the proposed developments Infrastructure Design Report, a SuDS maintenance plan has been outlined to provide regular maintenance of the stormwater system. The plan also outlines in detail the preventative measures and a response maintenance regime.

This maintenance and response plan has been extended to the Oranstown Stream and particularly the culvert system under the Royal Canal. Regular visual inspection

(monthly) is required to ensure no build-up of debris. Visual inspection is also required prior to red warning rainfall events to ensure the culvert is clear of debris. The visual inspection is extended to the Oranstown Stream along the western boundary of the site to remove any debris.

5.4 Residual Risks

Residual risks refer to risks that persist even after all avoidance, substitution, and mitigation measures have been implemented. The primary residual risk identified for the site is the potential blockage of four culverts upstream of the site and one downstream of the site.

The potential overtopping of the Royal Canal is also considered a residual risk.

5.4.1 Culvert Blockage

To assess this, a hydraulic model was developed to simulate the potential impact of a blockage scenario. The model was tested for a 67% blockage scenario. In total 6no. culverts surrounding the site have been apprised for blockage. The most sensitive to blockage is the culvert located under the Royal Canal. The resulting flood extents are presented in Figure 5-4, where the proposed road and residential areas have been raised above the predicated flood level.

The maxima flood level across the site is 55.08mOD and has been used to inform the appropriate FFL in Section 5.2.1.

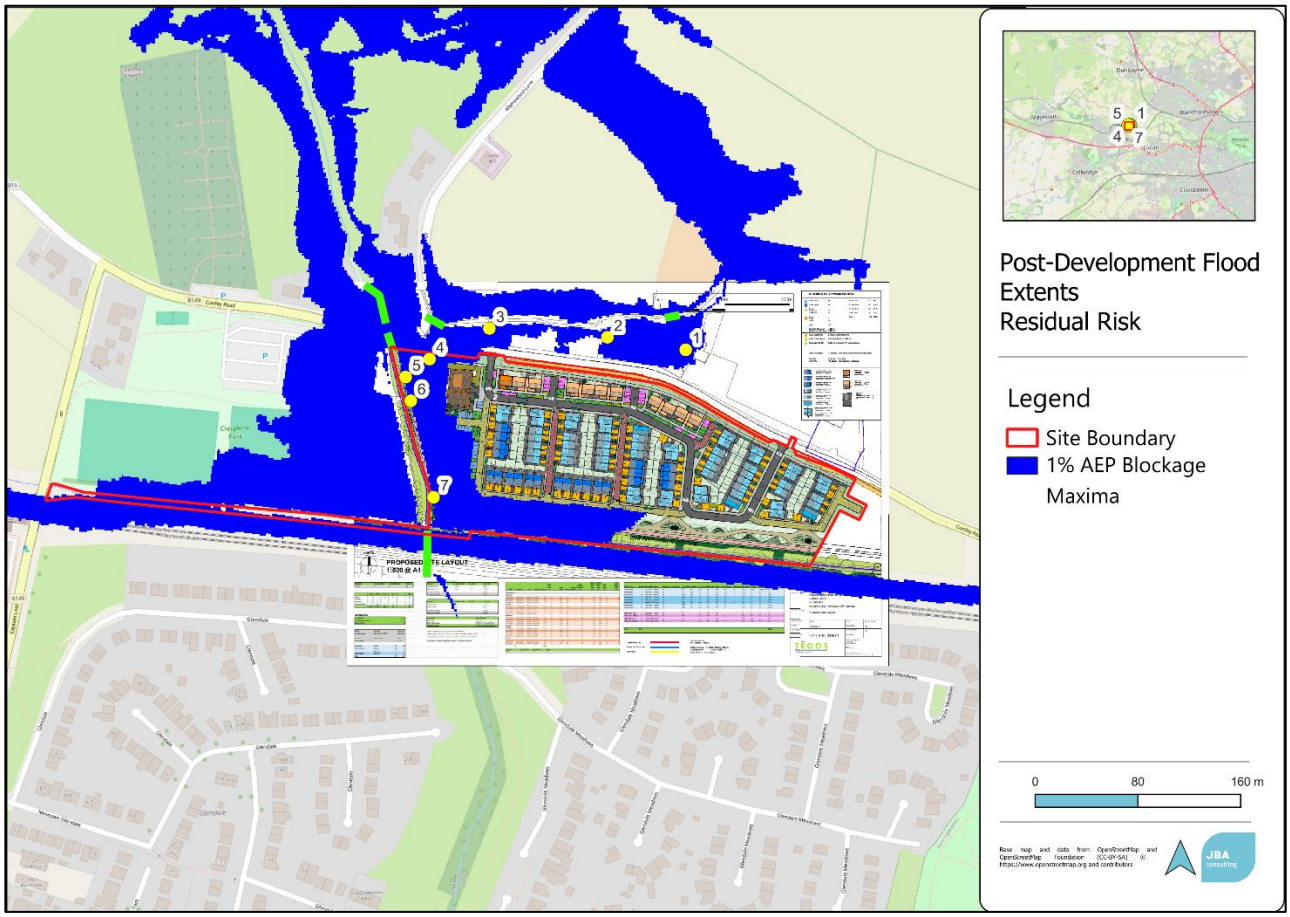


Figure 5-4: Blockage Scenario

5.4.2 Overtopping of Royal Canal

There has been no recorded overtopping of the Royal Canal identified within the surrounding area and the risk is considered low. Currently there is a drainage channel that runs along the southern boundary of the site that flows in a westerly direction and discharges into the Oranstown Stream. The general topography in the area falls in a westerly direction towards the Oranstown Stream.

To maintain this existing flow path the proposed landscaping needs to maintain the existing westerly gradient along the southern boundary to match the existing site levels, refer to Figure 5-5. This together with the provided distance of approximately 30m is considered sufficient to protect the development from overtopping events.

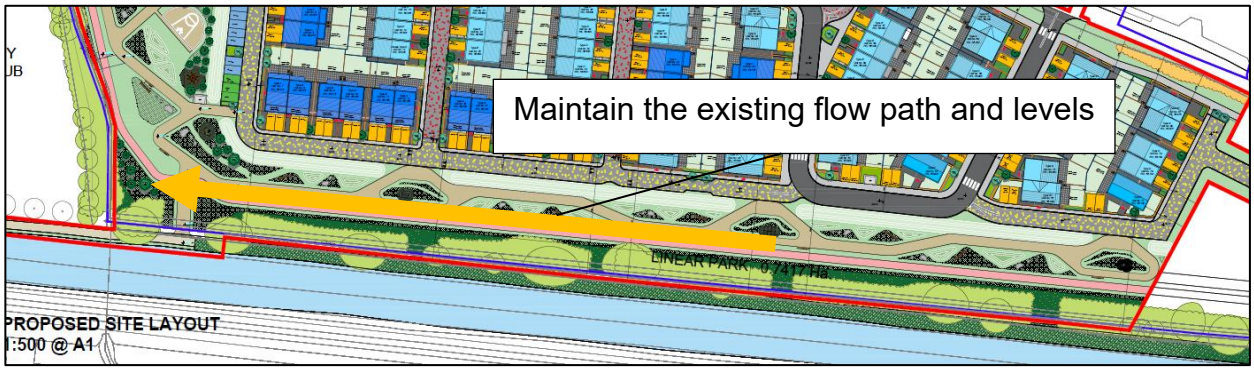


Figure 5-5: Canal Overtopping Mitigation Measure

6 Justification test

6.1 Justification Test Part 1

The subject lands have been zoned or otherwise designated for the particular use or form of development in an operative development plan, which has been adopted or varied taking account of the planning guidelines.

Under the Kildare County Development Plan 2023-2029 the site has a designated 'New Residential' zoning to the proposed site.

All residential areas of the site are located within the R1-New Residential.

Conclusion: The Kildare County Development Plan and SFRA, zoned the site as 'New Residential' and is in accordance with the Planning Guidelines.

6.2 Justification Test: Part 2

The proposal has been subject to an appropriate flood risk assessment that demonstrates:

(i) the development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk;

The majority of the site is located in Flood Zone C however it is noted that the western section of the site is located in Flood Zone A/B. No residential development is proposed in this area. It is proposed to retain the parks areas within Flood Zone A/B to the existing ground levels.

(ii) the development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible;

The main mitigation measures involve the provision of a minimum freeboard above the predicated flood levels, including climate change and residual risks. This ensures that flood risk has been minimised. As all residential and road infrastructure is located in Flood Zone C, no compensatory flood storage is required.

(iii) The development proposed includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures and provisions for emergency services access.

A specific hydraulic model has been developed to assess the flood risk to the development from climate change and residual risks (blockage). A minimum freeboard has been provided to ensure that the development will not be impacted from the modelled scenarios.

Regarding the stormwater discharge, the proposed discharge rate has been added to the post development hydraulic model, and the results show no increase in flood levels downstream of the site.

Furthermore, the established threshold of 150mm will ensure that the site will remain protected if failure of the stormwater system occurs.

(iv) The development proposed addresses the above in a manner that is also compatible with the achievement of wider planning objectives in relation to development of good urban design and vibrant and active streetscapes.

Refer to the accompanying planning application and design documentation in relation to good urban design.

7 Conclusion

JBA Consulting has undertaken a detailed Hydraulic Report for a proposed development in Confey, Leixlip, Co. Kildare. The site is situated east of the Oranstown Stream.

A review of available flood information identified the Oranstown as the primary source of flood risk. Historical data and predictive modelling, including the CFRAM Study, indicate that the development is in Flood Zone C. However, as the Oranstown flows through the west of the site, it is necessary to confirm this with detailed modelling.

To refine the understanding of flood risk, a site-specific 1D-2D hydraulic model was developed, incorporating channel survey data and a Digital Terrain Model (DTM). The modelling results confirmed that the western boundary of the site is partially inundated during the 1% AEP and 0.1% AEP event. Climate change (HEFS scenario) and residual risks, including the potential blockage structures, were also assessed.

The results from the hydraulic model confirm that all residential areas of the site are located in Flood Zone C. This is in accordance with the FRA guidelines, which recommends that all residential areas are retained in areas of the site classified as Flood Zone C.

As all residential areas have been located in Flood Zone C, a Justification Test has been undertaken and passed for the development.

Mitigation measures have been proposed, including setting the finished floor levels above the 1% AEP HEFS flood level and the 1% AEP residual risk scenario plus freeboard, as described in Section 5.2.1. A minimum freeboard of 1.08m has been provided over the 0.1% AEP flood event and all vulnerable development will be located in Flood Zone C. Regarding the residual risk event a freeboard of 300mm has been provided.

The proposed FFL has been set above the 1% AEP, 0.1% AEP, climate change and residual risk flood events plus freeboard.

Regarding pluvial flood risk, review of the available information and site topography does not indicate that the site is at risk of pluvial flooding. Surface water within the site will be managed through the provision of a stormwater system. Refer to the wider design statement and layout contained in the wider planning application for the stormwater details. To protect against potential surface water/pluvial flooding is it recommended that a threshold of 150mm is provided from the FFL to the external hardstanding areas.

The Hydraulic Report and strategic development recommendations were undertaken in accordance with 'The Planning System and Flood Risk Management' guidelines and agrees with the core principles contained within.

A Appendices

A.1 Understanding Flood Risk

Flood risk is generally accepted to be a combination of the likelihood (or probability) of flooding and the potential consequences arising. Flood risk can be expressed in terms of the following relationship:

Flood Risk = Probability of Flooding x Consequences of Flooding

A.1.1 Probability of Flooding

The likelihood or probability of a flood event (whether tidal or fluvial) is classified by its Annual Exceedance Probability (AEP) or return period (in years). A 1% AEP flood has a 1 in 100 chance of occurring in any given year.

In this report, flood frequency will primarily be expressed in terms of AEP, which is the inverse of the return period, as shown in the table below and explained above. This can be helpful when presenting results to members of the public who may associate the concept of return period with a regular occurrence rather than an average recurrence interval and is the terminology which will be used throughout this report.

Table: Conversion between return periods and annual exceedance probabilities

Return period (years)	Annual exceedance probability (%)
2	50
10	10
50	2
100	1
200	0.5
1000	0.1

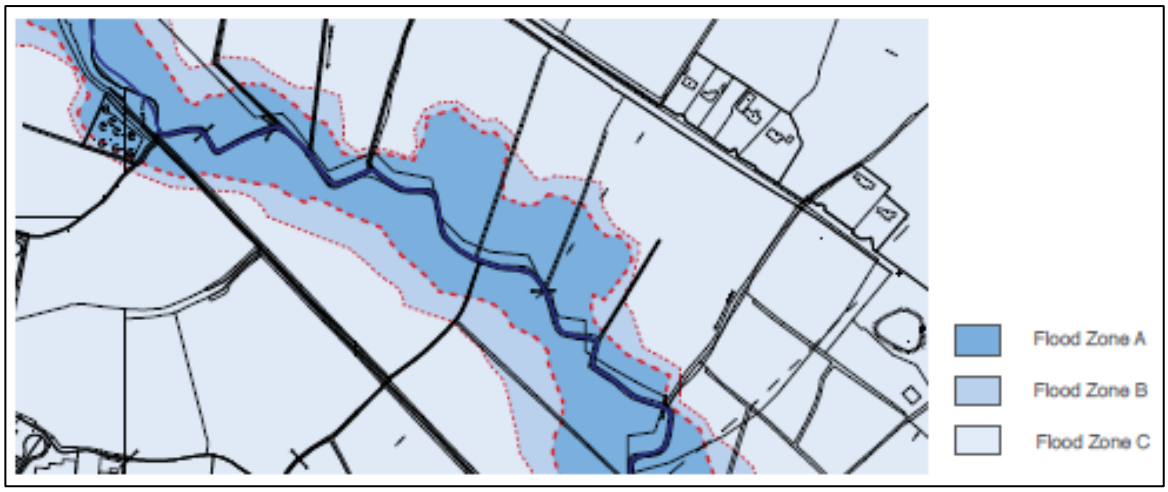
A.1.2 Flood Zones

Flood Zones are geographical areas illustrating the probability of flooding. For the purposes of the Planning Guidelines, there are 3 types or levels of flood zones, A, B and C.

Zone	Description
Flood Zone A	Where the probability of flooding is highest; greater than 1% (1 in 100) from river flooding or 0.5% (1 in 200) for coastal/tidal flooding.
Flood Zone B	Moderate probability of flooding; between 1% and 0.1% from rivers and between 0.5% and 0.1% from coastal/tidal.
Flood Zone C	Lowest probability of flooding; less than 0.1% from both rivers and coastal/tidal.

It is important to note that the definition of the flood zones is based on an undefended scenario and does not take into account the presence of flood protection structures such as flood walls or embankments. This is to allow for the fact that there is a residual risk of flooding behind the defences due to overtopping or breach and that there may be no guarantee that the defences will be maintained in perpetuity.

Indicative Flood Zones (OPW & DoEHLG 2009)



A.1.3 Consequence of Flooding

Consequences of flooding depend on the hazards caused by flooding (depth of water, speed of flow, rate of onset, duration, wave-action effects, water quality) and the vulnerability of receptors (type of development, nature, e.g. age-structure, of the population, presence, and reliability of mitigation measures etc.).

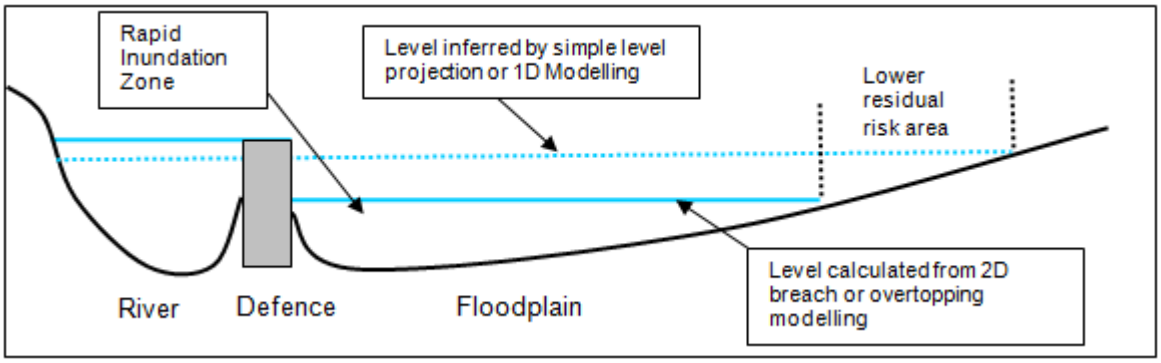
The 'Planning System and Flood Risk Management' provides three vulnerability categories, based on the type of development, which are detailed in Table 3.1 of the Guidelines, and are summarised as:

- Highly vulnerable, including residential properties, essential infrastructure, and emergency service facilities.
- Less vulnerable, such as retail and commercial and local transport infrastructure.

- Water compatible, including open space, outdoor recreation and associated essential infrastructure, such as changing rooms.

A.1.4 Residual Risk

The presence of flood defences, by their very nature, hinder the movement of flood water across the floodplain and prevent flooding unless river levels rise above the defence crest level, or a breach occurs. This is known as residual risk.



B Development Plan Policies & Objectives

Policy CON1 – Confey

CON1 *It is the policy of the Council to ensure that lands located at Confey are developed in a sustainable manner and in accordance with the details set out in the Confey Urban Design Framework recognising the areas strategic location within the Dublin Metropolitan Area.*

Objectives

It shall be an objective of the Council;

CON 1.1 To ensure the future development of the lands identified within the Confey Urban Design Framework are subject to a detailed Masterplan the contents of which shall be agreed in writing with the Planning Department of Kildare County Council.

CON 1.2 To ensure no development is permitted until a detailed Masterplan has been prepared for the Urban Design Framework lands. Individual applications for smaller sections of the Framework lands will not be considered until such time as an agreement in writing has been received from the Planning Department of Kildare County Council.

CON 1.3 To require that the Masterplan prepared for the Confey Lands is accompanied by a statement of compliance which demonstrates how proposals for future development are consistent with the overall design principles, concept and character area details set out in section 2 of the Urban Design Framework.

CON 1.4 To ensure the development of the Framework lands and Masterplan are consistent with the phasing/sequencing schedule set out in section 3 of the Confey Urban Design Framework.

C Cross Sections

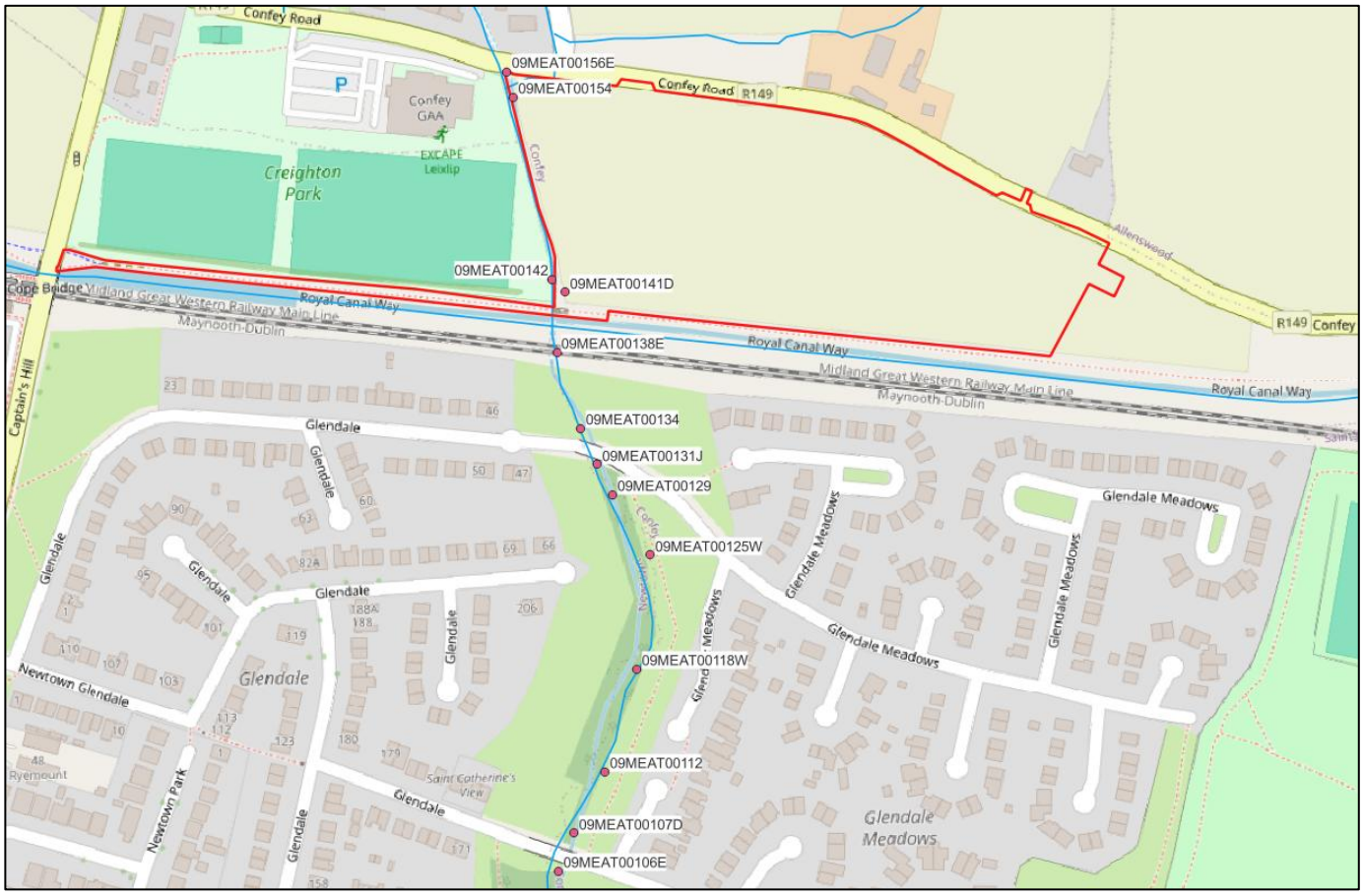


Figure: 7-1: Cross Sections Map

Table 7-1: Flood Level Comparison

Cross Sections	Existing 1% AEP Existing Water Levels (mOD)	Post - Development 1% AEP Existing Water Levels (mOD)	Existing 0.1% AEP Design Water Levels mOD)	Post-Development 1% AEP Design Water Levels (mOD)
09MEAT00156E	53.68	53.68	53.90	53.90
09MEAT00154	53.63	53.63	53.78	53.78
09MEAT00142	**53.07**	**53.07**	**53.52**	**53.52**
09MEAT00141D	**53.05**	**53.05**	**53.51**	**53.51**
09MEAT00134	**52.53**	**52.53**	**53.10**	**53.10**
09MEAT00131J	**51.49**	**51.49**	**51.65**	**51.65**

Cross Sections	Existing 1% AEP Existing Water Levels (mOD)	Post - Development 1% AEP Existing Water Levels (mOD)	Existing 0.1% AEP Design Water Levels mOD)	Post-Development 1% AEP Design Water Levels (mOD)
09MEAT00129	**50.99**	**50.99**	**51.10**	**51.10**
09MEAT00125W	**49.66**	**49.66**	**49.85**	**49.85**
09MEAT00118W	**48.26**	**48.26**	**48.38**	**48.38**
09MEAT00112	**47.29**	**47.29**	**47.62**	**47.62**
09MEAT00107D	**47.18**	**47.18**	**47.57**	**47.57**
09MEAT00106E	**45.67**	**45.67**	**45.72**	**45.72**

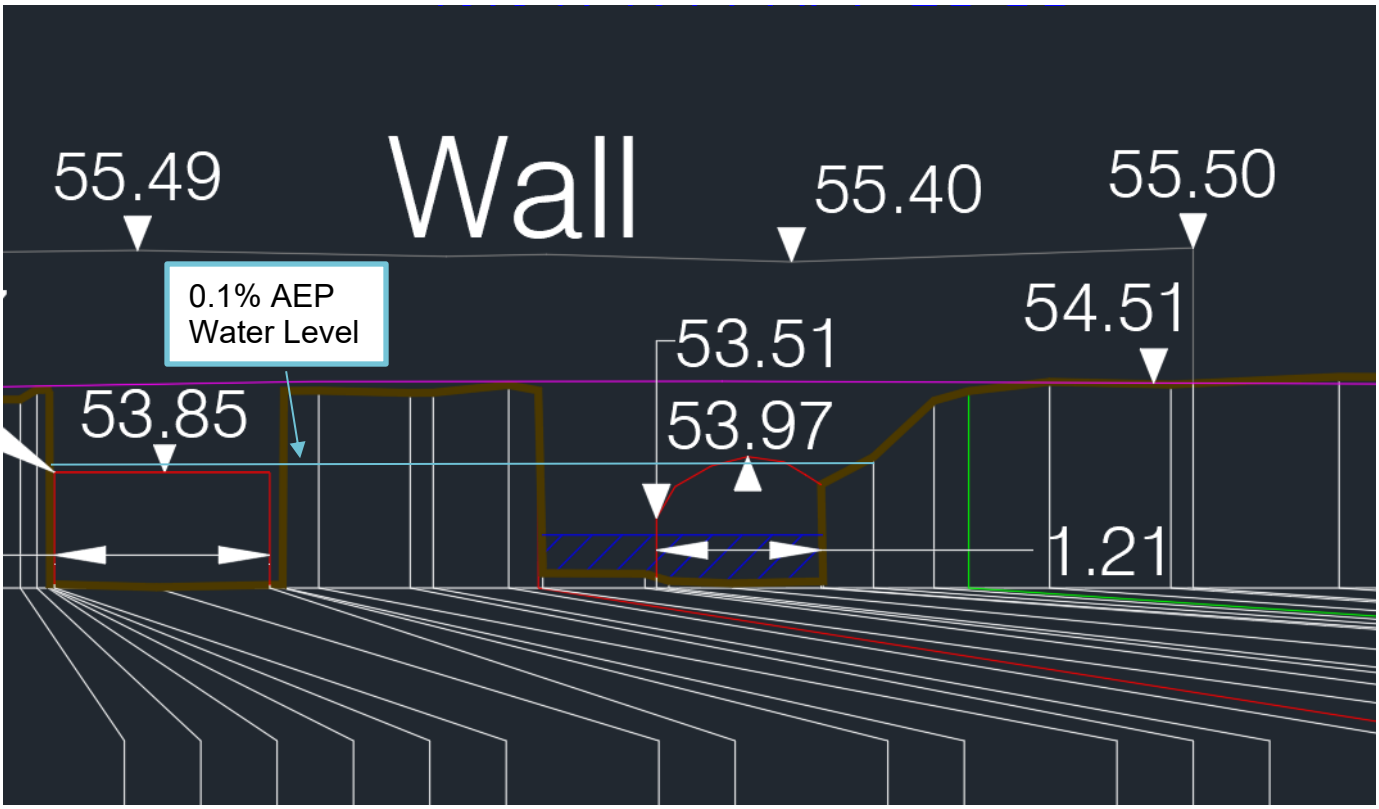


Figure 7-2: 09MEAT00156E

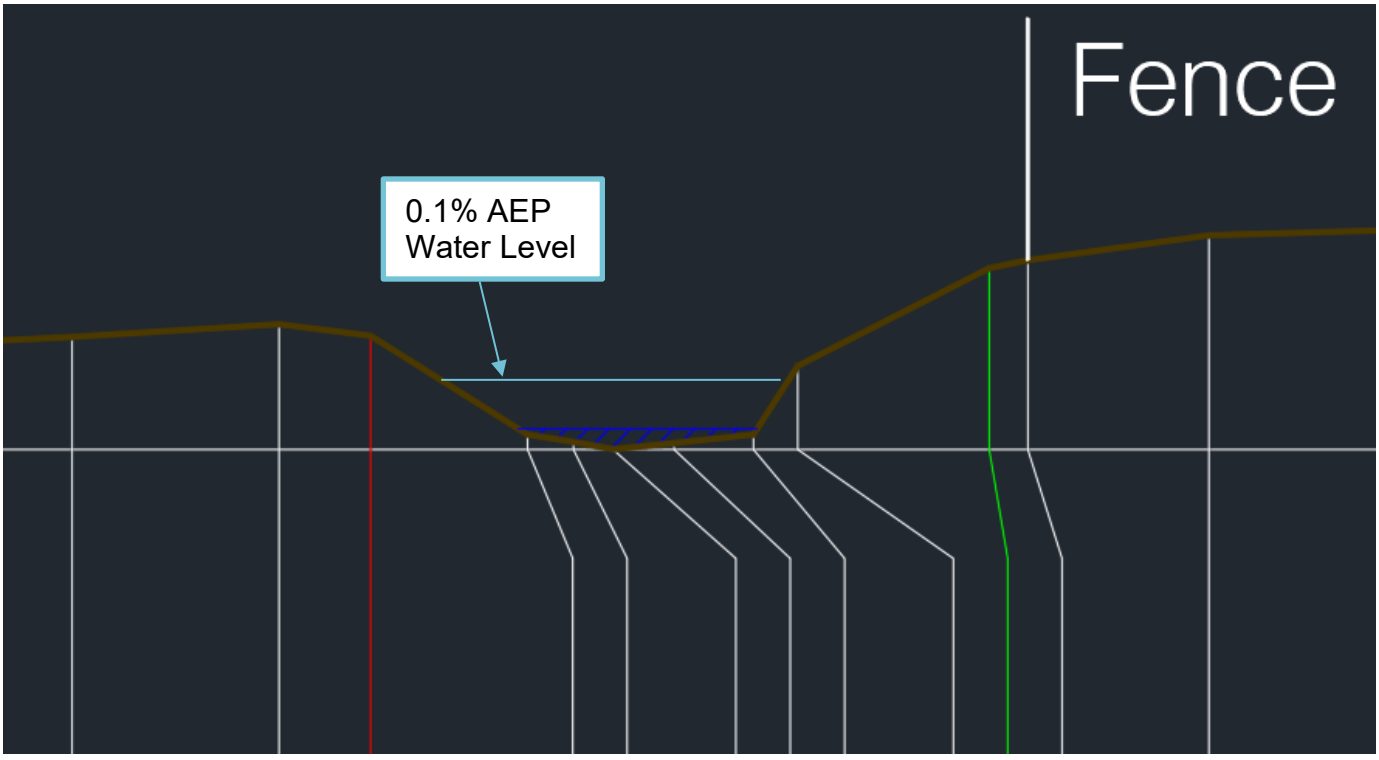


Figure: 7-3 09MEAT00154

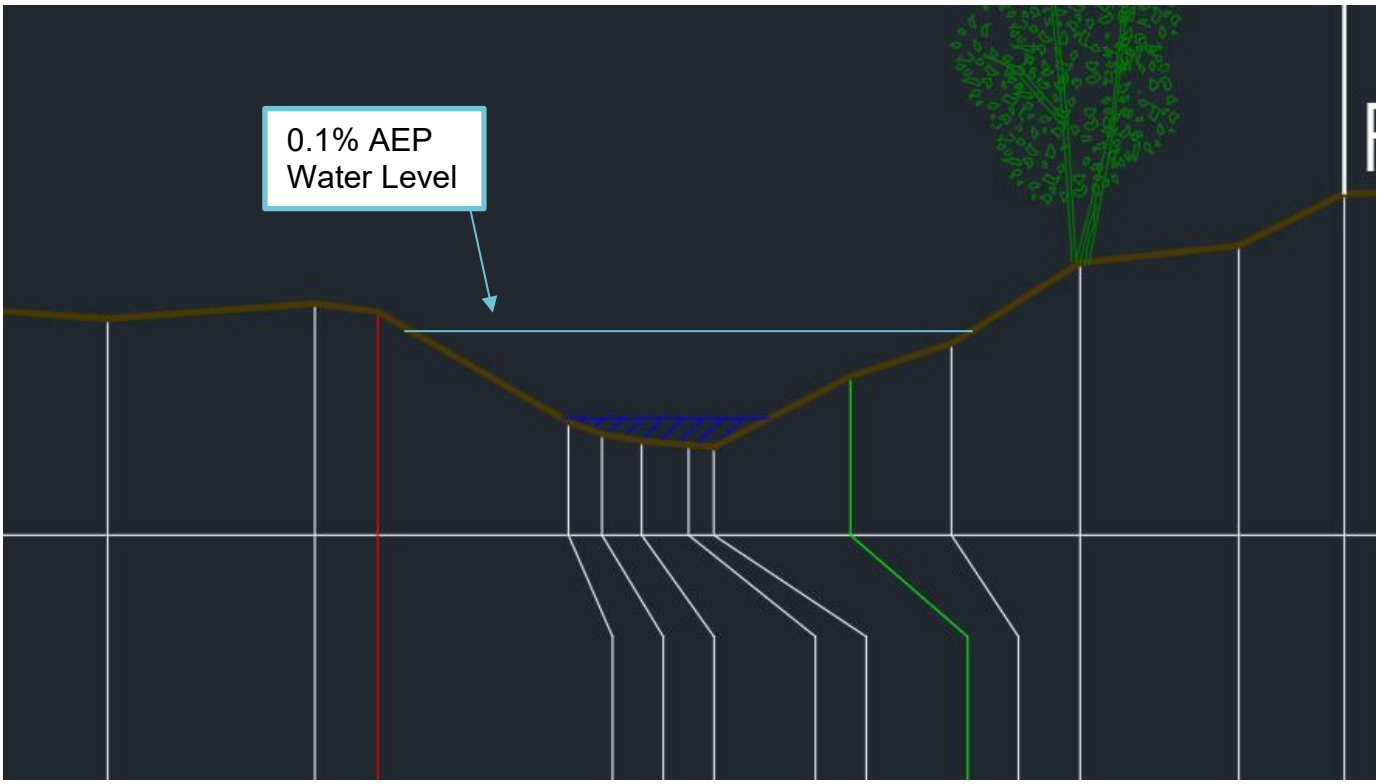


Figure: 7-4: 09MEAT00142

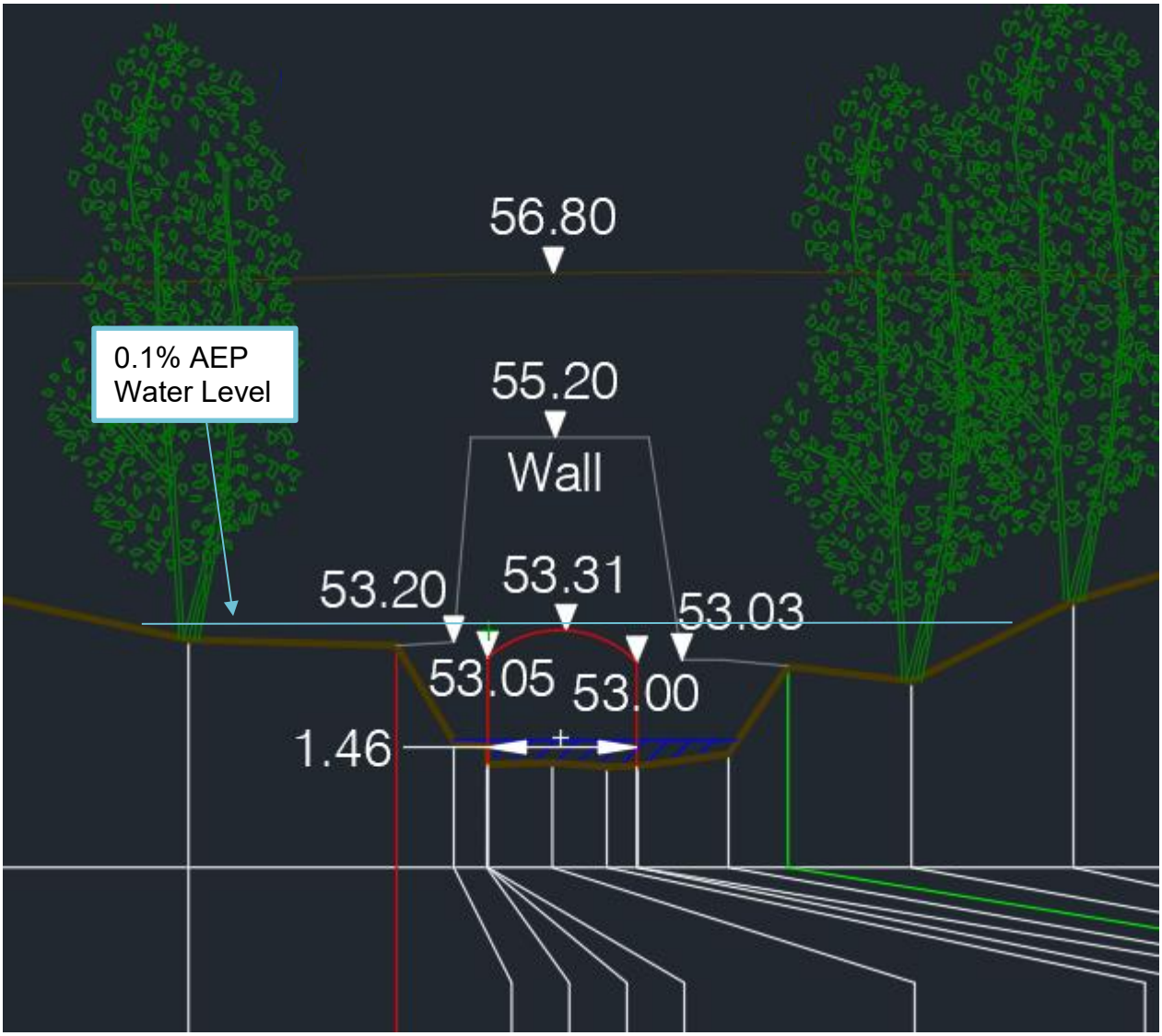


Figure: 7-5: 09MEAT00141D

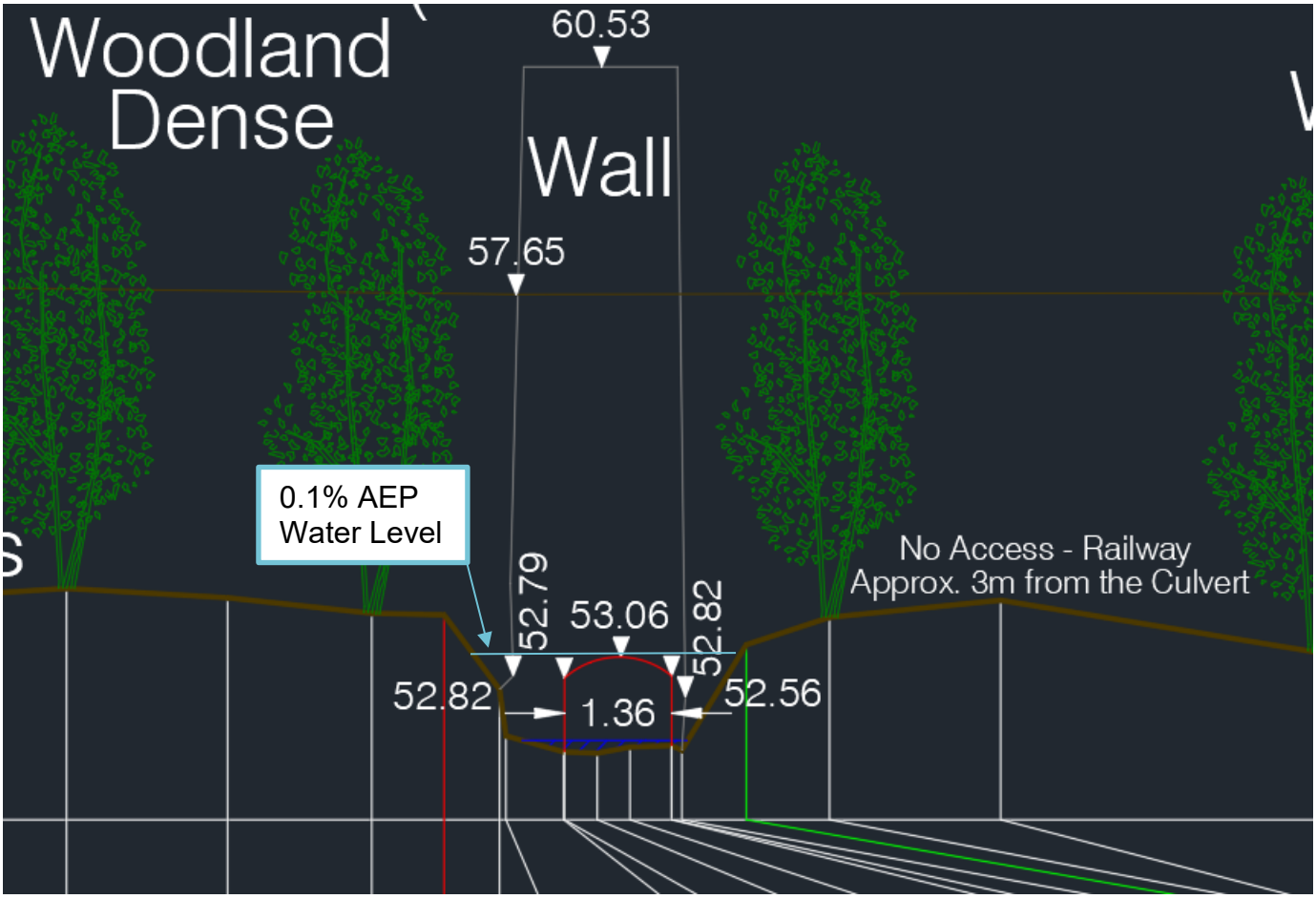


Figure: 7-6 09MEAT00138E

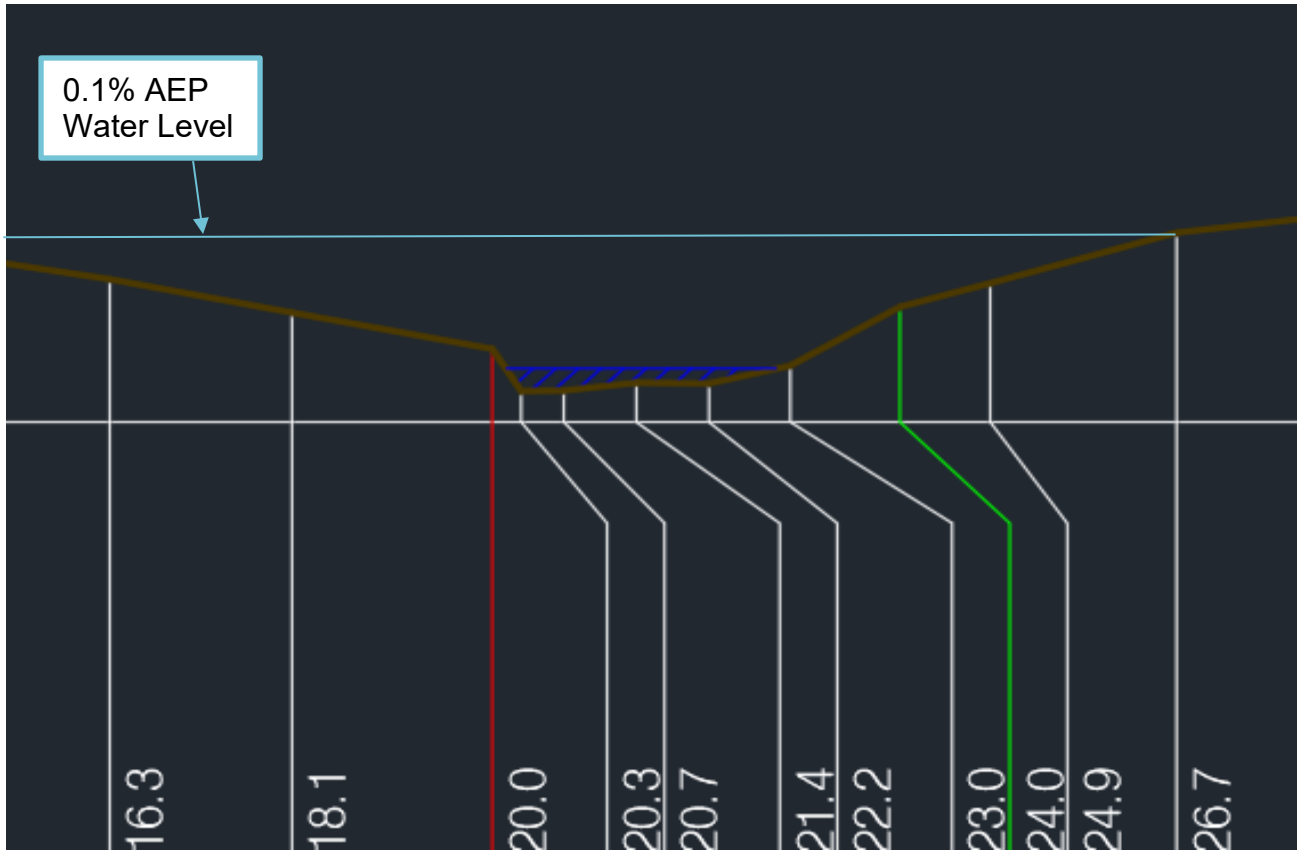


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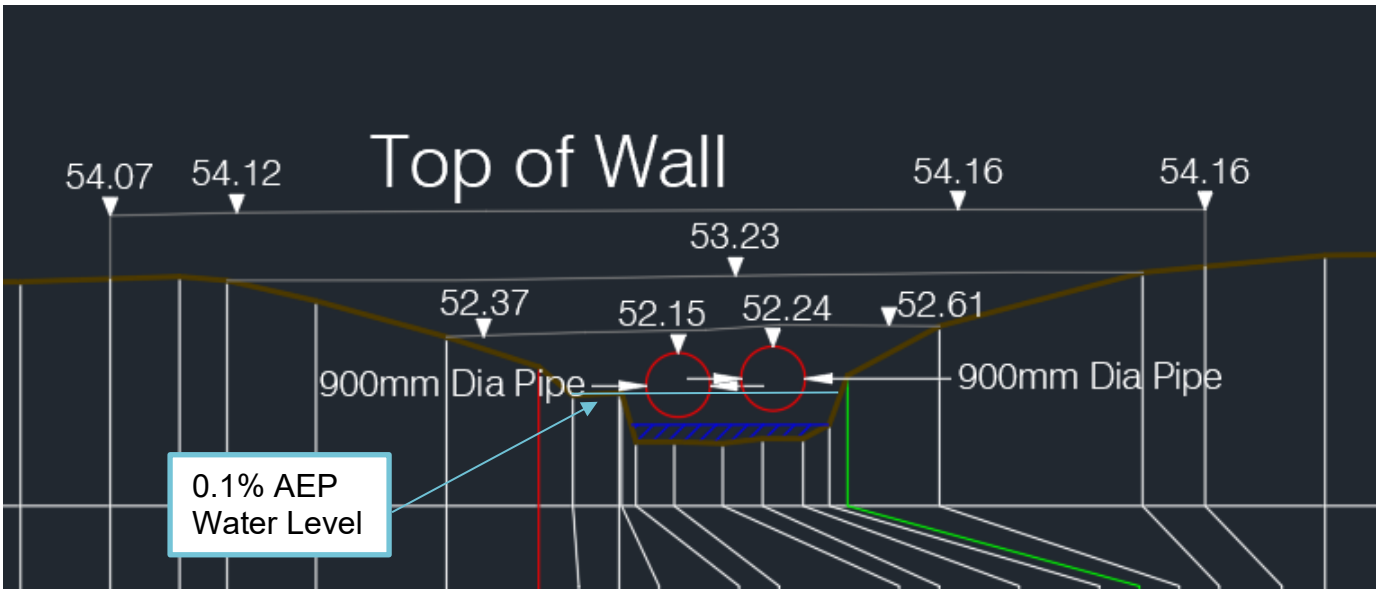


Figure: 7-8: 09MEAT00131J

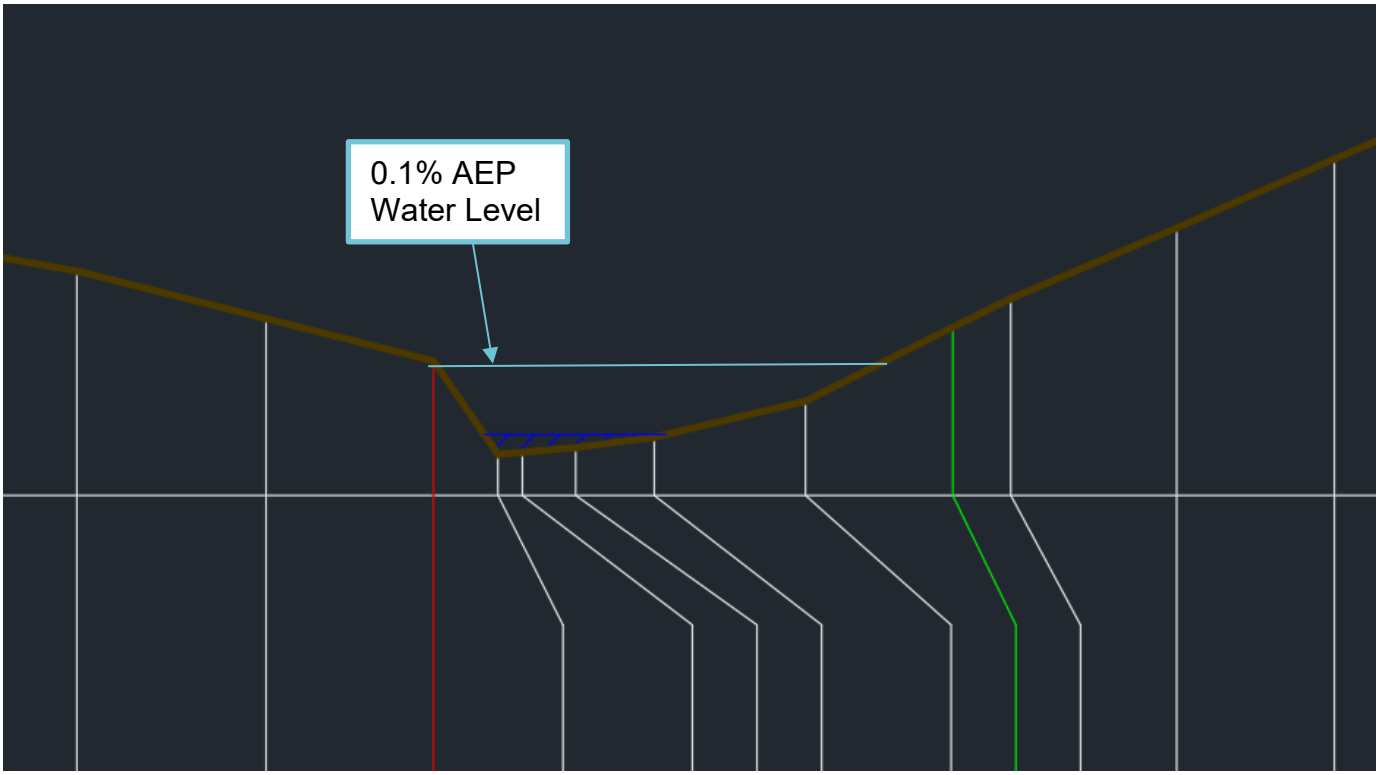


Figure: 7-9: 09MEAT00129

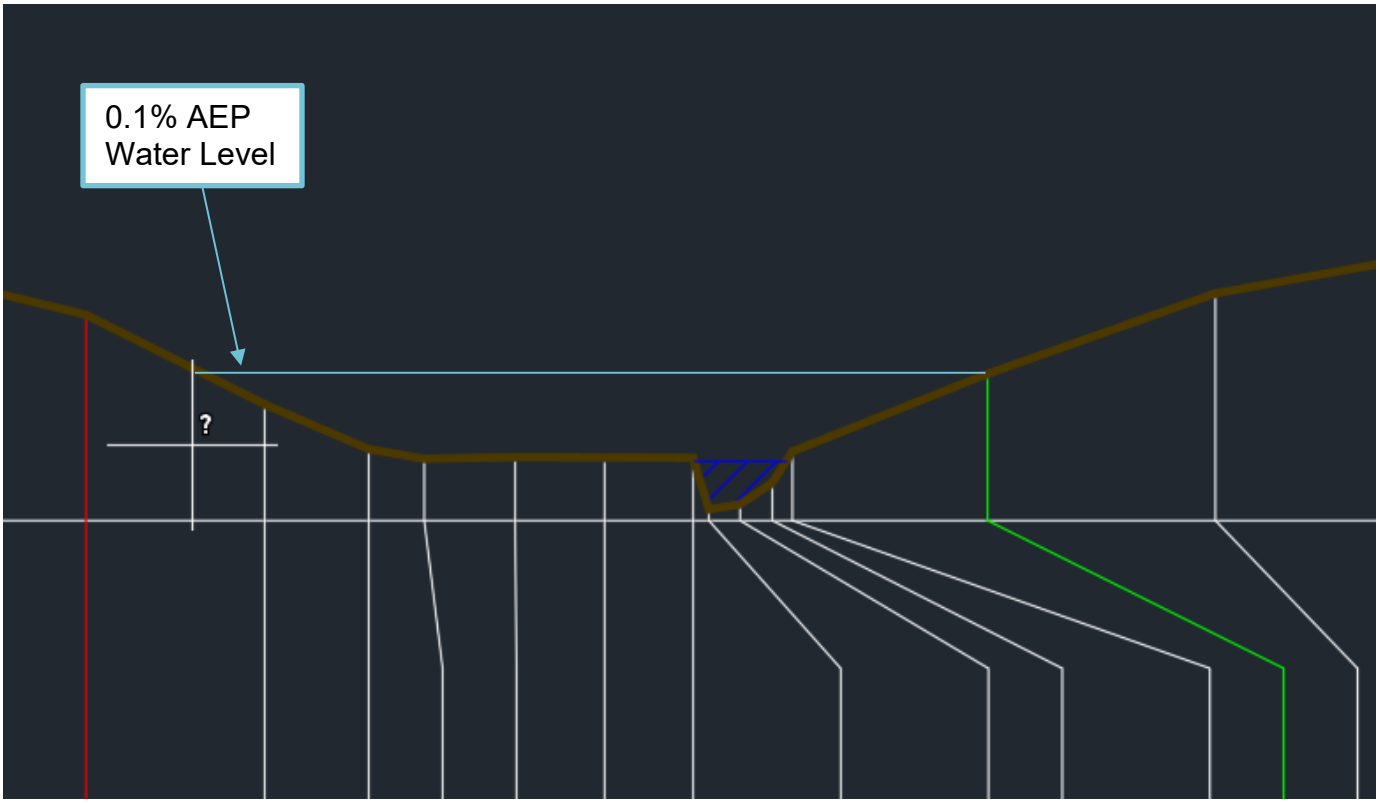


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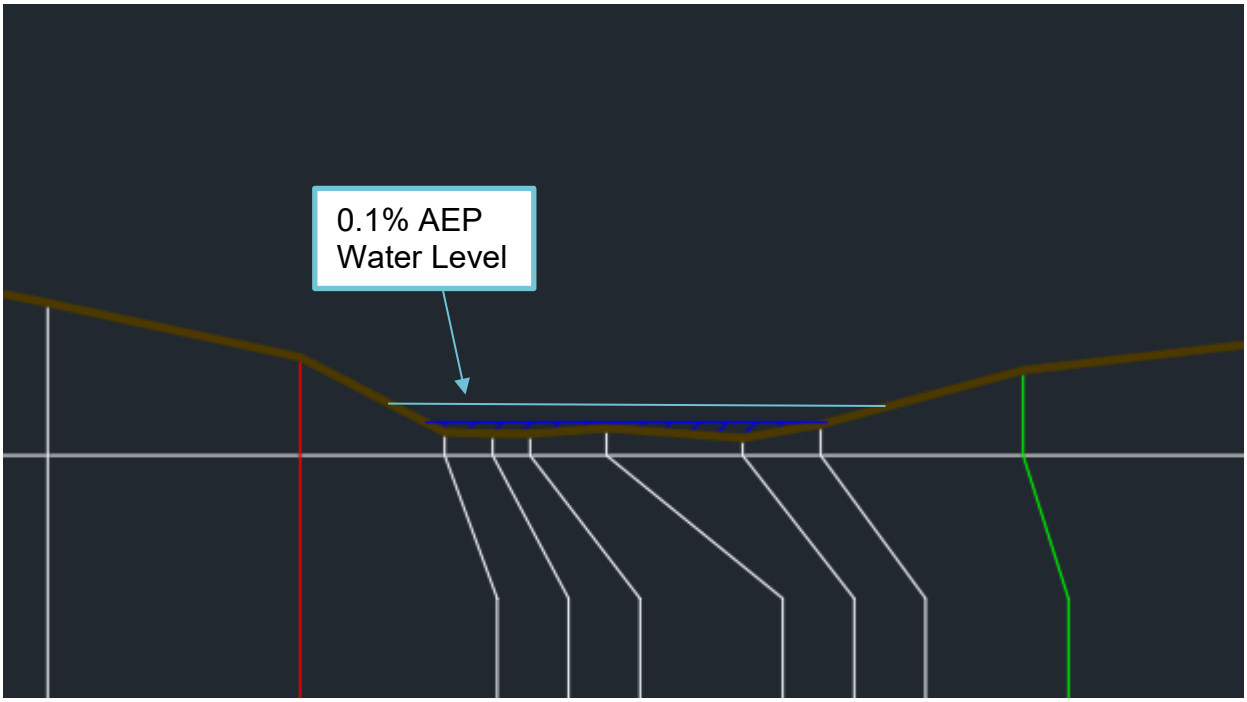


Figure: 7-11: 09MEAT0018W

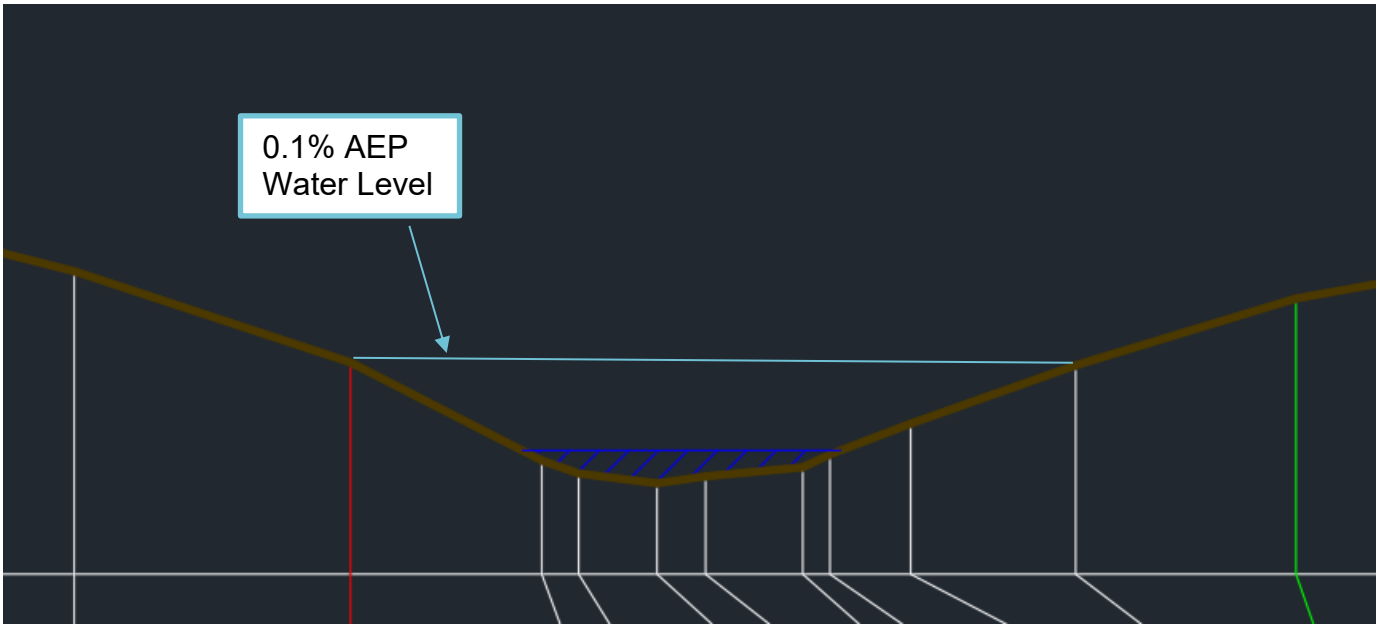


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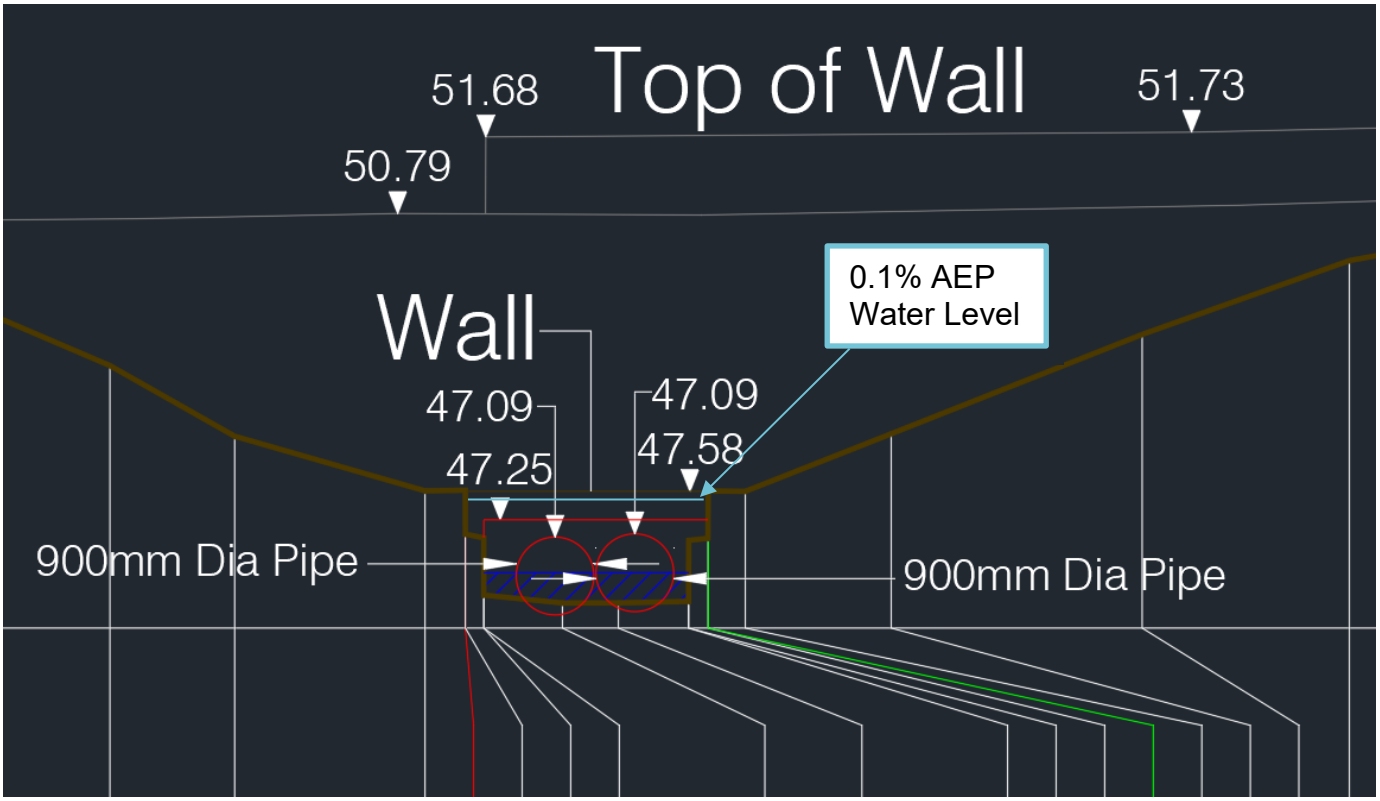


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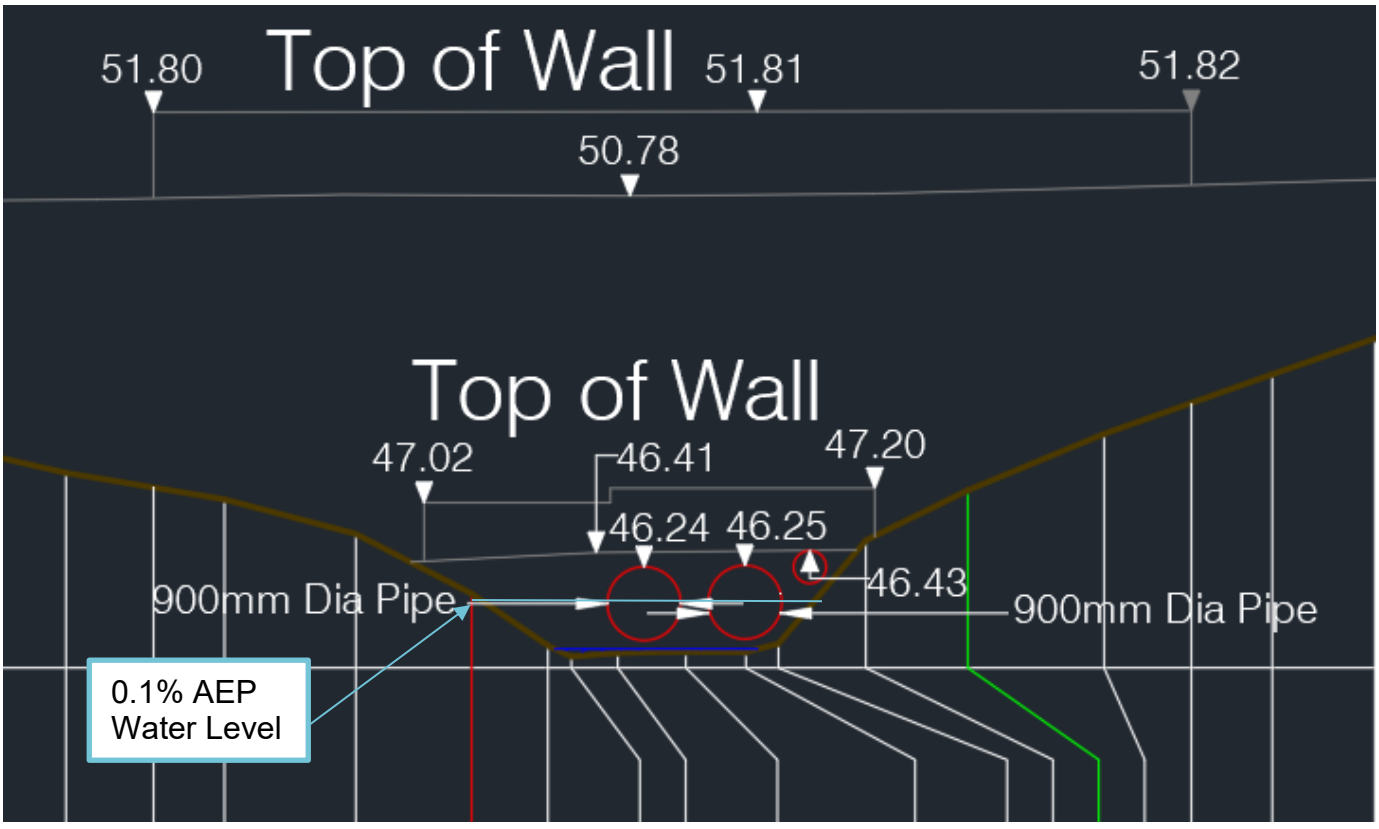


Figure: 7-14: 09MEAT00106E

D Structure Long Sections

D.1 09MEAT00141D

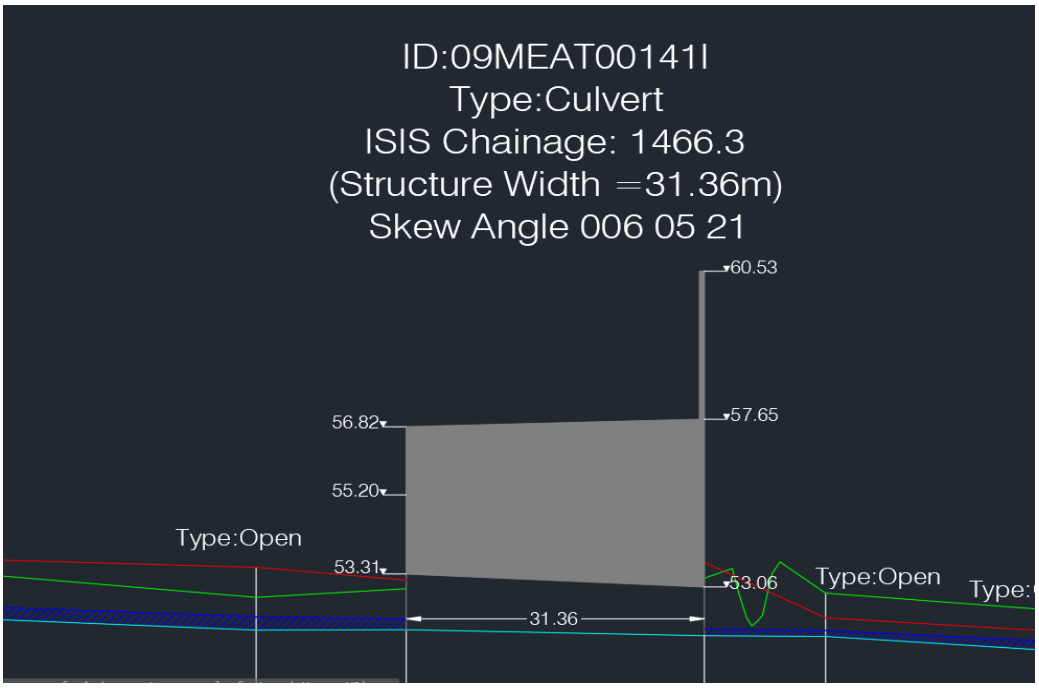


Figure 7-15: 09MEAT00141D Long Section



Figure 7-16: 09MEAT00141D (Upstream)



Figure 7-17: 09MEAT00141D Downstream

D.2 09MEAT00133I

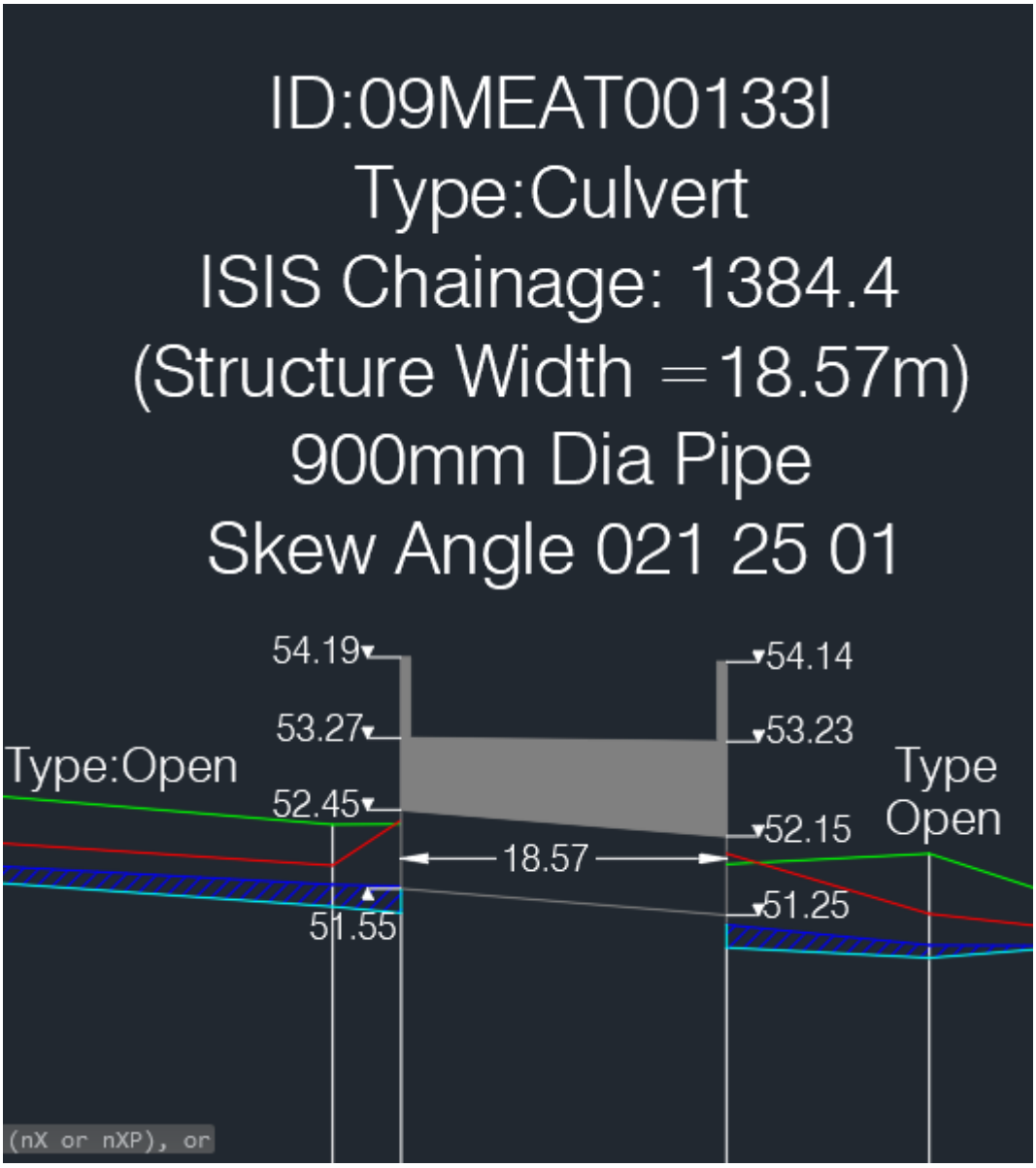


Figure 7-18: 09MEAT00133I Long Section



Figure 7-19: 09MEAT00133I (Upstream)



Figure 7-20: 09MEAT00133I (Downstream)



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