

Flood Risk Assessment

Cavan Regional Sports Campus

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CONTENTS

1	INTRODUCTION	1
1.1	TERMS OF REFERENCE	1
1.2	STATEMENT OF AUTHORITY	1
1.3	PURPOSE.....	1
1.4	APPROACH TO THE ASSESSMENT	1
1.4.1	<i>Method of Assessment</i>	1
1.4.2	<i>Hydraulic Model Status</i>	1
1.4.3	<i>Planning Guidelines</i>	2
2	SITE AND DEVELOPMENT DETAILS.....	3
2.1	SITE LOCATION	3
2.2	SITE DESCRIPTION	4
2.2.1	<i>Existing Land Use</i>	4
2.2.2	<i>Topography</i>	4
2.2.3	<i>Watercourses</i>	4
2.2.4	<i>Ground Conditions</i>	4
2.3	DEVELOPMENT PROPOSALS	5
2.4	VULNERABILITY CLASSIFICATION.....	7
3	BACKGROUND INFORMATION REVIEW	8
3.1	CAVAN COUNTY COUNCIL.....	8
3.1.1	<i>Cavan County Development Plan 2022-2028</i>	8
3.1.2	<i>Application Specific Consultation</i>	8
3.2	OFFICE OF PUBLIC WORKS DATA	8
3.2.1	<i>OPW Past Flood Events</i>	8
3.2.2	<i>Preliminary Flood Risk Assessment</i>	9
3.2.3	<i>Catchment Flood Risk Assessment and Management</i>	10
3.2.4	<i>Arterial Drainage Scheme</i>	10
3.3	INTERNET BACKGROUND SEARCH	11
3.4	GROUNDWATER FLOODING - GSI	11
4	ASSESSMENT OF FLOOD MECHANISMS	12
4.1	INITIAL ASSESSMENT	12
4.2	EXISTING (PRE-DEVELOPMENT) FLUVIAL FLOODING	13
4.2.1	<i>Preamble</i>	13
4.2.2	<i>Flood Zoning / Existing Flood Risk (Present Day)</i>	13
4.3	PROPOSED (POST-DEVELOPMENT) FLUVIAL FLOODING.....	14
4.3.1	<i>Preamble</i>	14
4.3.2	<i>Proposed Flood Risk – Present Day Hydrology</i>	15
4.3.3	<i>Proposed Flood Risk – Effect of development</i>	17
4.3.4	<i>Proposed Flood Risk – Climate Change</i>	19
4.3.5	<i>Proposed Flood Risk –Culvert Blockage</i>	21
4.3.6	<i>Mitigation</i>	24
4.4	SURFACE WATER.....	25
4.4.1	<i>Pluvial Runoff from Site</i>	25
5	SUMMARY & SCHEDULE OF MITIGATION	27
5.1	SUMMARY OF FINDINGS	27
5.2	SUMMARY OF DESIGN & MITIGATION MEASURES	27
5.3	CDP POLICY SUMMARY & JUSTIFICATION TEST	3
5.3.1	<i>Justification Test</i>	5

LIST OF TABLES

TABLE 2-1: VULNERABILITY CLASSIFICATION	7
TABLE 4-1: POSSIBLE FLOODING MECHANISMS	12
TABLE 4-2: MODELLED FLOOD LEVELS – EXISTING SCENARIO PRESENT DAY	14
TABLE 4-3: FLOOD LEVELS & DEPTHS AT RECEPTORS – PROPOSED SCENARIO / PRESENT DAY	ERROR! BOOKMARK NOT DEFINED.
TABLE 4-4: FLOOD LEVELS & DEPTHS AT RECEPTORS – PROPOSED SCENARIO / CLIMATE CHANGE	21
TABLE 4-5: CULVERT BLOCKAGE ASSESSMENT	22
TABLE 4-6: FLOOD LEVELS & DEPTHS AT RECEPTORS – PROPOSED SCENARIO / CULVERT BLOCKAGE	24
TABLE 5-1: SCHEDULE OF MITIGATION	0
TABLE 5-2: COUNTY DEVELOPMENT PLAN – FLOOD RISK POLICY COMMENTARY	3
TABLE 5-3: JUSTIFICATION TEST FOR DEVELOPMENT MANAGEMENT	5

LIST OF FIGURES

FIGURE 2-1 SITE LOCATION	3
FIGURE 2-2: SITE BOUNDARY AND WATERCOURSES	3
FIGURE 2-3: TOPOGRAPHY	4
FIGURE 2-4: SUPERFICIAL GEOLOGY	5
FIGURE 2-5: BEDROCK GEOLOGY	5
FIGURE 2-6: PROPOSED LAND USE	6
FIGURE 3-1: OPW PFRA INDICATIVE FLOOD EXTENTS	9
FIGURE 3-2: CFRAM FLUVIAL FLOOD MAP	10
FIGURE 3-3: CAVAN DRAINAGE DISTRICT BENEFITED LANDS	11
FIGURE 4-1: FLOOD ZONE MAP – EXISTING SCENARIO PRESENT DAY	13
FIGURE 4-2: PROPOSED LAYOUT OVERLAID WITH FLOOD ZONES	15
FIGURE 4-3: PROPOSED 1% AEP FLOOD EXTENT BANDED BY DEPTH	16
FIGURE 4-4: PROPOSED 0.1% AEP FLOOD EXTENT BANDED BY DEPTH	17
FIGURE 4-5: EFFECT OF DEVELOPMENT-- 1% AEP FLOOD EXTENTS	18
FIGURE 4-6: EFFECT OF DEVELOPMENT – 0.1% AEP FLOOD EXTENTS	19
FIGURE 4-7: PROPOSED 1% AEP +CC FLOOD EXTENT BANDED BY DEPTH	20
FIGURE 4-8: PROPOSED 0.1% AEP +CC FLOOD EXTENT BANDED BY DEPTH	21
FIGURE 4-9: CULVERT LOCATIONS ON CAVAN RIVER	22
FIGURE 4-10: PROPOSED 1% AEP BLOCKAGE FLOOD EXTENT BANDED BY DEPTH	24

APPENDICES

APPENDIX A APPLICATION DRAWINGS
APPENDIX B OPW FLOOD MAPPING
APPENDIX C HYDRAULIC MODELLING
APPENDIX D HYDROLOGICAL CALCULATIONS
APPENDIX E FLOOD MAPS
APPENDIX F PRELIMINARY FLOOD MANAGEMENT PLAN

1 INTRODUCTION

1.1 Terms of Reference

This Flood Risk Assessment was commissioned by McAdam Design Limited to support a planning application for development known as Cavan Regional Sports Campus.

1.2 Statement of Authority

This report / assessment has been prepared and reviewed by qualified professionals with appropriate experience in the fields of flood risk, drainage, wastewater, and hydraulic modelling studies. The key staff members involved in this project are as follows:

- Duncan Chapman *BSc (Hons)* – Project Consultant with experience in flood risk assessment, hydrology, and hydraulic modelling.
- Paul Singleton *BEng (Hons) MSc CEng MIEI* – Associate and Chartered Engineer specialising in flood risk assessment, hydrology, drainage design and Sustainable Drainage Systems (SuDS); a recognised industry professional providing training courses on these topics to the public and private sectors in Ireland and the UK.
- Kyle Somerville *BEng (Hons) CEng MIEI* – Director and Chartered Engineer specializing in the fields of flood risk assessment, flood modelling, drainage, and surface water management design for public and private sectors.

1.3 Purpose

This report is intended to present a detailed site-specific FRA (SSFRA) to ensure all relevant issues related to flooding are addressed. This 'Stage 3' FRA will assess the adequacy of existing information and present analysis undertaken to supplement existing data.

The assessment will therefore determine potential sources of flooding at the site. This report will also determine flood zones relevant to planning policy guidelines specific to flood risk management planning and will provide a basis for appropriate design and mitigation measures to be considered as part of the proposed development.

1.4 Approach to the Assessment

1.4.1 [Method of Assessment](#)

Consideration has been given to the sources and extent of fluvial flooding at the site, as well as flooding from pluvial sources, overland flow, and ponding of localised rainfall at the site. A topographical survey of the site was also commissioned and undertaken by a third party. The survey data forms the basis of this assessment.

The method of assessment complies with the Source-Pathway-Receptor model, allowing for a spatial assessment of flood risk to people, properties, and the environment at the site. The assessment investigates the existing runoff characteristics and the potential impact the proposed development will have on pluvial / surface water runoff.

1.4.2 [Hydraulic Model Status](#)

For the purposes of this assessment, the primary stakeholders are the Office of Public Works (OPW) and Cavan County Council (CC). OPW and Cavan CC data forms the basis of this assessment.

The watercourses at the site have been modelled as part of the the CFRAM programme. The CFRAM hydraulic model Has been supplied by the local authority under licence. A truncated site-specific hydraulic model has been developed For the reaches affecting the site, based on CFRAM geometry and more recent high resolution geometry data on the site, and utilising CFRAM hydrology.

It is understood that a new hydrological and hydraulic analysis is ongoing in the Cavan town region as part of the Cavan Flood Relief Scheme, however that model data is not available at the time of submission.

The detailed site-specific model results summarised in this report are intended to supersede existing CFRAM flood maps / data and are considered fit for purpose for this assessment.

1.4.3 Planning Guidelines

The requirements for FRAs are generally as set out in the OPW's 'The Planning System and Flood Risk Management – Guidelines for Planning Authorities, Technical Appendix A' published by the OPW and Department of the Environment, Heritage and Local Government in November 2009 (hereafter referred to as the 'OPW Guidelines'). The OPW Guidelines are supplemented by 'Departmental Circular PL 2/2014', issued by the Department of Environment, Community and Local Government on 13th August 2014, which relates to the use of OPW flood mapping in assessing planning applications and provides clarifications of advice contained within the OPW Guidelines. Further guidance is also provided in the CIRIA Research Project 624 'Development and Flood Risk: Guidance for the Construction Industry'.

Planning guidelines applicable to the site are set out in the Cavan County Development Plan 2022-2028, specifically in the Strategic Flood Risk Assessment (SFRA) undertaken to inform the Development Plan.

The SFRA was prepared in accordance with the requirements of the OPW Guidelines and, as such, adopts an identical Flood Zone standard. Flood Zones are the extents of particular design floods events used to determine the suitability of development from a flood risk point of view. They are defined in both the SFRA and OPW Guidelines as follows:

- Flood Zone A – where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding).
- Flood Zone B – where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding).
- Flood Zone C – where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding).

The OPW Guidelines specify that Flood Zones are to be used to determine suitability of proposed developments and are to be derived from present day scenario hydrological estimates. Although Flood Zones are to be generated without the inclusion of climate change allowances, the OPW Guidelines state that developments should be designed to be resilient to the effects of climate changes.

2 SITE AND DEVELOPMENT DETAILS

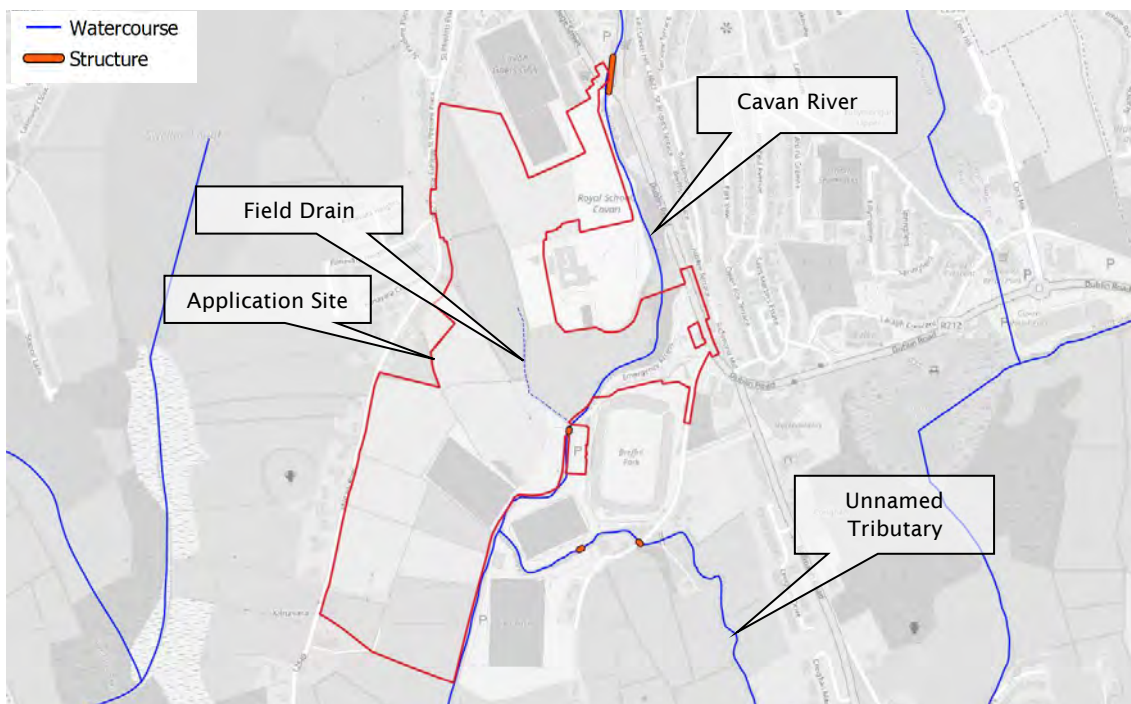
2.1 Site Location

The site is located at Cavan Regional Sports Campus, approximately 0.5 km south of Cavan Town. The site location and boundary are shown in Figure 2-1 and Figure 2-2, respectively.

Figure 2-1 Site Location



Figure 2-2: Site Boundary and Watercourses



2.2 Site Description

The application site area is 26.9ha. Characteristics relevant to assessment of flood risk are as follows.

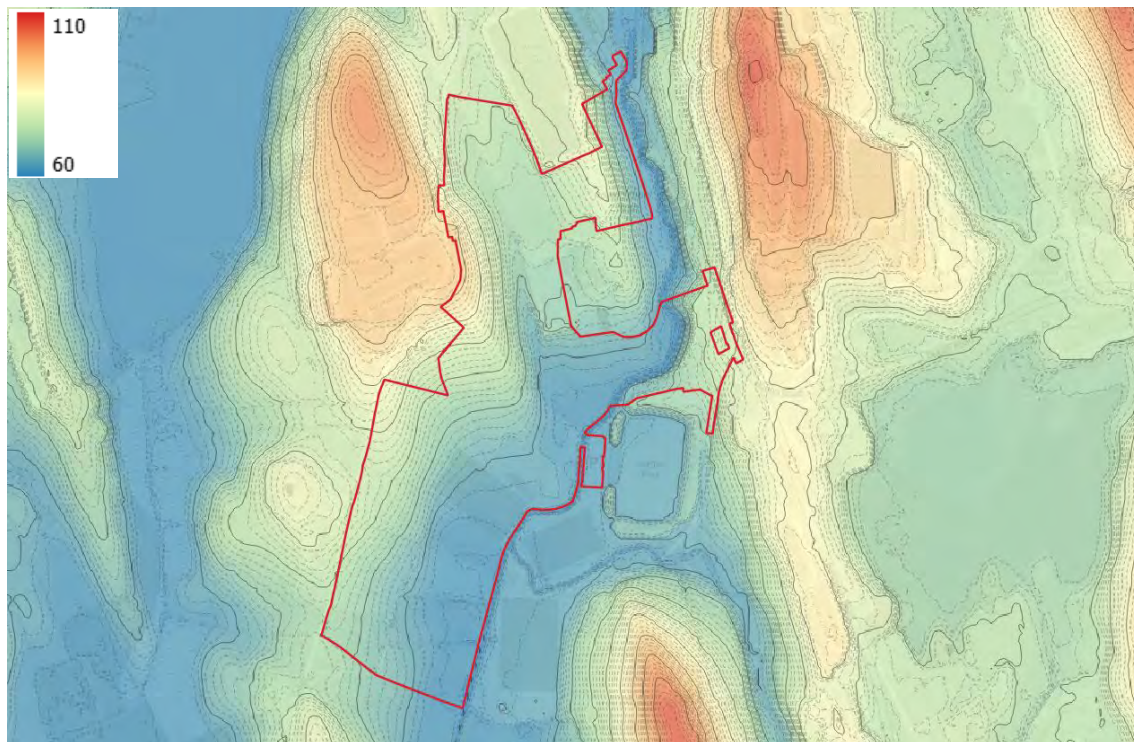
2.2.1 Existing Land Use

The application site mostly comprises undeveloped land to the west of Breffni Park.

2.2.2 Topography

Existing site levels from the ground-based topographical survey undertaken by a third party are shown in the topographical survey drawing included Appendix A. Site levels range from 83mOD to 61mOD and are shown on the Figure 2-3

Figure 2-3: Topography



2.2.3 Watercourses

Review of stakeholder datasets, OSI mapping and topographic surveys indicates the following:

- A watercourse known to the EPA as the Cavan River flows from south to north to the east of the site as shown in Figure 2-2.
- An unnamed watercourse, which is a tributary of the Cavan River, joins along the south eastern boundary of the site.
- A minor field drain serving drainage function primarily to the application site follows a field boundary in the centre of the site.

One existing access culvert spans the Cavan River in the middle of the site boundary. Other drainage within the site is characteristic of field boundary land drainage.

2.2.4 Ground Conditions

GSI quaternary sediments mapping indicates that the site is underlain by limestone derived Till in the west of the site while the east of the site is underlain by Alluvium and a bedrock outcrop. See Figure 2-4.

GSI 100K Bedrock mapping indicates that the site is underlain by the Cooldaragh Formation (Pale brown-grey flaggy, silty mudstone) in the west of the site and by the Red Island Formation (Greywacke, microconglomerate & argillite) in the northeast of the site. See Figure 2-5.

Figure 2-4: Superficial Geology

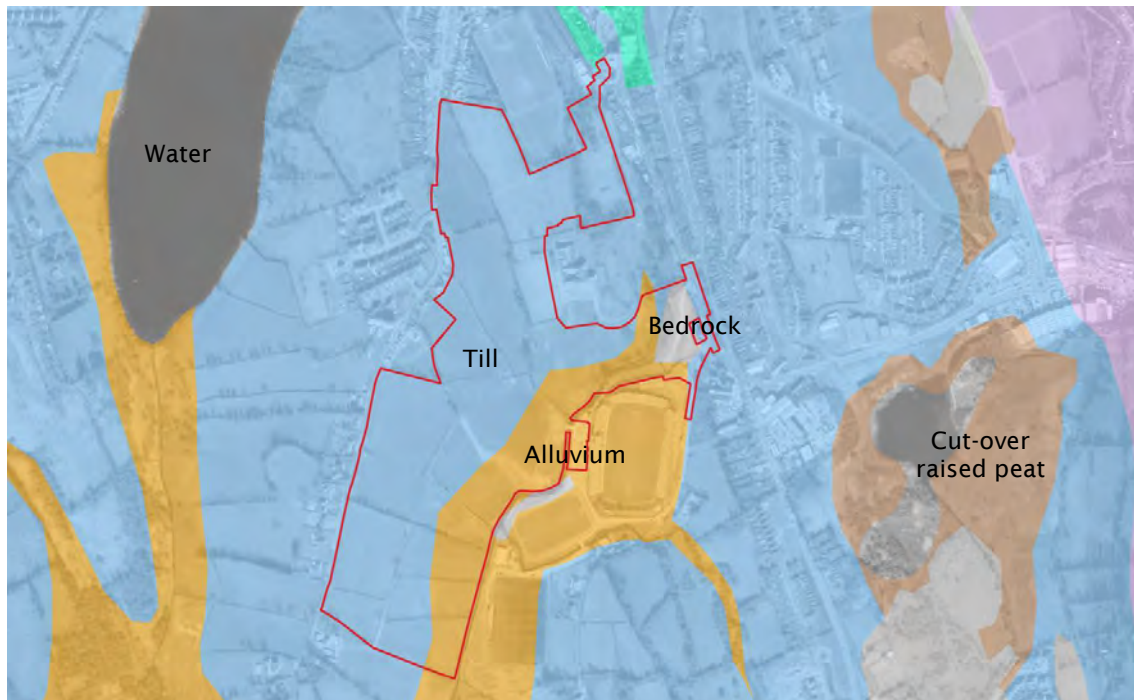
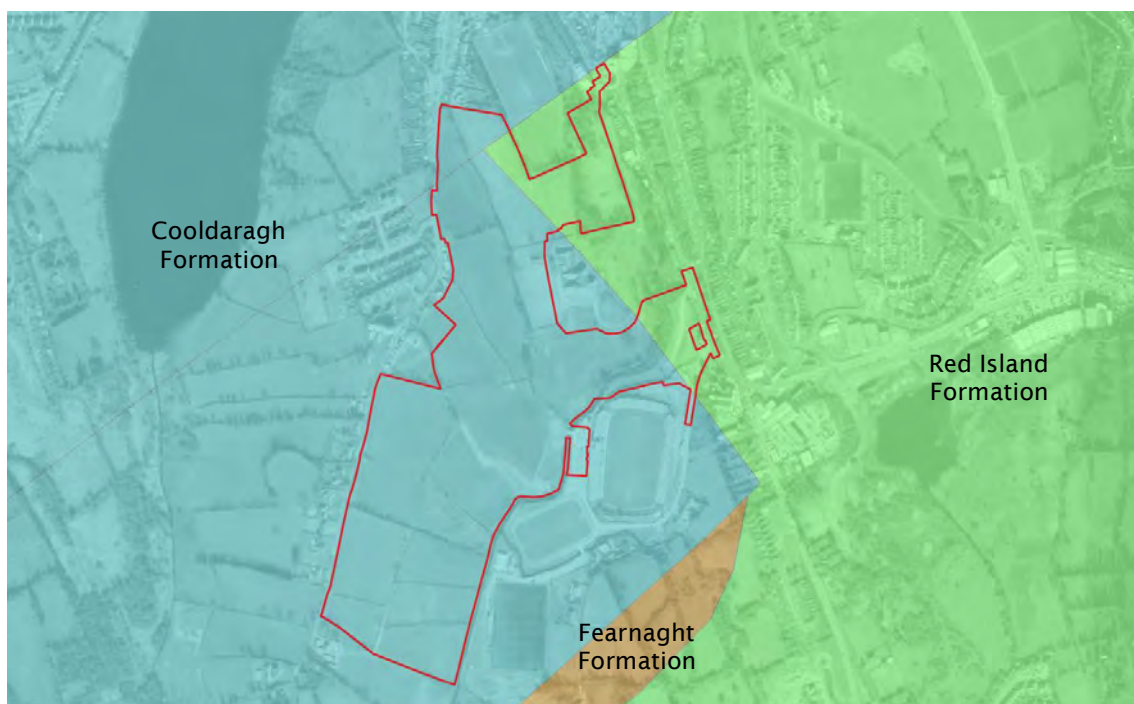


Figure 2-5: Bedrock Geology

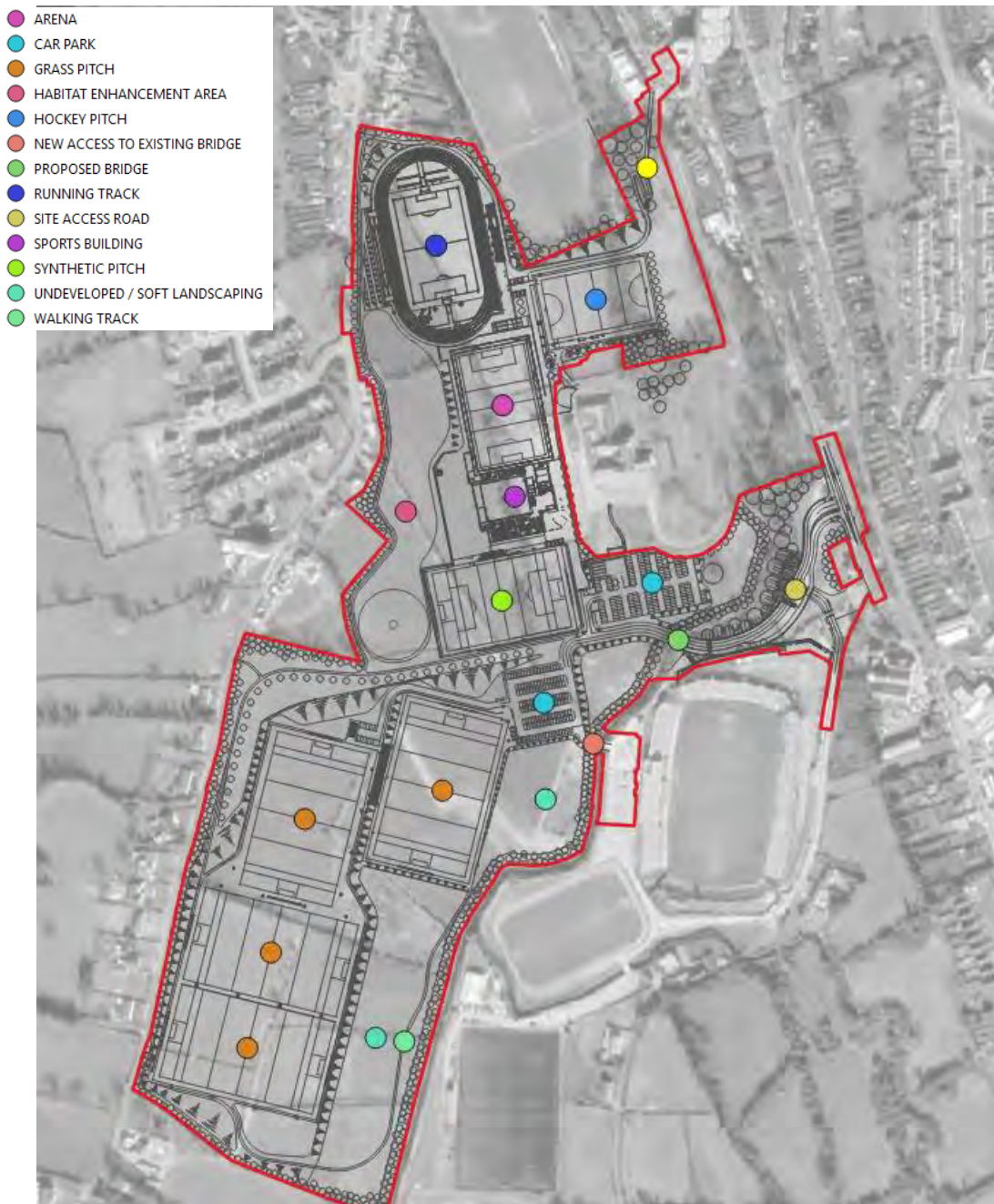


2.3 Development Proposals

The development description submitted with the planning application that this assessment is intended to support includes the following key elements:

- Development of a vehicular access bridge carrying a new internal access road over the River Cavan
- Development of grass playing fields / pitches on / adjacent to floodplains, including land re-grading
- Development of synthetic playing fields
- Development of a building ancillary to the use of land for open space and recreation.
- Development of car parking ancillary to the use of land for open space and recreation, where that parking is on /adjacent to floodplains.

Figure 2-6: Proposed Land Use



Relevant proposal drawings are included in Appendix A.

2.4 Vulnerability Classification

The overarching nature of the development is for outdoor recreational space which is classified as Water Compatible based on the classification criteria set out in the OPW Guidelines.. Given the nature of the various components and ancillary aspects of the proposed development, consideration has been vulnerability classification(s) of elements of the proposed development is shown in Table 2-1 in order to inform siting of aspects of the proposal.

Table 2-1: Vulnerability Classification

Part	Use	Classification
Recreational building	Commercial	Less Vulnerable
Car Parking / Internal access Road	Local Transport Infrastructure	Less Vulnerable
Synthetic pitches	Open Amenity Space	Less Vulnerable ¹
Green Areas / Grass sports Pitches	Open Amenity Space	Water Compatible

¹ Differentiation is volunteered in this assessment whereby synthetic pitches are not deemed water compatible, due to their being prone to irreparable damage in the event of flooding, and environmental consequences of washout of e.g. rubber infill particles from surfaces and potential effects to the water environment.

3 BACKGROUND INFORMATION REVIEW

As part of the data collection phase of this assessment, several available sources of information (generally as set out in the OPW Guidelines) were investigated to build an understanding of the potential risk of flooding to the site. This section outlines the key findings of the background information review.

3.1 Cavan County Council

3.1.1 [Cavan County Development Plan 2022-2028](#)

The Cavan County Development Plan 2022-2028 (incorporating the Cavan Town Local Area Plan) has been consulted as part of this assessment. Policies FRM01 through FRM15 have been screened to establish their relevance to the specific proposal. A summary of policy context and commentary is shown at the conclusion of this report. The Plan includes zoning at the site for Sport and Recreation.

3.1.1.1 [Strategic Flood Risk Assessment](#)

The SFRA undertaken to inform the Cavan County Development Plan 2022-2028 was reviewed in order to determine site specific information. Flood mapping and OPW arterial drainage data is as per OPW and GSI datasets described and mapped in subsequent sections of this report. Policies and objectives in the SFRA, relevant to this assessment, are as per those in the County Development Plan.

3.1.2 [Application Specific Consultation](#)

Consultation was sought from the Flooding Engineering section in the Council in order to agree parameters for the technical assessment, and in particular the assessment and mitigation of the potential effects of development on flooding elsewhere. Agreement was noted in relation to the following approach to this assessment:

- Build site-specific hydraulic model from CFRAM data, site survey and best available height data.
- Produce Flood Zone mapping by running present day 1% AEP and 0.1% AEP flows in the existing scenario model to establish the 'baseline' flood extents for the site.
- Create a proposed scenario version of the model with proposals (structures, ground level changes etc.) included to assess the impact of the development.
- Compare the pre- and post-development model scenarios to ascertain any off-site increase in flood risk.
- In light of OPW Guidelines, any offsite increase in 1% AEP / Flood Zone A flood risk requires Flood Compensatory Storage provided on a level-for-level basis.
- Similarly, any increase in 0.1% AEP / Flood Zone B flood risk that would affect a Highly Vulnerable receptor requires mitigation. Effects to Flood Zone B that do not affect a receptor (which is expected given the upstream land use at this site) will not require mitigation.
- Flood compensatory storage / mitigation to be incorporated in a 'final' version of the proposed development model to demonstrate effectiveness.
- Climate change and culvert blockage scenarios run with the 'final' proposals to ensure the proposals are resilient to both.

3.2 Office of Public Works Data

3.2.1 [OPW Past Flood Events](#)

OPW Past Flood Event Mapping (available from floodinfo.ie) provides a record of past flooding. One record was noted, east of the site boundary, and states that "the Cavan River overflows its banks every year after heavy rain".

No historic flood events within the site boundary were found.

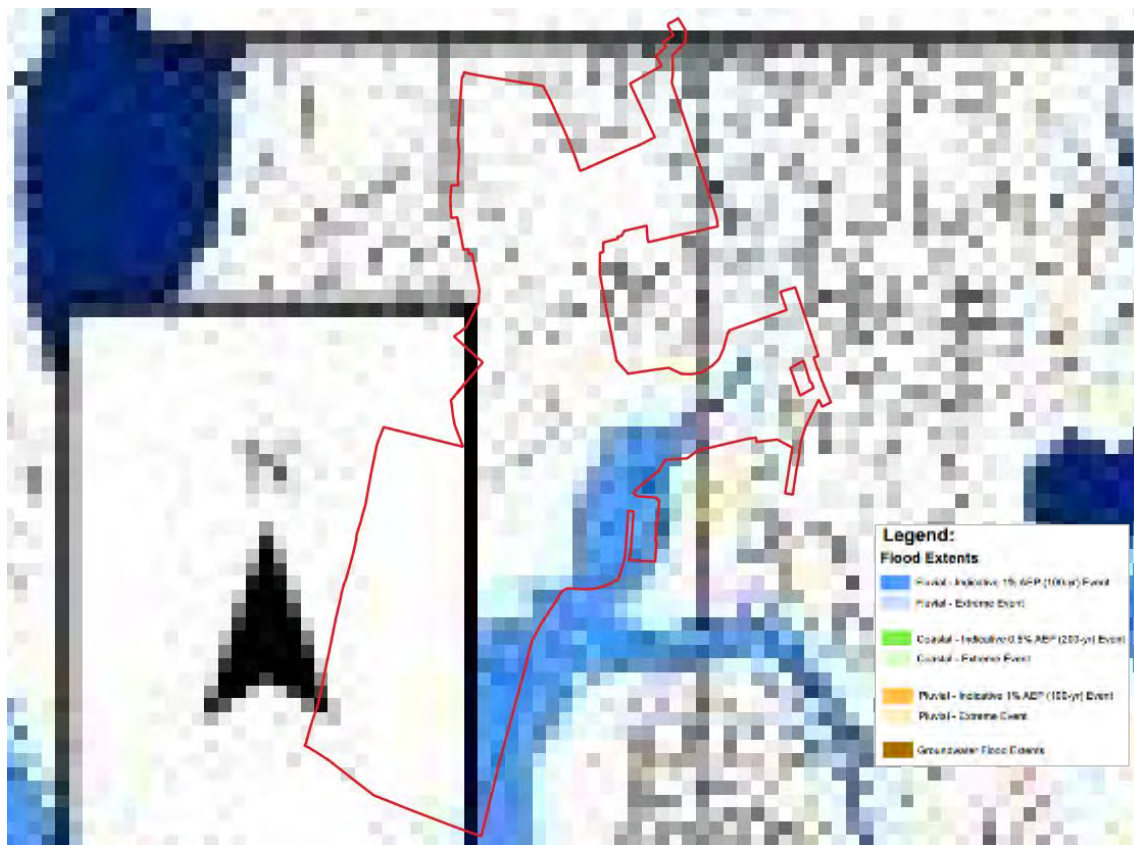
3.2.2 Preliminary Flood Risk Assessment

The first stage of the OPW's CFRAM Programme comprised the national PFRA, which included flood mapping for the entire country based on available or readily derivable information. The purpose of the PFRA was to identify areas that may be susceptible to flooding to inform further CFRAM stages. PFRA flood mapping is considered indicative only and is therefore unsuitable for site-specific assessment.

The PFRA is understood to be considered 'superseded' by the OPW but has been used to inform an assessment of pluvial flood risk in the absence of more recent data.

PFRA flood mapping is available for the site and surrounding area, as shown in Figure 3-1. A copy of the original PFRA flood map is included in Appendix B. The PFRA flood map indicates that portion of the site is affected by fluvial flooding. The site is not indicated to be at risk from pluvial (surface water) flooding or groundwater flooding.

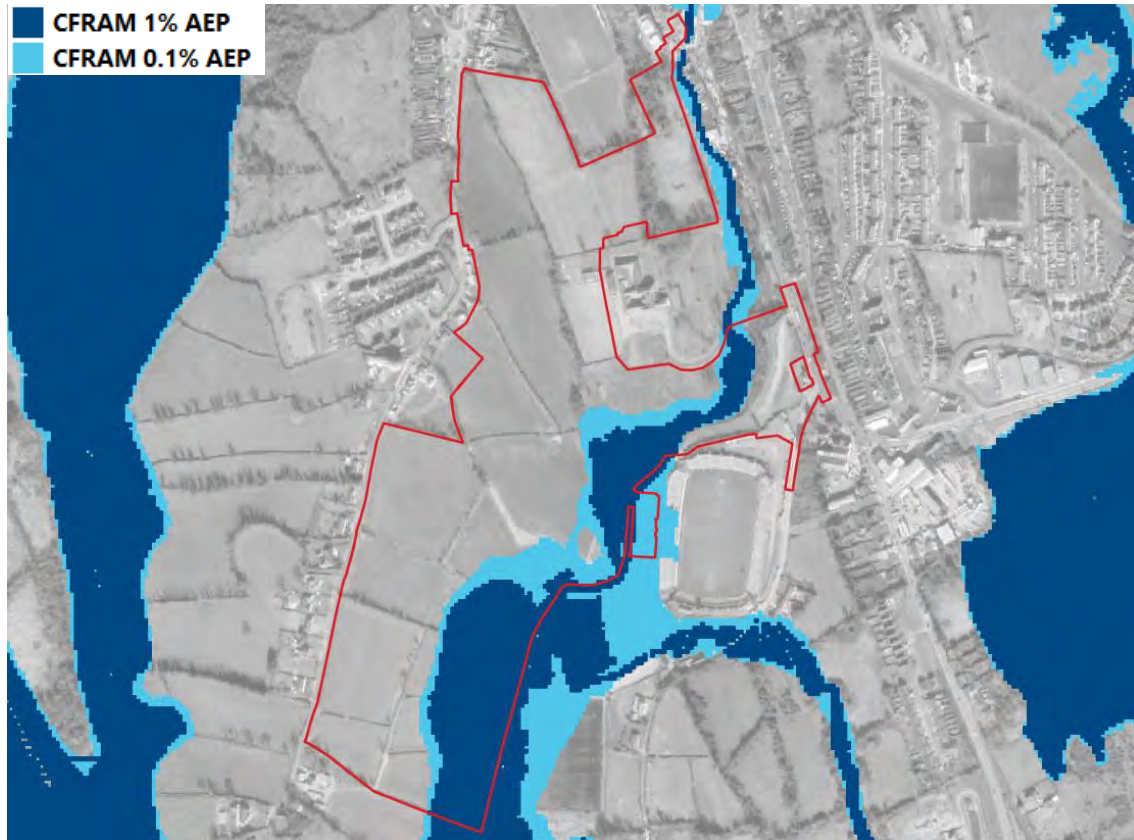
Figure 3-1: OPW PFRA Indicative Flood Extents



3.2.3 Catchment Flood Risk Assessment and Management

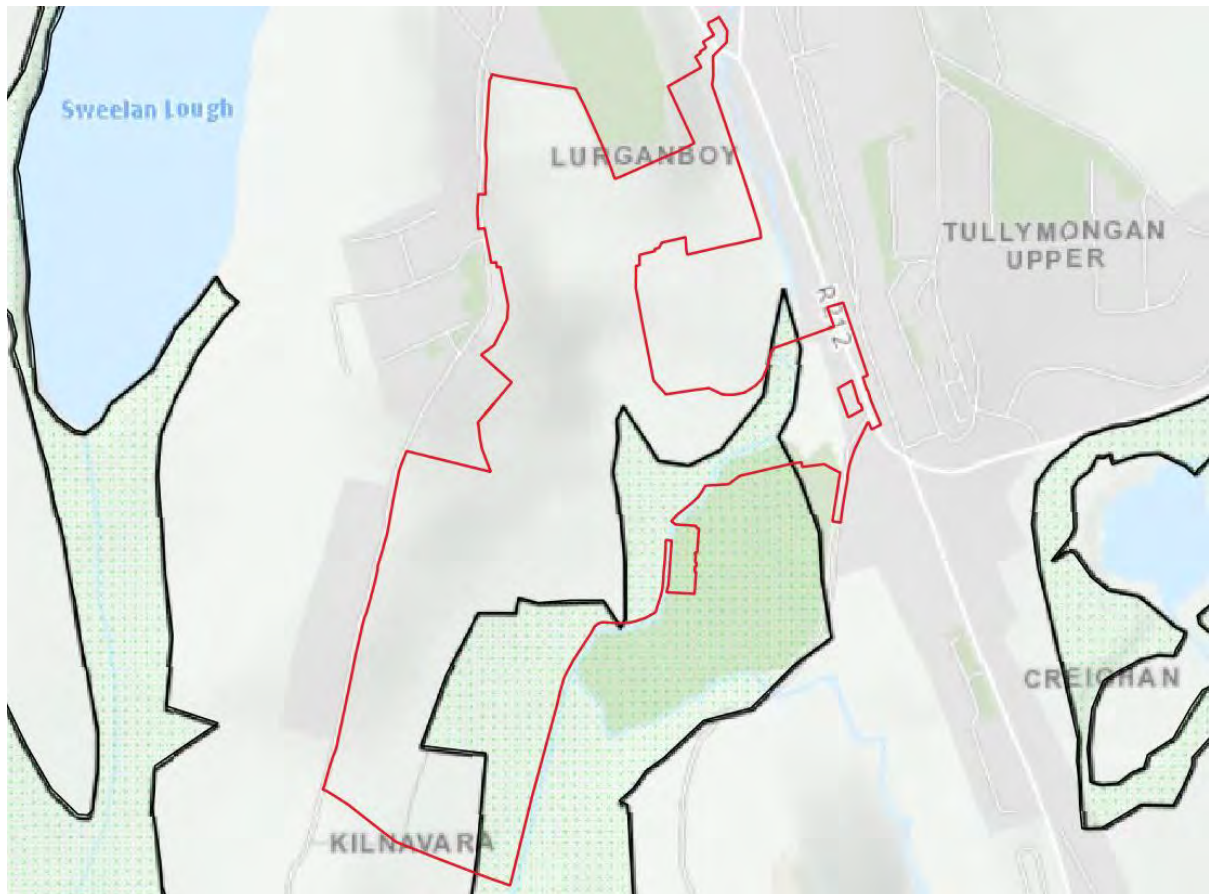
CFRAM flood maps were developed during the second stage of the CFRAM programme. The site and surrounding area were covered by the North Western-Neagh Bann CFRAM. CFRAM flood mapping indicates that the site may be affected by fluvial flooding in minor portions along the southern boundary, as shown in the extract in Figure 3-2. A copy of the CFRAM flood map from which this extract is taken is included in Appendix B.

Figure 3-2: CFRAM Fluvial Flood Map



3.2.4 Arterial Drainage Scheme

Arterial Drainage Schemes were carried out under the Arterial Drainage Act, 1945 to improve agricultural lands by ensuring open channels forming part of the schemes could retain the 33.3% AEP (1 in 3 year) flood event to reduce waterlogging of adjacent lands. Lands that were drained as part of a scheme are referred to as 'benefited lands.' OPW Drainage Mapping confirms that the lands are subject to Benefited Lands under the Erne River Drainage District.

Figure 3-3: Cavan Drainage District Benefited Lands

3.3 Internet Background Search

An internet / media search found no specific evidence of flooding at or in the vicinity of the site.

3.4 Groundwater Flooding - GSI

GSI groundwater flood mapping shows no groundwater flooding on or within the vicinity of the site.

4 ASSESSMENT OF FLOOD MECHANISMS

Development control procedures advise against inappropriate development in areas that are at risk of flooding and aim to prevent new development that increases flood risk elsewhere. This section aims to determine flood hazards to people, property, and the environment at the site and to subsequently assess the site and development proposals in accordance with the framework set out in the OPW Guidelines.

4.1 Initial Assessment

Table 4-1 presents a screening assessment of the site for potential flooding mechanisms requiring further detailed assessment. It is based on the background information review and consultations.

Table 4-1: Possible Flooding Mechanisms

Source / Pathway		Significant?	Reason
Fluvial Flooding	Floodplain	Yes	OPW flood mapping indicates that the site is affected by fluvial flooding.
	Culvert Blockage	Yes	The Cavan River is culverted across its reach adjacent to the site and at the downstream extent of the site.
Coastal Flooding		No	N/A
Urban Drainage		No	No indication of urban drainage flooding / sewer incapacity was found in an initial evidence search. Existing on site and existing upgradient land use is largely undeveloped.
Surface Water Flooding		No	OPW data / past flood events do not indicate that the site is at risk of surface water flooding. The fluvial flood model incorporates assessment of runoff from the surrounding catchment.
Surface Water Discharge		Yes	Any development has the potential to increase the amount of impermeable area at a site and thereby increase the rate and volume of surface water runoff from the site.
Groundwater Flooding		No	OPW and GSI flood mapping indicates that the site is not affected by groundwater flooding. Due to the topography of the site, there are no areas that would cause impoundment of groundwater.
Artificial Sources / Reservoirs / Canals		No	A screening assessment based on OSI mapping indicates that there are no artificial sources such as reservoirs or canals in close proximity to or that drain towards the site.

Flood mechanisms screened as being significant or possibly significant and requiring further assessment have been assessed in detail and are discussed in the following sections.

Mitigation of flood hazards, where required, is detailed in Section 5.3.

4.2 Existing (Pre-Development) Fluvial Flooding

4.2.1 Preamble

A detailed site-specific hydraulic model was built for the Cavan River and the unnamed watercourse using a linked 1D-2D approach in Innowyze InfoWorks ICM. This is intended to supersede the CFRAM flood model as it uses higher resolution and more up to date site-specific topographic survey.

The modelling methodology used is consistent with and exceeds detailed CFRAM model standards. Details on the methodology are provided in Appendix C.

4.2.2 Flood Zoning / Existing Flood Risk (Present Day)

Floodwater from the 1% AEP (Flood Zone A) and 0.1% AEP (Flood Zone B) events are predicted to inundate part of the site as shown in an extract from the existing scenario, present day Flood Zone map in Figure 4-1. The full Flood Zone map is provided in Appendix E.

Table 4-2 shows flood levels for key return periods within the site boundary as determined from the linked 1D-2D model of the Cavan River and hydraulic structures crossing it.

Figure 4-1: Flood Zone Map – Existing Scenario Present Day

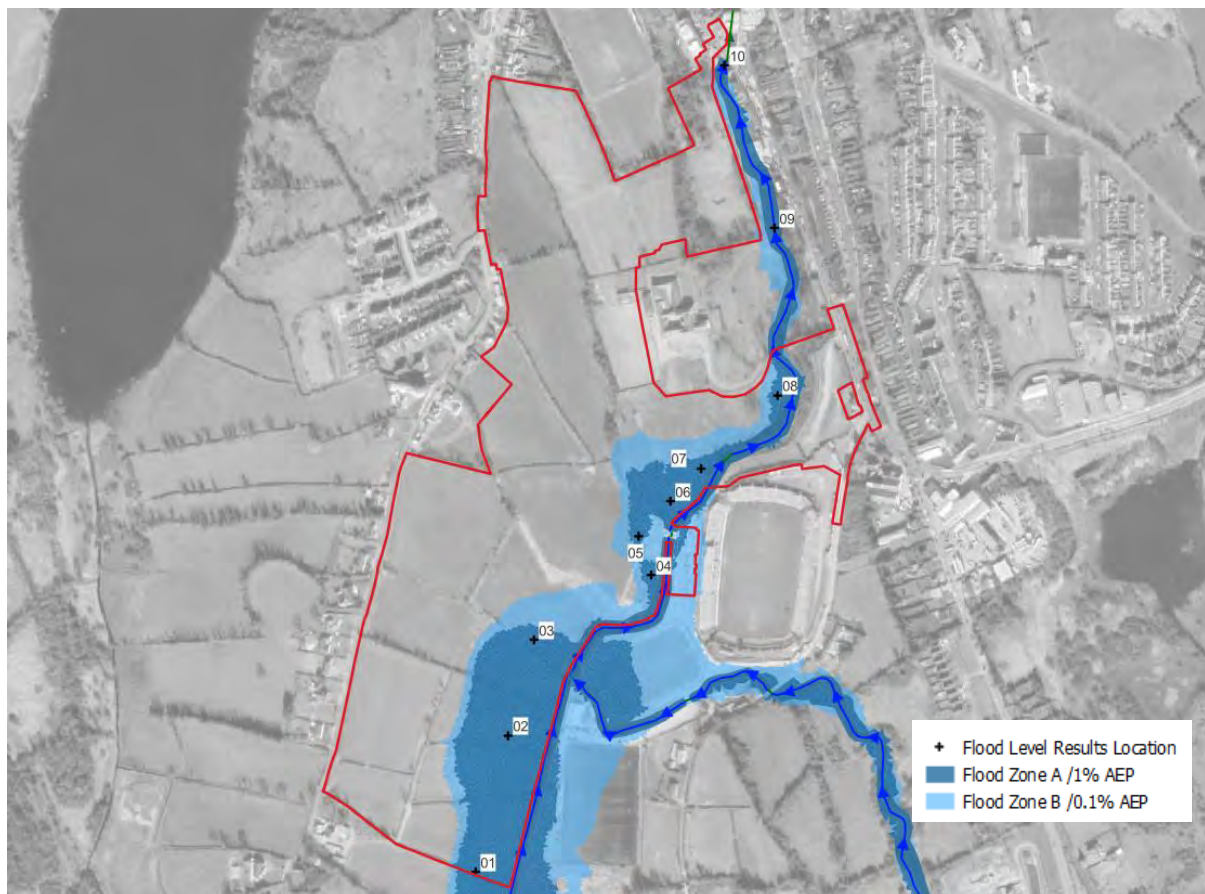


Table 4-2: Modelled Flood Levels – Existing Scenario Present Day

Node Reference	Location	Flood Zone A / 1% AEP Flood Level (mOD)	Flood Zone B / 0.1% AEP Flood Level (mOD)
01	Upstream extent of site	63.35	64.19
02	Adj. Proposed Southern Grass Pitches	63.35	64.17
03	Adj. Proposed Northern Grass Pitches	63.35	64.17
04	Upstream of Ex. Bridge	63.24	64.12
05	Adj. Southern Proposed Car Park	63.10	64.07
06	Downstream of Ex. Bridge	63.10	64.07
07	Adj. Northern Proposed Car Park	63.09	64.09
08	Adj. Northern Proposed Car Park	62.99	63.99
09	Adj. Proposed Hockey Pitch	62.63	63.73
10	Downstream extent of site / Adj pedestrian entrance	61.84	63.46

4.3 Proposed (Post-Development) Fluvial Flooding

4.3.1 Preamble

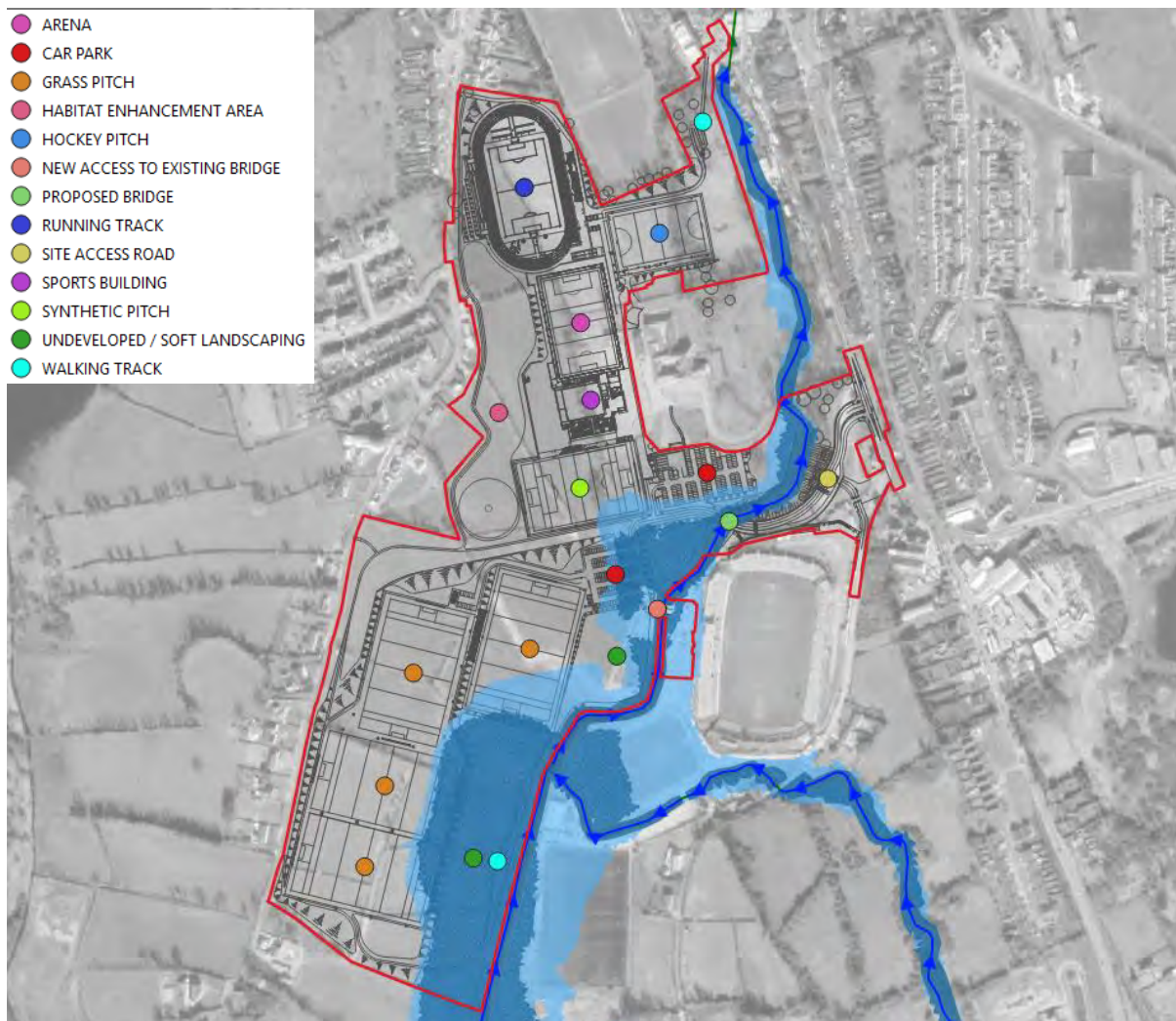
Proposals for the site have been developed on the basis of the Flood Zone Map in line with the OPW Guidelines and Cavan CC requirements. The vulnerability classification of the proposed development permits development in Flood Zone A and B per the Sequential approach, subject to a flood risk assessment.

The proposed development has therefore been assessed as a scenario within the hydraulic model, in order to determine flood risk to the development, and to assess flood risk elsewhere as a consequence of the development. The proposed development has been developed in conjunction with the flood risk assessment and flood modelling process such that the effect of development on flooding elsewhere is minimised.

Figure 4-2 presents the proposed layout overlain with the ‘existing scenario’ Flood Zones (i.e. not the floodplain extents with the impact of the proposals included). While designed to minimise impact of the existing floodplain, the watercourse crossing, and associated site access is inevitably sited over and within Flood Zone A and Flood Zone B. However, all proposed built development (including toilet block and sports building) is located in Flood Zone C

The following report sections assess flood risk to the development as proposed and determine the effect of the development proposal on flood risk elsewhere.

Figure 4-2: Proposed Layout overlaid with Flood Zones



4.3.2 Proposed Flood Risk – Present Day Hydrology

Figure 4-3 and Figure 4-4 shows the present-day flood of the site for 1% AEP and 0.1% AEP.

As shown in Figure 4-3 (1% AEP flood) flooding is limited to undeveloped area where soft landscaping is proposed, and a proposed walking trail east of the grass pitches. The majority of the area where the walking trail is proposed is flooded to a depth exceeding 1m.

As shown in Figure 4-4 (0.1% AEP flood) more extensive flooding affects the following:

- The existing bridge and access in the middle of the site is predicted to flood to a maximum depth of 1m.
- The northern-most Grass Pitch is predicted to partially flood to depth of 0.2m.
- The majority of the walking trail east of the grass pitches is predicted to flood to a depth exceeding 1.5m.

Full flood extents maps indicating flood elevations for the proposed scenario are provided in Appendix E.

Figure 4-3: Proposed 1% AEP Flood Extent Banded by Depth

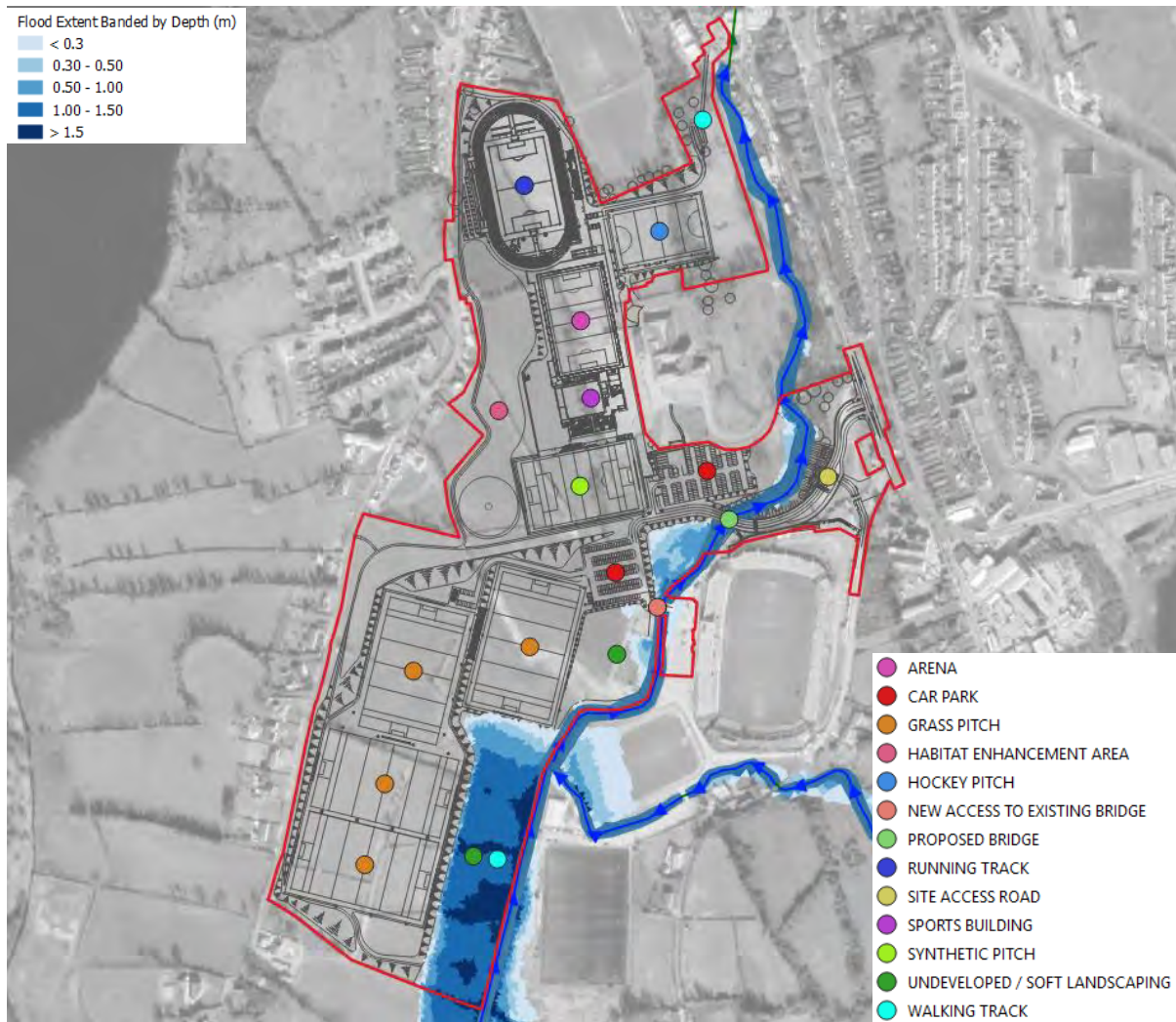
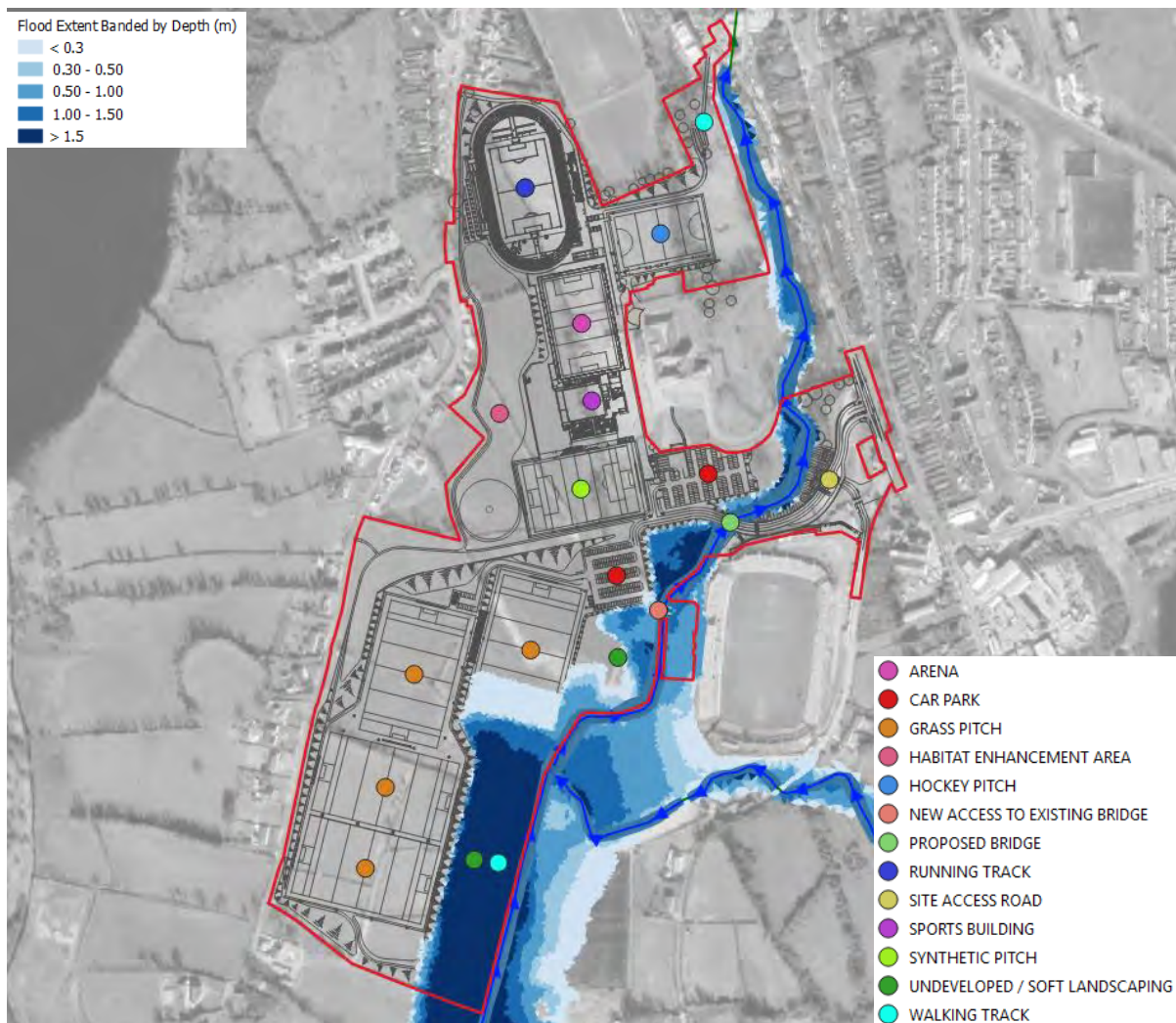


Figure 4-4: Proposed 0.1% AEP Flood Extent Banded by Depth



4.3.3 Proposed Flood Risk – Effect of development

Prior consultation with County Cavan in light of OPW Guidelines (refer to Section 3.1.2) confirmed the requirements for assessing the effect of the development.

- Flood Zone A /1% AEP: any offsite increase to flood levels requires mitigation (nominally Flood Compensatory Storage provided on a level-for-level basis) such that there is no increased flooding offside for the 1% AEP flood..
- Flood Zone B /0.1% AEP any offsite increase that would affect a vulnerable receptor requires mitigation. Effects to Flood Zone B that do not affect a vulnerable receptor will not require mitigation.

Hydraulic model results are shown in the following figures and confirm the key findings:

- For Flood Zone A / 1% AEP flood – the analysis confirms that there no measurable change to flood levels offsite, refer to see Figure 4-5. No further mitigation is required.
- Flood Zone B / 0.1% AEP flood – the analysis indicates slight increases to flood levels upstream, reaching a maximum increase 0.07m/70mm to flood levels on third party lands. The effect is slight when compared to the existing depth of flooding on the land. No existing vulnerable receptors are affected where the land us undeveloped pasture. No new receptors are brought into an area at risk. Per OPW guidelines and prior consultation with Cavan County Council, no further mitigation is required.

Figure 4-5: Effect of Development-- 1% AEP Flood Extents

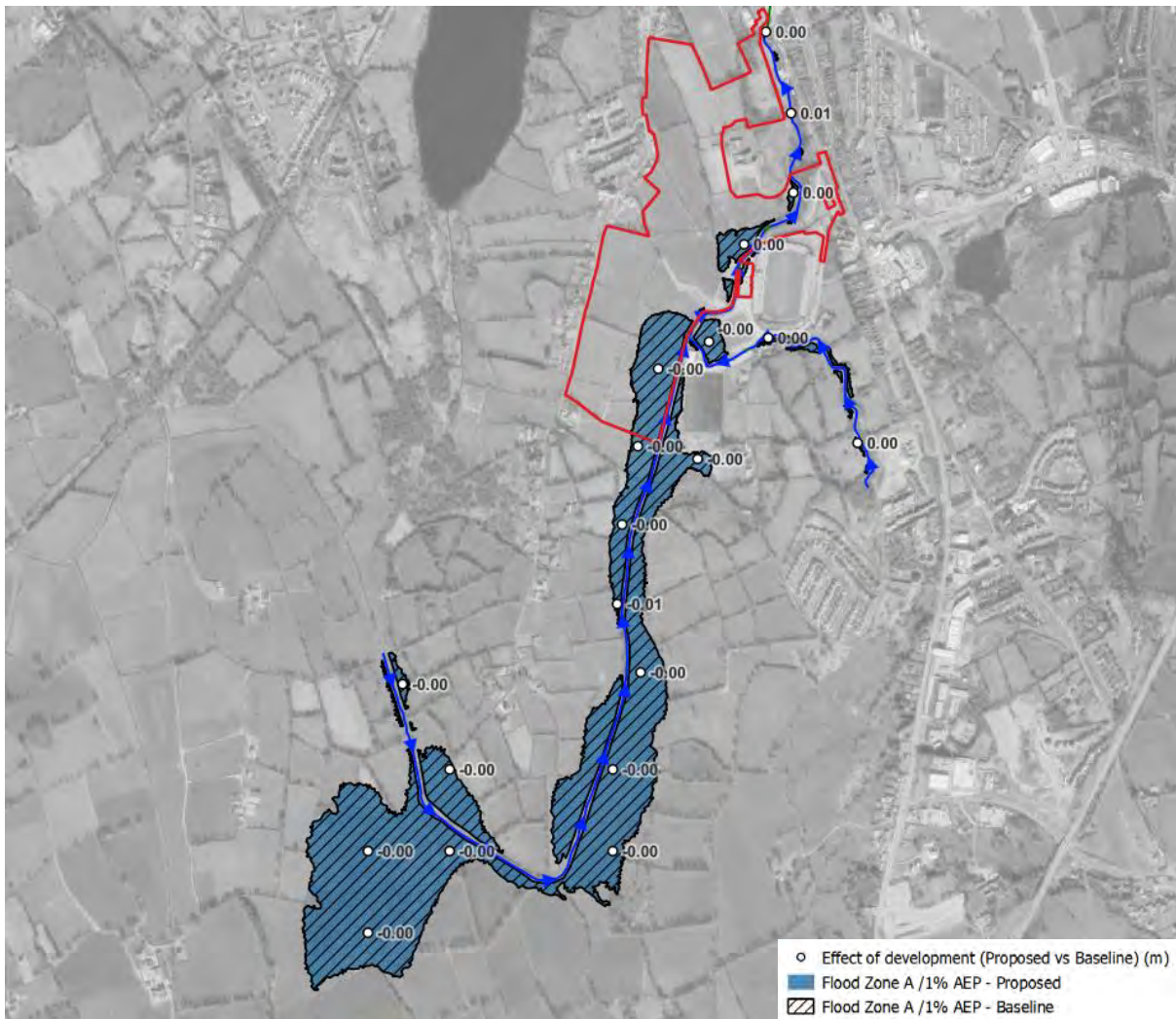
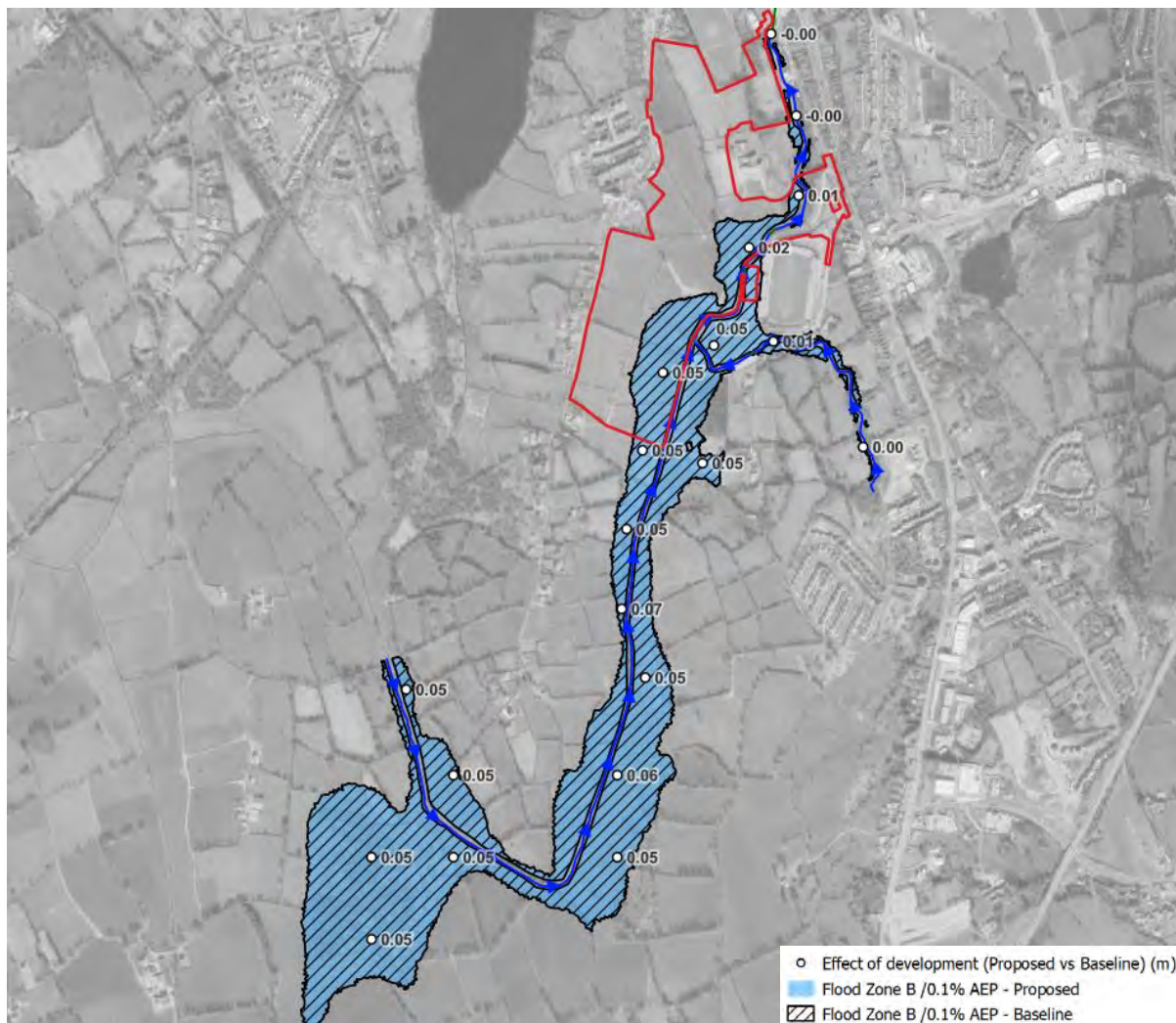


Figure 4-6: Effect of Development – 0.1% AEP Flood Extents



4.3.4 Proposed Flood Risk – Climate Change

The OPW Guidelines and the SFRA require that site-specific FRAs should consider increased flood risk to the proposed development under climate change (CC) scenarios. OPW guidance suggests using a Mid-Range Future Scenario (MRFS) to account for CC, representing a 20% increase in flood flows and / or 0.5 m increase in mean sea level.

An estimation of the effect of climate change on flooding at the site has been derived from the 1D-2D linked river model using a 20% increase in the present-day design flows coupled with an uplift on the downstream water level in line with existing methodologies (refer to Appendix C for full details).

Figure 4-7 shows predicted flooding for the 1% AEP MRFS climate change scenario. Climate change causes a maximum increase in flood level of 0.41 m with no new flow pathways activated. The flood hazard to affected receptors is summarised as follows:

- Shallow flooding (<0.3m) is predicted to the deck of the existing bridge where new access to the proposed development is proposed.
- The majority of the walking trail east of the grass pitches is predicted to flood to a depth exceeding 1.5m.

No other receptors are affected for the 1% AEP MRFS.

Figure 4-8 shows predicted flooding for the 0.1% AEP MRFS climate change scenario. Climate change causes a maximum increase in flood level of 1.27m and the activation of a new flow pathway leading to

flooding of the southern proposed carpark. The flood hazard to affected receptors is summarised as follows:

- Flooding >1.5m is predicted to the deck of the existing bridge where new access to the proposed development is proposed.
- The majority of the walking trail east of the grass pitches is predicted to flood to a depth exceeding 1.5m.
- The northern-most grass pitch is flooded over its whole area, with the majority of the pitch flooded to a depth of 1m or more.
- The southern proposed carpark is flooded to a depth of up to 1m.
- Marginal flooding up to 0.5m is predicted to the northern walking track / pedestrian access to the site.

Full flood extents maps indicating flood elevations for the proposed scenario are provided in Appendix E.

Figure 4-7: Proposed 1% AEP +CC Flood Extent Banded by Depth

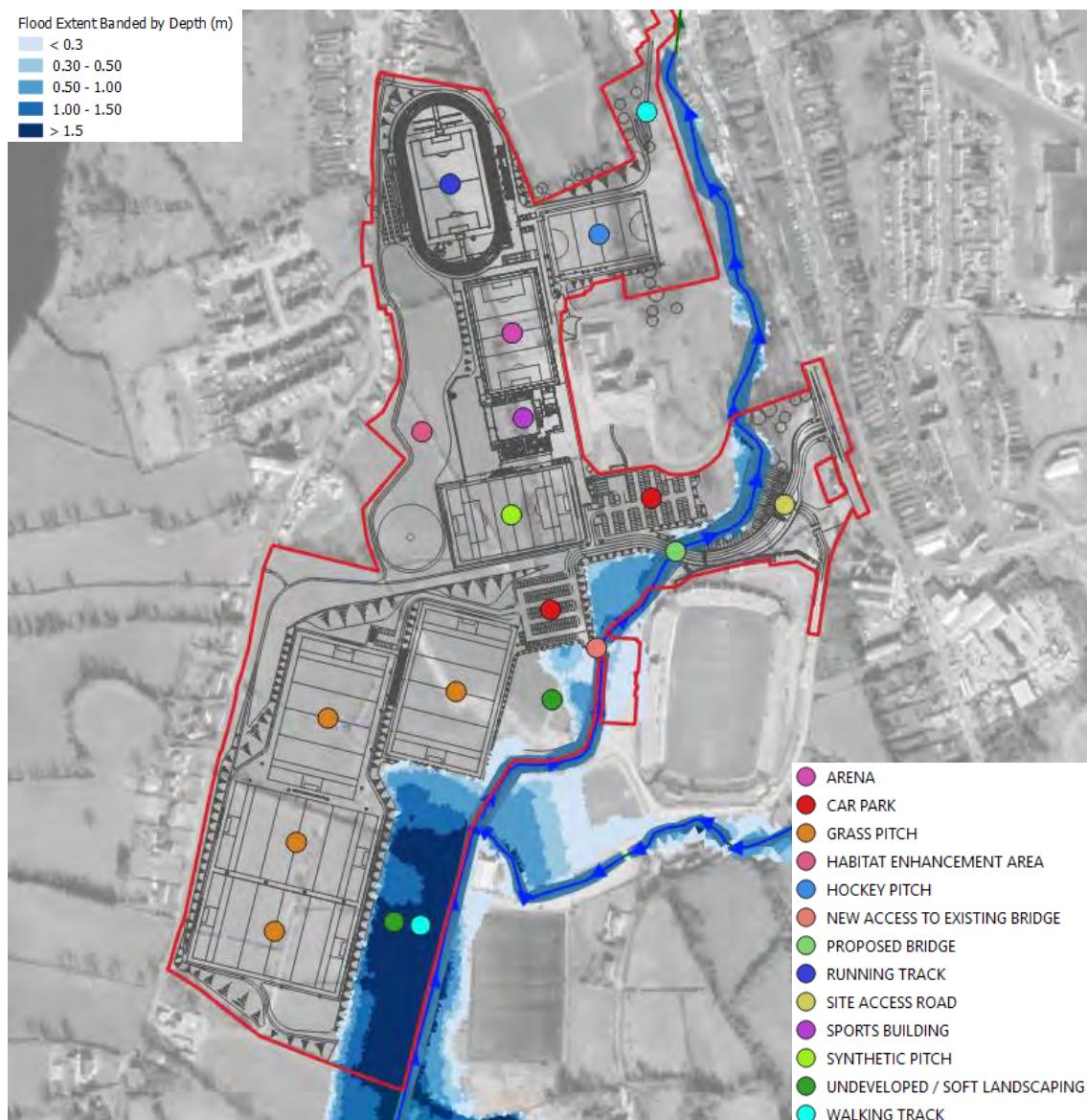
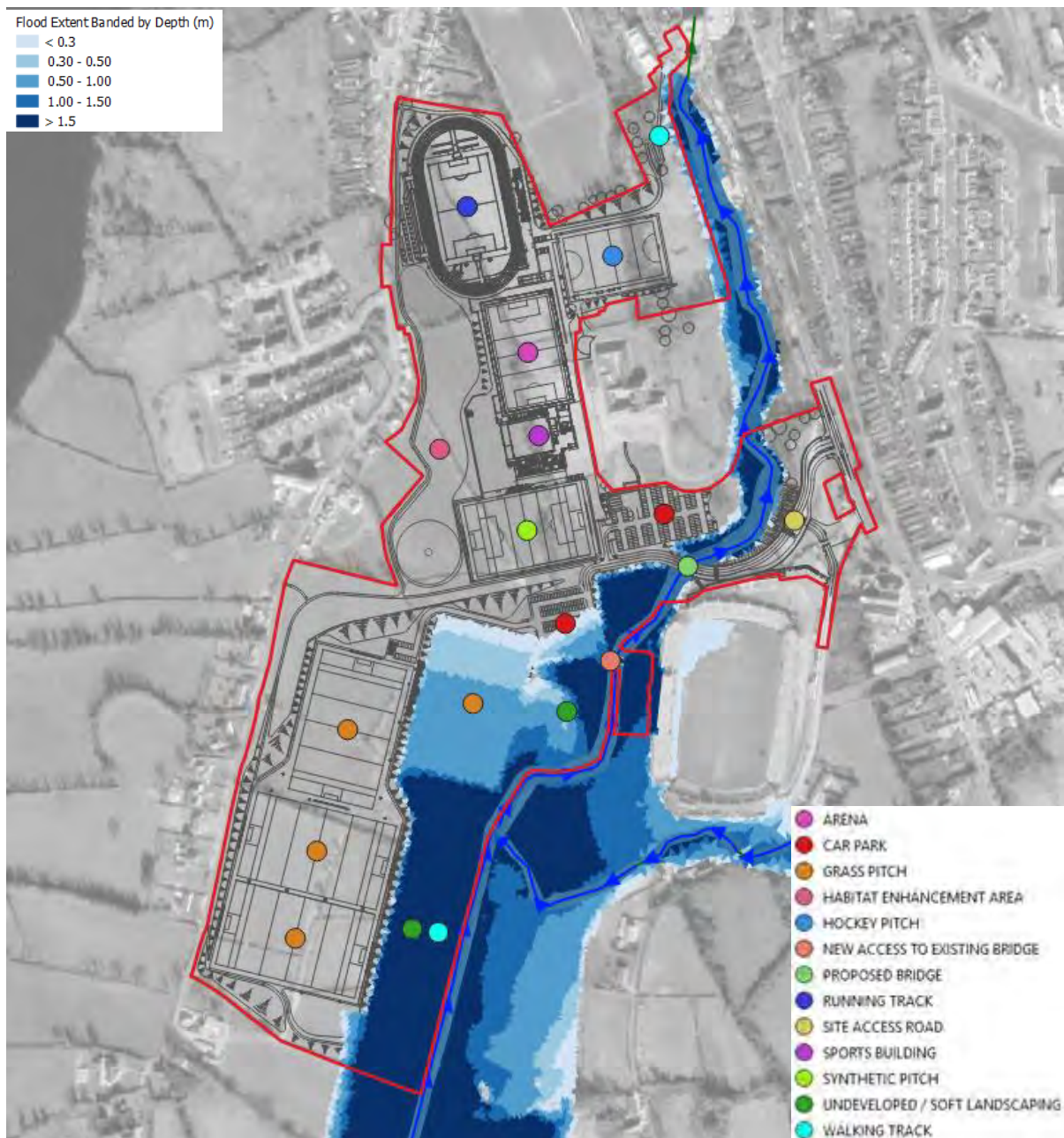


Figure 4-8: Proposed 0.1% AEP +CC Flood Extent Banded by Depth



4.3.5 Proposed Flood Risk – Culvert Blockage

The OPW Guidelines state that FRAs should consider increased flood risk to the development arising from potential culvert blockage.

The Cavan River is culverted at three locations for the proposed model geometry as shown in Figure 4-9. An assessment has been carried out to determine if the structures would be prone to blockage and whether further assessment should be carried out. Table 4-3 summarises the findings.

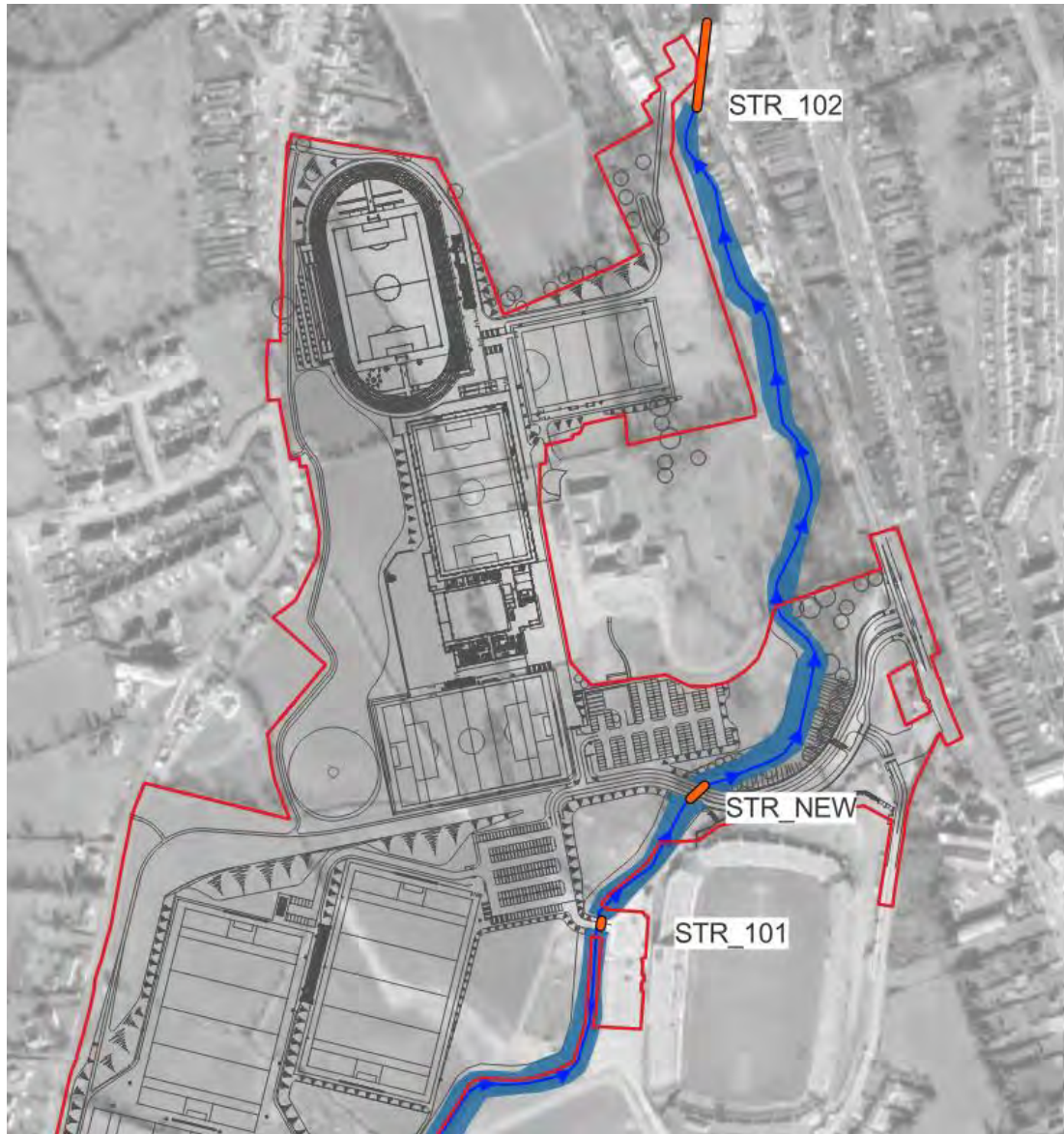




Figure 4-9: Culvert Locations on Cavan River

Table 4-3: Culvert Blockage Assessment

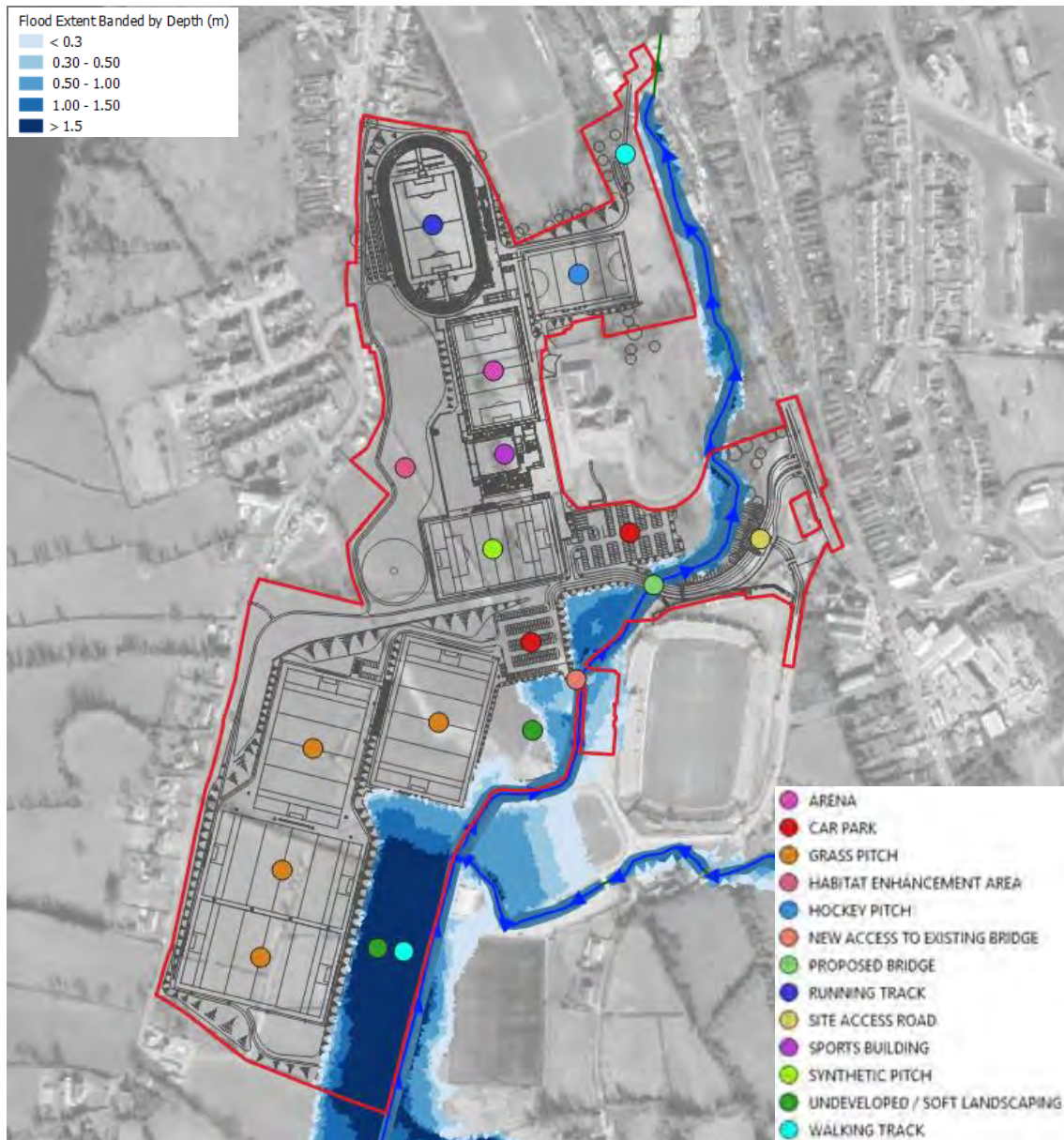
Structure reference	Location	Assess further?
STR_101		<p>Culvert is drowned out at 0.1% AEP and flow bypassing present on both banks.</p> <p>Blockage is unlikely to affect flood levels.</p> <p>No further assessment required.</p>

Structure reference	Location	Assess further?
STR_NEW	Location of new proposed culvert	<p>Proposed clear span bridge structure designed to accommodate the 0.1% AEP flood (exceeding OPW Section 50 standards). Likelihood of blockage is very low</p> <p>No further assessment</p>
STR_201		<p>Existing culvert at downstream of site. Significant difference from soffit to parapet (2.4m) so structure could lead to increased flood levels upstream. Channel upstream is incised with limited flow bypassing.</p> <p>Further assessment required.</p>

Further consideration has therefore been given to potential additional flood risk associated with blockage of the downstream culvert (STR_102) coinciding with a 1% AEP flood. shows the anticipated flood levels at the site in the event of 50% blockage of the culvert.

For the 1% AEP flood event, culvert blockage resulted in a maximum increase in flood level of 1.6m at the downstream extent of the site and reduced to 0.5m upstream of the proposed crossing. There are no new flow pathways activated that impact receptors. Flooding remains confined to undeveloped greenspace and the area east of the grass pitches where a walking trail is proposed.. The effect and consequence of blockage is not significant relative to the baseline "no blockage" flood, and no additional mitigation is required.

Figure 4-10: Proposed 1% AEP Blockage Flood Extent Banded by Depth



4.3.6 Mitigation

The effect of development and risk to the development includes mitigation embedded and informed by this flood risk assessment. Risks to the development comprise:

- Damage to fixtures, fittings and finishes, and parked vehicles.
- Significant flood hazard to occupiers (visitors).

Mitigation of fluvial flood risk and the effect of climate change or culvert blockage to the proposed development, including design measures already “built in” to the proposal assessed herein, are as following:

- **Built development:** all built development, including synthetic playing fields, is in Flood Zone C at an elevation unaffected by flooding including 500mm freeboard to the adjacent 1% AEP flood. No further mitigation is required.
- The **Proposed Bridge** is a clear span structure. The proposed structure exceeds OPW Section 50 standards (OPW Section 50 requirements would require the bridge deck soffit to be not less than the adjacent / upstream in-channel 1% + Climate Change flood level + 300mm freeboard) by

designing to accommodate the 0.1% AEP flood, in order to minimise offsite / upstream effects to Flood Zone B.

- **Dry Site access and egress** is available at all times via the new main site access and bridge. No further mitigation is required to manage access or egress during a flood event.
- The majority of **Grass Pitches** are unaffected by flooding for all scenarios assessed and no further mitigation is required.
- **The northern-most Grass Pitch** floods to a maximum of 0.2m in the present-day 0.1% AEP flood and increases to maximum of 0.9m in the 0.1% AEP +Climate Change flood. The grass surface is inherently water compatible and no further mitigation is required.

Onset of flooding over a number of hours from the south would be visible and therefore any people using the site should have enough time to leave the site.

- **Carparks** are unaffected by 1% and 0.1% present-day floods, and 1% climate change flood. Flooding is predicted to the southern carpark to a maximum depth of 0.7m in the 0.1% AEP + Climate Change flood. The carparks are to be constructed with a porous aggregate surface and therefore are inherently flood resilient. No further mitigation is required to the car parks.

Given the rarity of the flood in which the flow pathway is activated and the less vulnerability classification of the car parks, no additional mitigation (flood management or signage) is deemed necessary or appropriate.

- **Existing Cavan River Crossing:** The existing bridge crossing linking to Breffni Park stadium is affected by flooding for all floods of higher magnitude than the 1% AEP present-day hydrology scenario, and the lands in the adjacent carpark that the bridge accesses are predicted to be affected by flooding for all scenarios considered such that it should be considered impassable during a flood.

Mitigation of hazard to visitors will be by implementation of a **Flood Management Plan** (FEMP). Cavan County Council (the applicant) has a role in conjunction with the OPW as emergency coordinators and would have a role in managing the response to predicted flooding across the County. The FEMP shall seek to prevent access via the affected route, with alternative dry access and egress available via the new site access bridge in all events.

A preliminary FEMP is included at **Appendix F**.

- The proposed **pedestrian track / trail** east of the grass pitches is predicted to be flooded to a significant depth for all scenarios considered, resulting in a flood hazard that would be deemed a Danger to All. The track is likely to be susceptible to high-frequency flooding. It is recommended that the track is constructed from a bound surface to reduce potential for scour and washout from frequent flooding and therefore will be inherently flood resilient. No further mitigation is required to the track.

Mitigation of hazard to users of the track will be by implementation of a Flood Management Plan as noted above. The FEMP shall seek to prevent use of the access route prior to and during a flood. The track is non-essential and alternative dry egress from the grass pitches that it accesses is available.

- **Boundary treatments including landscaping** in Flood Zone A shall be of a type that permit free passage of floodwater, to avoid impounding or re-routing floodwater and flow paths on the site. Soft landscaping and groundworks in Flood Zone A shall not be permitted to cause land raising outside the scope of the development proposal as submitted.

4.4 Surface Water

4.4.1 [Pluvial Runoff from Site](#)

While there is existing development at the site, new development will increase the impermeable area of the site. The proposal will lead to an increase in the overall impermeable area of the site, thus resulting in an increase to the rate and volume of runoff from the site, when compared to the existing scenario.

Topography dictates that any uncontrolled runoff from the site would tend towards and be collected by the Cavan River. There is no potential to cause a significant direct pluvial flood risk to adjacent lands / development.

4.4.1.1 *Mitigation*

The effect of surface water flood risk to the site and elsewhere shall be by means of an **effective surface water drainage network and surface water management**. Surface water drainage design will be as per the requirements of the Cavan County Council Development Plan and to the standards of Cavan County Council Water Services Department.

The Development Plan promotes the use of Sustainable Drainage Systems (SuDS), flood attenuation areas, controlled release of surface water, and use of open spaces and semi-permeable hard surfaces for appropriate development proposals.

SuDS components shall be considered in relation to the nature and character of the site. The nature of SuDS suitable for the site will be subject to outline and detailed design. The SuDS design should demonstrate how water quantity and quality are dealt with, as well as make provision for amenity and biodiversity where practicable.

A planning-stage Drainage Strategy is submitted in support of the Planning Application separately.

The local authority as site owner / manager shall be responsible for **maintenance** of drainage networks at the site and will ensure that maintenance of the drainage system is provided for. Detailed drainage layout for the site is to ensure that key SuDS features requiring maintenance are located in accessible public locations. Maintenance plans for drainage assets should include (where applicable):

- Cyclical (min. annual) check of all surface water drainage features – in particular, clearing of debris.
- Cyclical (min. annual) visual inspection of any surface or underground features – blockages and obstructions to be removed by jetting as required.

5 SUMMARY & SCHEDULE OF MITIGATION

5.1 Summary of Findings

The site is partly affected by the 1% AEP and 0.1% AEP fluvial floodplain of the Cavan River and development is proposed in Flood Zone A and Flood Zone B as defined by the OPW Planning Guidelines.

The proposed development is flood-resilient and mitigation measures are to be put in place to manage residual risks. The proposed development has been determined to cause no measurable effect to flooding elsewhere for the 1% AEP flood, and a slight effect for the 0.1% AEP flood which does not affect any new or existing vulnerable receptor. No additional mitigation over and above that embedded in the existing layout is required.

No other significant flood mechanism exists at the site.

5.2 Summary of Design & Mitigation Measures

The following section summarises the measures incorporated within the proposal submitted in support of the planning application, and to be further developed in any detailed design post-determination of the planning application / in securing other necessary OPW authorisations.

Table 5-1: Schedule of Mitigation

Identified Flood Mechanism	Consequence	Mitigation Measure	Details
Fluvial Flooding (incl. effect of climate change, effect of flood defence breach)	Risk to Property (Buildings)	Design Levels - Buildings	Building is sited at a sufficient level to prevent flooding up to a 0.1% AEP + Climate Change flood
	Risk to Property (Synthetic Pitches)	Design Levels - Pitches	Synthetic pitches sited at a sufficient level to prevent flooding up to a 0.1% AEP + Climate Change flood
	Risk to Property (Grass Pitches)	Design Levels - Pitches	All grass pitches sited at a sufficient level to prevent flooding up to 1% AEP + Climate Change flood.
	Risk to Property - Roads & Car Parking	Design Levels - Pitches	All new roads and car parking sited at a sufficient level to prevent flooding up to 1% AEP + Climate Change flood.
	Risk to Property - Walking Track (east of Grass Pitches)	Flood Resilient Construction	Walking tracks in areas of likely high frequency flooding should be constructed from materials that are resilient to inundation / waterlogging.
	Risk to Property (hard landscaping / amenity aspects)	Flood Resilient Construction	Landscaping in floodplains to include flood resilient construction / selection of flood resilient palette of materials and finishes. Vulnerable equipment (M&E, lighting etc) to be sited at a flood resilient level (1% AEP + Climate Change or greater).

Identified Flood Mechanism	Consequence	Mitigation Measure	Details
	Risk to Property (soft landscaping / and flood risk elsewhere)	Selection of planting in Flood Zones	Landscaping including riparian planting of the Cavan River corridor will be of a type that avoids heavy stands of timber or dense shrubbery at ground level within Flood Zone A to avoid displacing or re-routing floodwater. Planting in high frequency flooded areas east of the grass pitches should be of a type suitable for wet / seasonally waterlogged conditions.
	Risk to Property (Boundary treatments and flood risk elsewhere)	Porous Boundary Treatments & Landscaping	Boundary treatments I Flood Zone A shall be of a type that permit free passage of floodwater, to avoid impounding or re-routing floodwater and flow paths on the site.
	Risk to Users (access via existing bridge, and users of walking track east of grass pitches)	Flood Management Plan	Management of parts of the site affected by flooding including in particular likely high frequency flooding of low lying land east of grass pitches and the existing bridge access to Breffni. To including control of access / egress in response to predicted flooding; and flood response.
Proposed Bridge	Risk to Property (proposed bridge) and flood risk elsewhere	Bridge Design	Proposed bridge to be a clear span crossing (30m) which is confirmed to have no adverse effect to flooding elsewhere. Bridge to have a soffit level of minimum 64.16m OD which exceeds OPW Section 50 standards
	Risk to Property (proposed bridge)	Bridge Authorisation	Bridge to be subject to OPW authorisation under Section 50 of the Arterial Drainage Act.

Identified Flood Mechanism	Consequence	Mitigation Measure	Details
Proposed Culverts to Land Drains	Risk to Property and flood risk elsewhere	Culvert Design	<p>Culverts to land drains shall be sized to accommodate flows to the equivalent of the design standards required for Section 50 authorisation (i.e. 1% AEP + climate change).</p> <p>Given the minor nature of the drains it is not expected that Section 50 authorisation is required, however authorisation will be sought if the local authority or OPW deem it be a requirement, post planning consent.</p>
Surface Water Flooding	Risk to property and risk to adjacent lands / property	Drainage / SuDS plan	<p>Surface water drainage design to be as per the requirements of the Council Development Plan and to the standards of Council Water Services Department.</p> <p>Drainage approach to use SUDS principles.</p> <p>Refer to separately submitted Drainage Plan within the civil engineering package.</p>

5.3 CDP Policy Summary & Justification Test

The following table sets out screening of flood-related policies in the CDP, their applicability to the application and the status of the proposed development relative to those policies.

Table 5-2: County Development Plan – Flood Risk Policy Commentary

Policy	Objective	Commentary	Policy Satisfied?
FRM01	Support, in co-operation with the OPW, the implementation of the EU Flood Risk Directive, the Flood Risk Regulations and the 'The Planning System and Flood Risk Management Guidelines for Planning Authorities.	This SSFRA addresses the suitability of the proposed development in light of the planning guidelines as implemented in the CDP and supporting SFRA.	Yes
FRM02	Protect Flood Zone A and Flood Zone B from inappropriate development and direct developments/land uses into the appropriate Flood Zone	The overarching nature of the development is outdoor recreation which is a suitable land use in Flood Zone A and B. Within the proposed development masterplan higher vulnerability land uses have been directed to least risk spaces. A Justification Test is included for access roads and ancillary car parking within Flood Zone A and B.	Yes
FRM03	Site-specific Flood Risk Assessment (FRA) is required for all planning applications in areas at risk of flooding	This site specific (Stage 3) Flood Risk Assessment meets the policy requirement	Yes
FRM04	Development proposals will need to be accompanied by a Development Management Justification Test when required by the Guidelines	A justification test is required at this development to allow development of "Less Vulnerable" development (access road, car parking) in Flood Zone A. Refer to Section 0 All other development complies with the Sequential Approach.	Yes
FRM05	Risk to Development in Flood Zone C	N/A	N/A
FRM06	Applications for development in flood vulnerable zones, including those at risk under the OPW's Mid-Range Future Scenario, shall provide details of structural and non-structural risk management measures, such as those relating to floor levels, internal layout, flood-resistant construction, flood-resilient construction, emergency response planning and access and egress during flood events.	Mitigation measures and development proposal details in this FRA set out the information requested	Yes

Policy	Objective	Commentary	Policy Satisfied?
FRM07	Protect water bodies and watercourses within the County from inappropriate development, including rivers, streams, associated undeveloped riparian strips, wetlands and natural floodplains. This will include buffers in riverine and wetland areas as appropriate.	The proposal is set back from the rivers edge and avoids artificial modification of the watercourse. The proposed bridge is a clear span structure.	Yes
FRM08	Importance of peatlands	N/A	N/A
FRM09	Work with other bodies and organisations to help protect critical infrastructure, including water and wastewater, within the county	N/A	N/A
FRM10	Council will contribute towards the improvement and / or restoration of the natural flood risk management functions of flood plains	N/A	N/A
FRM11	Take account of CFRAM measures for managing flood risk	Project is coordinated by Cavan Co. Co. which is delivering Cavan Town Flood Relief Scheme.	Yes
FRM12	Effective climate change adaptation as set out in the OPW Climate Change Sectoral Adaptation Plan for Flood Risk Management	Mitigation measures and development proposal details in this FRA assess the risk to the proposal as a result of climate change. All development at the site is resilient to the normal standard of flood protection of the 1% AEP flood including the effect of climate change.	Yes
FRM13	Potential future variations to the Plan	Policy relates to plan making rather than development management at planning application stage	N/A
FRM14	Applications for development on land identified as benefitting land may be prone to flooding and site-specific flood risk assessments may be	Part of the site is benefitting land and this SSFRA meets the policy objective.	Yes
FRM15	Co-operate with the Office of Public Works (OPW) in the delivery of Flood Relief Schemes	Project is coordinated by Cavan Co. Co. which is delivering Cavan Town Flood Relief Scheme.	Yes

5.3.1 Justification Test

As noted at Section 2.4 (pg. 7) The overarching nature of the development is for outdoor recreational space which is classified as *Water Compatible* based on the classification criteria set out in the OPW Guidelines. Water compatible development is permitted in Flood Zone A and B in accordance with the Sequential Approach and without a justification test.

It is conservatively assumed that the planning authority may require that, given the scope of the application and range of development components proposed within it, that it is more appropriate to consider the vulnerability of specific aspects of the development in a granular manner. Table 2-1 (pg. 7) identifies that aspects of the proposal are deemed “less vulnerable”. Referring to previous Figure 4-2 (page 15) all development is sited in an appropriate flood zone based on its vulnerability classification with the exception of “less vulnerable” access roads and car parking (local transport infrastructure) which is sited partly in Flood Zone A and B. Assuming a granular approach, the CDP SFRA directs that a Justification Test is required for Less Vulnerable land use in those Zones.

The requirements for a Justification Test are set out in Box 5.1 of the OPW Planning Guidelines. Suitability of the proposed development relative to those requirements is set out in the following section.

Table 5-3: Justification Test for Development Management

Part	Justification Test Criteria	Note / Comment
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 these Guidelines.	<p>The lands are zoned in the extant County Development Plan for <i>Sport and Recreation</i> and relate to a Regional Sports Facility which is an objective in the CDP.</p> <p>The application and proposed development meets that zoning requirement.</p> <p>The siting of the “less vulnerable” access road and car parking is ancillary to that overall land use for sport and recreation.</p> <p>The method of substation as required by the Sequential Test has been utilised to site the main elements of built form outside Flood Zone A and B.</p>
2	The proposal has been subject to an appropriate flood risk assessment that demonstrates:	This SSFRA refers and confirms that the access road and car parking is resilient to the normal standard of flood protection of the 1% AEP flood including the effect of climate change.
2(i)	The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk;	This SSFRA refers and confirms that the proposed development will not cause an unacceptable effect on flooding elsewhere (refer to Section 4.3.3).
2(ii)	The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible;	This SSFRA refers and includes embedded and future mitigations to minimise flood risk to the proposed development and elsewhere.

Part	Justification Test Criteria	Note / Comment
2(iii)	<p>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; and</p>	<p>This SSFRA refers and confirms that the access road and car parking is resilient to the normal standard of flood protection of the 1% AEP flood including the effect of climate change.</p> <p>Mitigations (flood management) is to be implemented flood risk to other parts of the site which would be similarly effective in reducing residual risks.</p>
2(iv)	<p>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.</p>	<p>The method of substation as required by the Sequential Test has been utilised to site the main elements of built form outside Flood Zone A and B.</p> <p>The siting of the less vulnerable development in the areas where they are located is in the context of a wider development of the site to realise the maximum potential of the Cavan Regional Sports Campus within the Sports and Recreation land zoning.</p> <p>While the site is zoned for sport and recreational uses, which are considered 'water compatible' developments there is ancillary works associated with this, such as the car parking and access which are considered to form part of the zoning. This is confirmed at Section 2.2.9.1 of the Plan which sets out that Cavan County Council commissioned a feasibility study for the development of a regional sports facility for County Cavan with Cavan Town identified as the most appropriate location for a facility of regional significance for the County.</p> <p>The consultation process, recommended the capital vision for Cavan and in addition to the sporting and recreational uses seeks the provision of a link road between the existing Kingspan Breffni Park stadium and the Royal school, connecting Dublin Road to Kilnavara Lane. This opens up access to Swellan and the potential for future development of outdoor activity and lakeside activity. In addition, the link road should be developed to alleviate traffic congestion into the Town Centre on the Dublin Road.</p>

Appendix A

Application Drawings



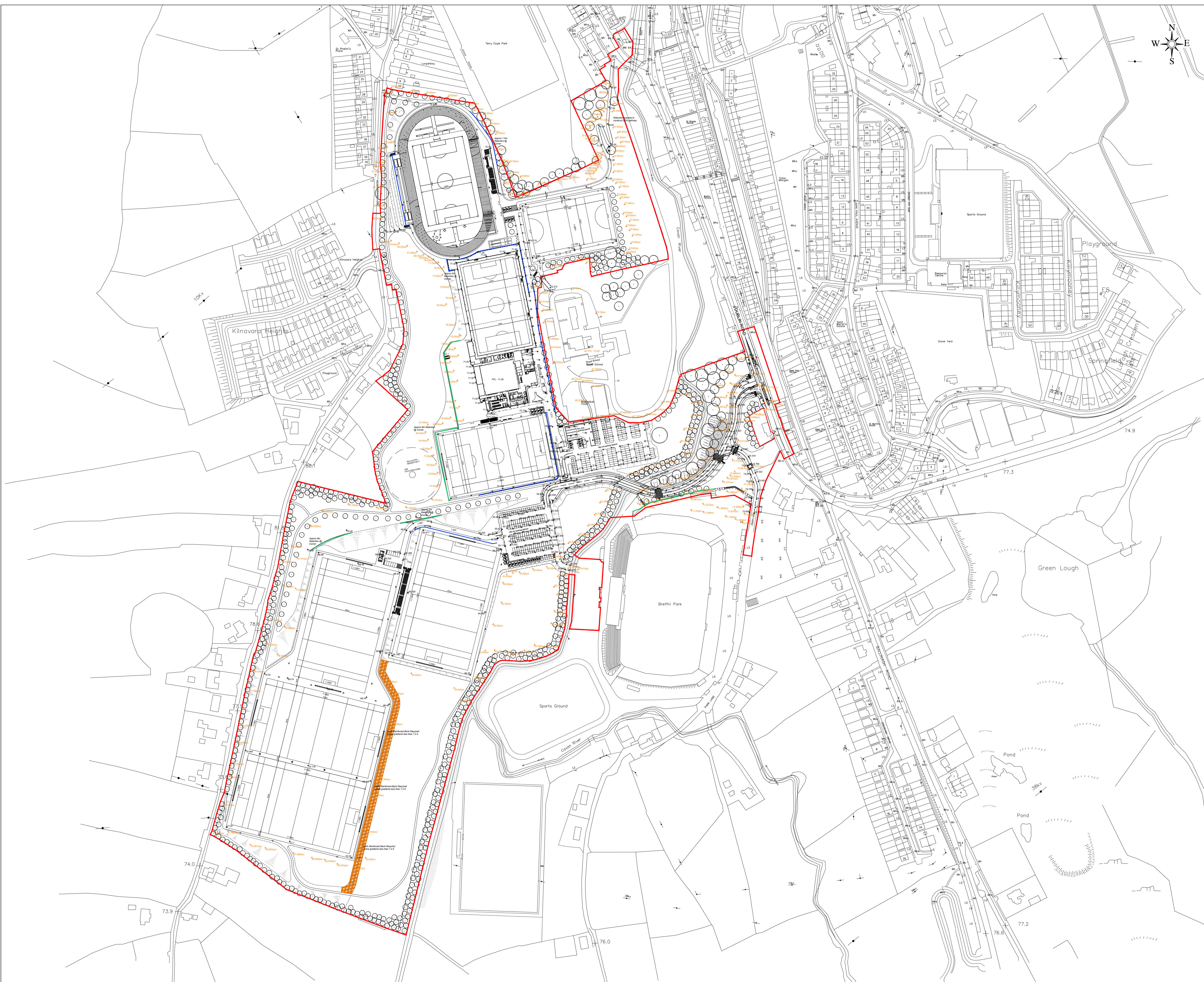
- Notes:**
1. This drawing should be read in conjunction with all relevant drawings (Architectural and Engineering).
 2. This drawing is provided to illustrate the contours of the existing ground levels. Existing levels indicated taken from Topographical Survey as received by the Client Cavan County Council.
 3. All measurements shown are in metres, and all levels are to ordnance datum unless otherwise indicated.
 4. All Coordinates are to Irish Grid, unless otherwise noted.

LEGEND

17.045 + Existing Levels

— Site boundary

P2	06/03/2024	RLB Added	PC
Rev	Issue Date	Description	App
Status	FOR PLANNING		
Client	Cavan County Council		
Project	Cavan Regional Sports Campus		
Drawing	Existing Site Layout & Levels		
Scale	1:2000 @ A1		
Contact Details	1c Montgomery House 478 Castlereagh Road Belfast, BT5 6BQ	T: 028 9040 2000 E: admin@mcadamdesign.co.uk www.mcadamdesign.co.uk	
Drawn	PC	Checked	PA
Date	13.02.24	Date	13.02.24
Approved	PA	Date	13.02.24
Project	Organisation - Zone - Level - Type - Role - Number - Revision		
CRSP	MCA - 00 - 00 - DR - C - 1001 - P2		
Project Number	Status code & Description		
A2156	S4		
All dimensions are in metres. Figured dimensions to be taken in preference to scale dimensions. Dimensions to be checked on site. © 2021 McAdam Design Ltd.			



- Notes:
- All dimensions are in millimeters unless stated otherwise. All levels are in meters referenced to AOD.
 - The mapping illustrated on this drawing is the proposed site layout which will be subject to change following design development.
 - This drawing should be read in conjunction with all relevant drawings (Architectural and Engineering).
 - This drawing is provided to illustrate the proposed levels and retaining structures for the site. All other features illustrated are indicative only and the respective drawing should be consulted if discrepancies occur.
 - Final levels are subject to minor change depending on site layout client discussions.

- LEGEND:
- Site boundary
 - Proposed Levels
 - Existing Levels
 - Proposed proprietary concrete block geosynthetic reinforced segmental retaining wall system
 - Proposed Timber cribb retaining wall
 - Proposed Grass Reinforced Bank

Rev	Issue Date	Description	App
P9	06/03/2024	Site Layout Amended	PC
P8	05/03/2024	Segregated Cycle Lanes	PA
P7	26/02/2024	Amendments to Accommodate Bridge	PA
P6	22/02/2024	Retaining Walls added	PC
P5	21/02/2024	Red Line Amendment	PA
P4	21/02/2024	Red Line Adjustment	PA
P3	20/02/2024	Site Layout Amendment	PA
P2	07/02/2024	Levels Raised / Cut Minimised	PA

Status: **FOR PLANNING**

Client: **Cavan County Council**

Project: **Cavan Regional Sports Campus**

Drawing: **Proposed Layout-Levels-Overview**

Scale: **1:2000 @ A1**



Contact Details: 1c Montgomery House, 478 Castlereagh Road, Belfast, BT5 6BQ. T: 028 9040 2000, E: admin@mcadamdesign.co.uk, www.mcadamdesign.co.uk

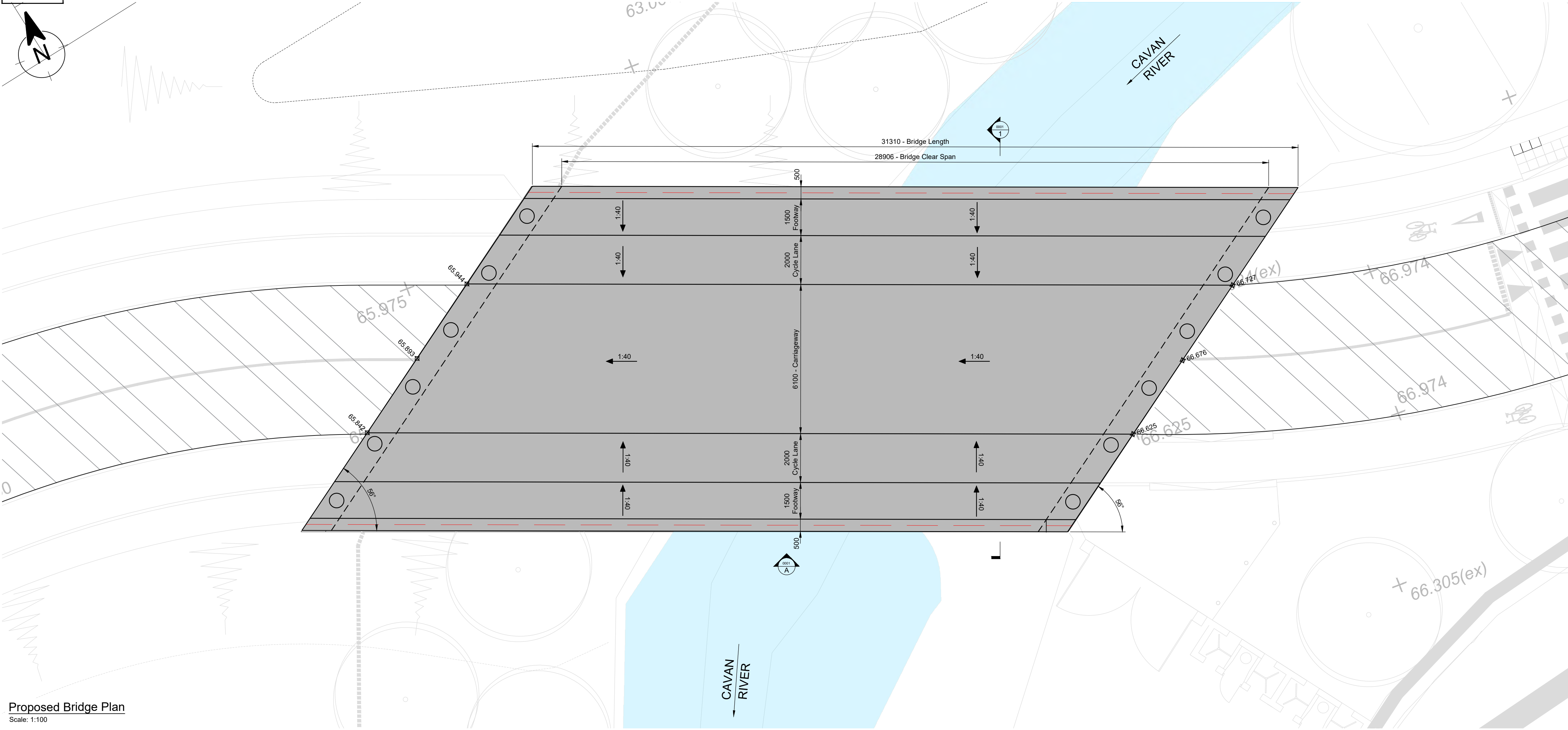
Drawn	PC	Checked	PA	Approved	PA
Date	19/12/2023	Date	19/12/2023	Date	19/12/2023

Project: CRSP - MCA - 00 - 00 - DR - C - 1100 - P9

Project Number: **A2156** Status code & Description: **S4**

All dimensions are in metres. Figured dimensions to be taken in preference to scale dimensions. Dimensions to be checked on site. © 2021 McAdam Design Ltd.

A1 Original



Proposed Bridge Plan

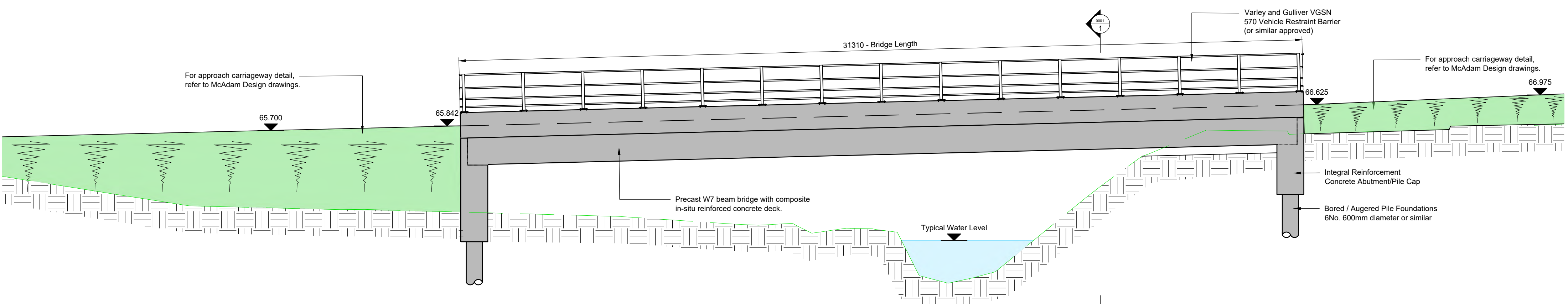
Scale: 1:100

General Notes

1. Design ID are responsible for the planning drawings and setting out of the proposed bridge only. For carriageway details refer to McAdam design drawings supplied under separate cover.
2. This Drawing has been produced based on the following drawings supplied by McAdam:
 - CRSP-MCA-ZZ-DR-SK-011 (05.02.24)
 - CRSP-MCA-00-00-DR-C-1100 (05.03.24)
3. The proposed bridge soffits has been set in consideration of achieving a minimum 1031mm freeboard above a 1% AED + CC flood event 63.4mOD as provided by McCloy Consulting. Please refer to Flood Risk Assessment conducted for this scheme issued under separate cover.

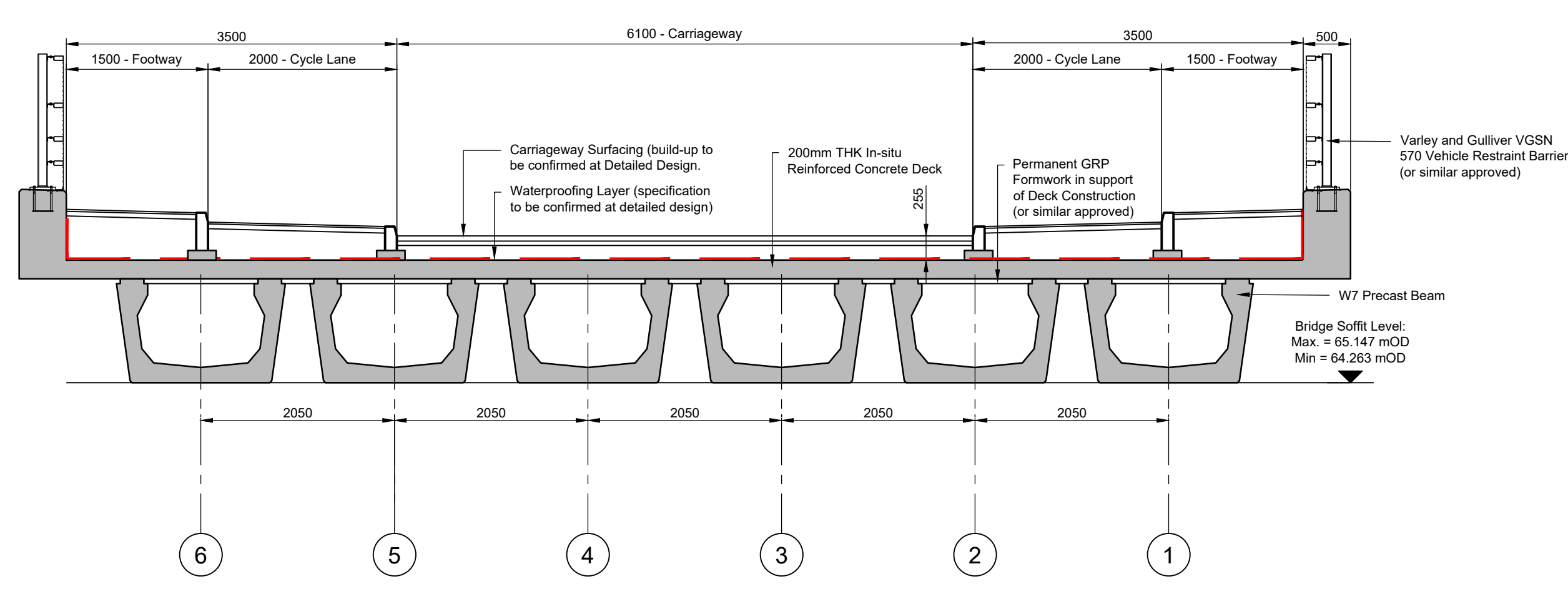
Legend

- Cavan River
- Proposed Precast Concrete Deck Structure
- Existing Level (mOD)
- Proposed Level (mOD)
- Existing Ground Level
- VRS Barrier (Varley & Gulliver VGSN 570 Vehicle Restraint Barrier or Similar Approved)
- McAdam Proposed Levels



Elevation A

Scale: 1:100



Typical Section 1

Scale: 1:50

Rev	Date	Drawn By	Appr. By	Description
P03	05/03/24	LP	RC	Cycle Lane Added
P02	27/02/24	LP	RC	Issued for Stage Approval
P01	26/02/24	LP	RC	Issued for Coordination

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Project	Drawn By	Design ID Project No.
Cavan Regional Sports Complex	LP	24020

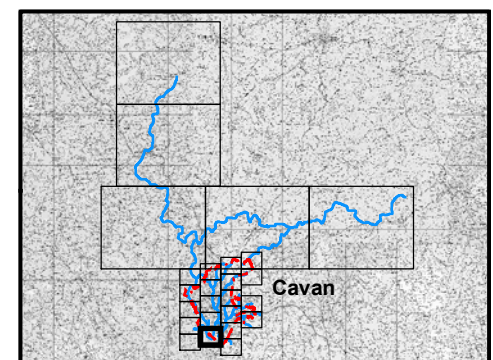
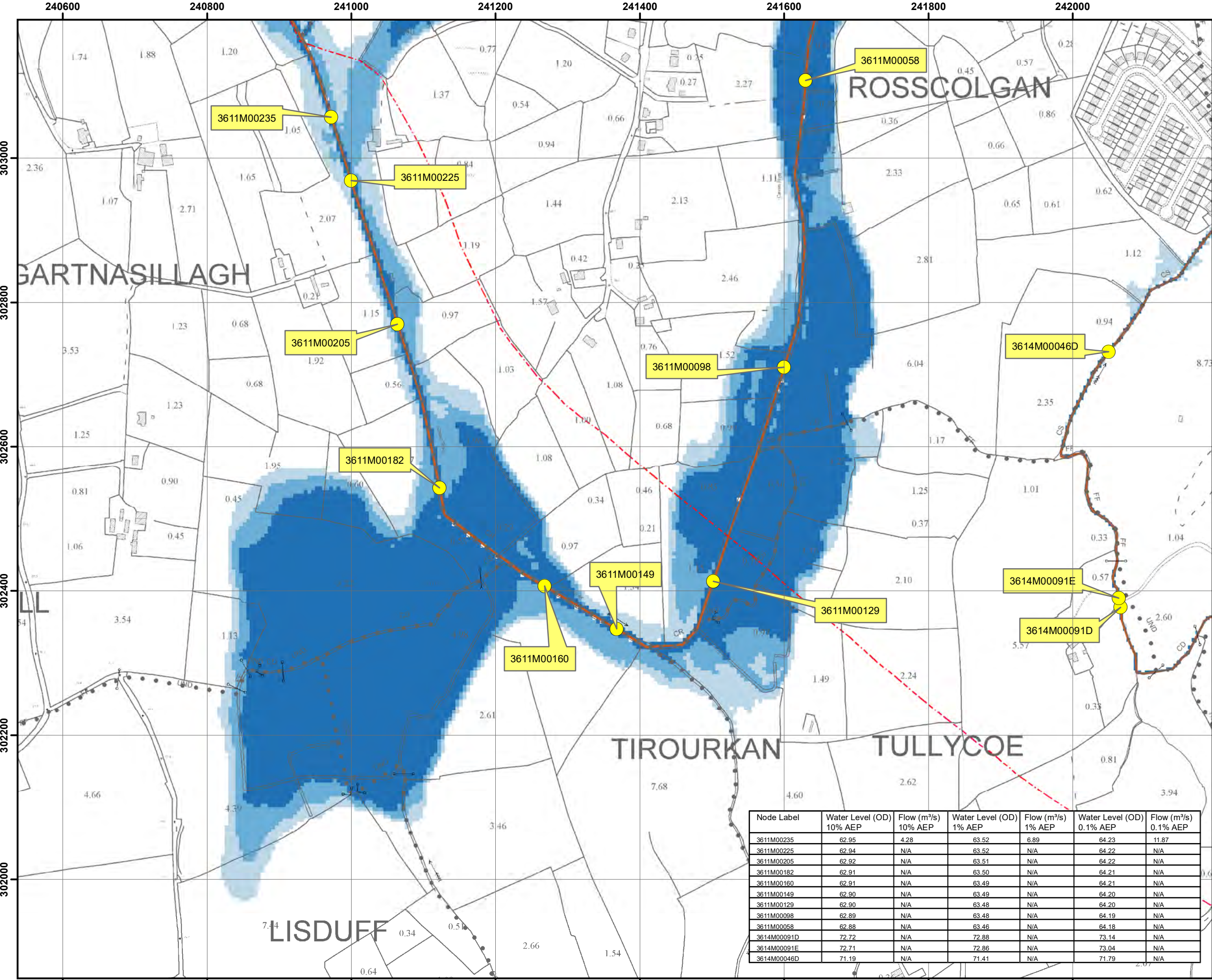
Drawing Title	Date Drawn	Scale(s) @ A1
Bridge Layout and Sections	Feb '24	As Shown

Full Document Reference	Suitability & Description
CRSP-DID-ZZ-XX-DR-C-0001	S4 For Stage Approval

Project	Originator	Volume	Level	Type	Role	Number	Revision
CRSP	DID	ZZ	XX	DR	C	0001	P03

Appendix B

OPW Flood Mapping



IMPORTANT USER NOTE:
THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP.

- Legend**
- 10% Fluvial AEP Event
 - 1% Fluvial AEP Event
 - 0.1% Fluvial AEP Event
 - Modelled River Centreline
 - AFA Extents
 - Node Point
 - Node ID

FINAL

REV:	NOTE:	DATE:
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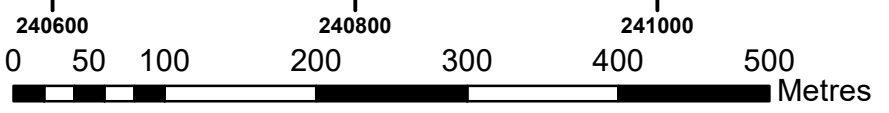


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Node Label	Water Level (OD)		Flow (m ³ /s)		Water Level (OD)		Flow (m ³ /s)	
	10% AEP	1% AEP	10% AEP	1% AEP	0.1% AEP	1% AEP	0.1% AEP	
3611M00235	62.95	63.52	4.28	6.89	63.52	6.89	64.23	
3611M00225	62.94	63.52	N/A	N/A	63.52	N/A	64.22	
3611M00205	62.92	63.51	N/A	N/A	63.51	N/A	64.22	
3611M00182	62.91	63.50	N/A	N/A	63.50	N/A	64.21	
3611M00160	62.91	63.49	N/A	N/A	63.49	N/A	64.21	
3611M00149	62.90	63.49	N/A	N/A	63.49	N/A	64.20	
3611M00129	62.90	63.48	N/A	N/A	63.48	N/A	64.20	
3611M00098	62.89	63.48	N/A	N/A	63.48	N/A	64.19	
3611M00058	62.88	63.46	N/A	N/A	63.46	N/A	64.18	
3614M00091D	72.72	72.88	N/A	N/A	72.88	N/A	73.14	
3614M00091E	72.71	72.86	N/A	N/A	72.86	N/A	73.04	
3614M00046D	71.19	71.41	N/A	N/A	71.41	N/A	71.79	



Map:
Cavan Fluvial Flood Extents

Map Type: EXTENT

Source: FLUVIAL

Map Area: HPW

Scenario: CURRENT

Drawn By: C.C. **Date:** 14 July 2016

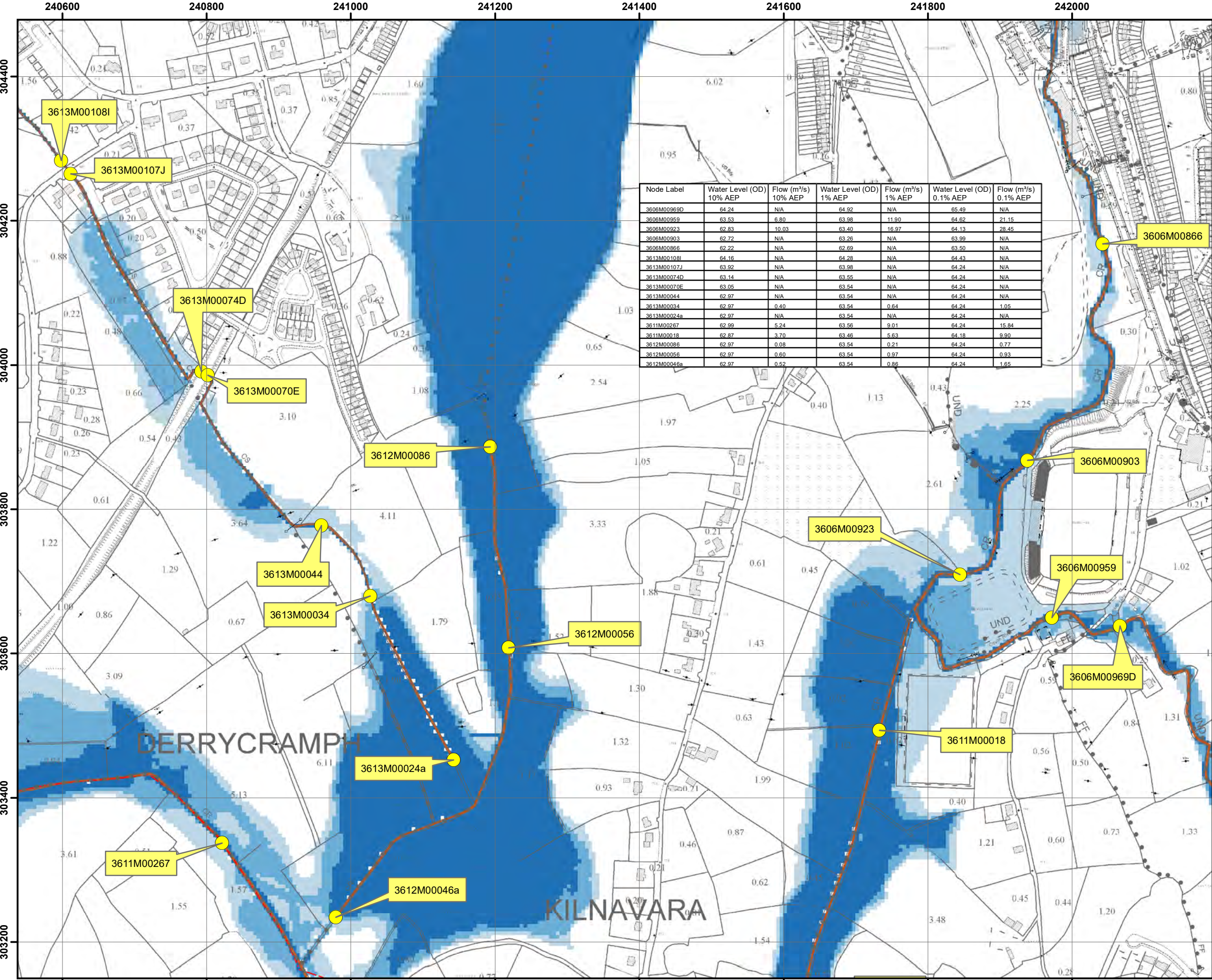
Checked By: T.D. **Date:** 14 July 2016

Approved By: S.P. **Date:** 14 July 2016

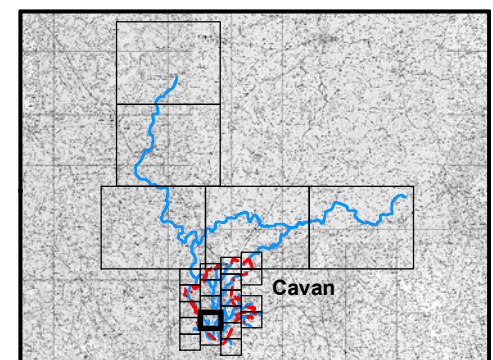
Drawing No.:
N36CAV_EXFCD_F0_04

Map Series: Page 4 of 25

Drawing Scale: 1:5,000 @ A3



Node Label	Water Level (OD) 10% AEP	Flow (m ³ /s) 10% AEP	Water Level (OD) 1% AEP	Flow (m ³ /s) 1% AEP	Water Level (OD) 0.1% AEP	Flow (m ³ /s) 0.1% AEP
3606M00969D	64.24	N/A	64.92	N/A	65.49	N/A
3606M00959	63.53	6.80	63.98	11.90	64.62	21.15
3606M00923	62.83	10.03	63.40	16.97	64.13	28.45
3606M00903	62.72	N/A	63.26	N/A	63.99	N/A
3606M00866	62.22	N/A	62.69	N/A	63.50	N/A
3613M00108I	64.16	N/A	64.28	N/A	64.43	N/A
3613M00107J	63.92	N/A	63.98	N/A	64.24	N/A
3613M00074D	63.14	N/A	63.55	N/A	64.24	N/A
3613M00070E	63.05	N/A	63.54	N/A	64.24	N/A
3613M00044	62.97	N/A	63.54	N/A	64.24	N/A
3613M00034	62.97	0.40	63.54	0.64	64.24	1.05
3613M00024a	62.97	N/A	63.54	N/A	64.24	N/A
3611M00267	62.99	5.24	63.56	9.01	64.24	15.84
3611M00018	62.87	3.70	63.46	5.63	64.18	9.90
3612M00086	62.97	0.08	63.54	0.21	64.24	0.77
3612M00056	62.97	0.60	63.54	0.97	64.24	0.93
3612M00046a	62.97	0.52	63.54	0.86	64.24	1.65



IMPORTANT USER NOTE:
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- Legend**
- 10% Fluvial AEP Event
 - 1% Fluvial AEP Event
 - 0.1% Fluvial AEP Event
 - Modelled River Centreline
 - AFA Extents
 - Node Point
 - Node ID
 - Node Label

FINAL

REV:	NOTE:	DATE:
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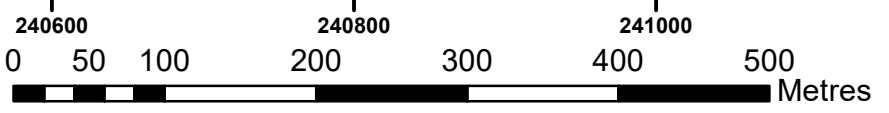


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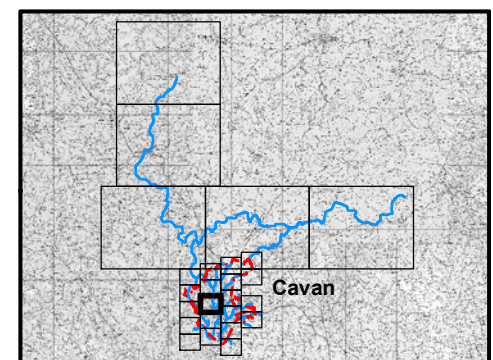
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Map:	
Cavan Fluvial Flood Extents	
Map Type: EXTENT	
Source: FLUVIAL	
Map Area: HPW	
Scenario: CURRENT	
Drawn By : C.C.	Date : 14 July 2016
Checked By : T.D.	Date : 14 July 2016
Approved By : S.P.	Date : 14 July 2016
Drawing No. : N36CAV_EXFCD_F0_07	
Map Series : Page 7 of 25	
Drawing Scale : 1:5,000 @ A3	



240600 240800 241000 241200 241400 241600 241800 242000

Node Label	Water Level (OD) 10% AEP	Flow (m³/s) 10% AEP	Water Level (OD) 1% AEP	Flow (m³/s) 1% AEP	Water Level (OD) 0.1% AEP	Flow (m³/s) 0.1% AEP
3606M00829I	60.88	10.13	61.38	17.09	62.82	29.36
3606M00811D	59.75	N/A	60.66	N/A	61.79	N/A
3606M00804	59.51	10.15	60.28	17.15	61.22	31.23
3606M00798	59.40	10.34	59.92	17.32	60.48	31.68
3606M00781D	59.28	N/A	59.70	N/A	60.14	N/A
3606M00750	57.52	10.38	57.89	17.44	58.54	31.21
3606M00739	57.14	10.40	57.55	17.45	58.19	31.69
3606M00727D	56.74	N/A	57.18	N/A	57.76	N/A
3606M00687	55.10	N/A	55.47	N/A	56.09	N/A
3610M00086J	62.65	N/A	62.86	N/A	63.21	N/A
3610M00082eI	60.04	N/A	60.27	N/A	60.88	N/A
3610M00082hI	59.40	3.21	59.92	5.00	60.48	8.64



IMPORTANT USER NOTE:
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Legend

- 10% Fluvial AEP Event
- 1% Fluvial AEP Event
- 0.1% Fluvial AEP Event
- Modelled River Centreline
- AFA Extents
- Node Point
- Node ID Node Label

FINAL

REV:	NOTE:	DATE:
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OPW **RPS**

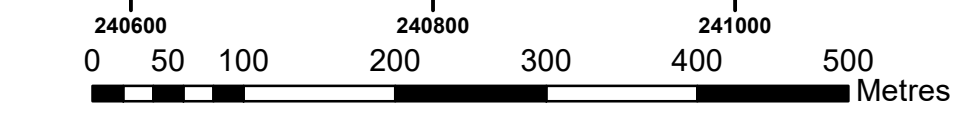
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Map:
Cavan Fluvial Flood Extents
Map Type: EXTENT
Source: FLUVIAL
Map Area: HPW
Scenario: CURRENT
Drawn By: C.C. Date: 14 July 2016
Checked By: T.D. Date: 14 July 2016
Approved By: S.P. Date: 14 July 2016
Drawing No.:
N36CAV_EXFCD_F0_08
Map Series: Page 8 of 25
Drawing Scale: 1:5,000 @ A3

305600
305400
305200
305000
304800
304600



Appendix C

Hydraulic Modelling

PREAMBLE

As no existing modelled data was available for the unnamed watercourse at the site, a detailed hydraulic model suitable to the scale and nature of the proposed development and associated risk, was developed for the site. An InfoWorks ICM 1D-2D model has been developed for the site, allowing accurate determination of flood levels at the site.

CFRAM survey data was provided from Cavan County Council and was collected in 2013. This was deemed suitable for use and has been supplemented with topographic survey within the site boundaries.

HYDROLOGICAL ASSESSMENT

Fluvial Inflows

The CFRAM flows applied to the hydraulic model were provided in the accompanying Hydrology Report². These were compared with flow reported at locations in the CFRAM mapping (see Figure 3-2) and showed a mismatch. The flood nodes on the CFRAM mapping showed larger flows, and it was therefore assumed that “top up” flows or a re-estimation of flow to suit calibration or validation had been applied during the hydraulics phase subsequent to completion of the reported hydrology.

To ensure that results of this analysis were no less conservative than CFRAM results, flows were extracted from the CFRAM pdf maps at two nodes and applied directly to the model. The map below highlights the nodes where flow and level were extracted from CFRAM mapping. Flow checks were undertaken to ensure the modelled flows matched the CFRAM recorded flows (within $\pm 5\%$) at the downstream extent of the model to ensure that the significant storage available across the modelled reach did not attenuate the peak flood flow.

Flows were scaled by +20% to account for Mid-Range Future Scenario Climate Change.

Figure C-1: Extraction Locations for flow and level from CFRAM Mapping

² CFRAM UoM36 Hydrology Report_F03.pdf

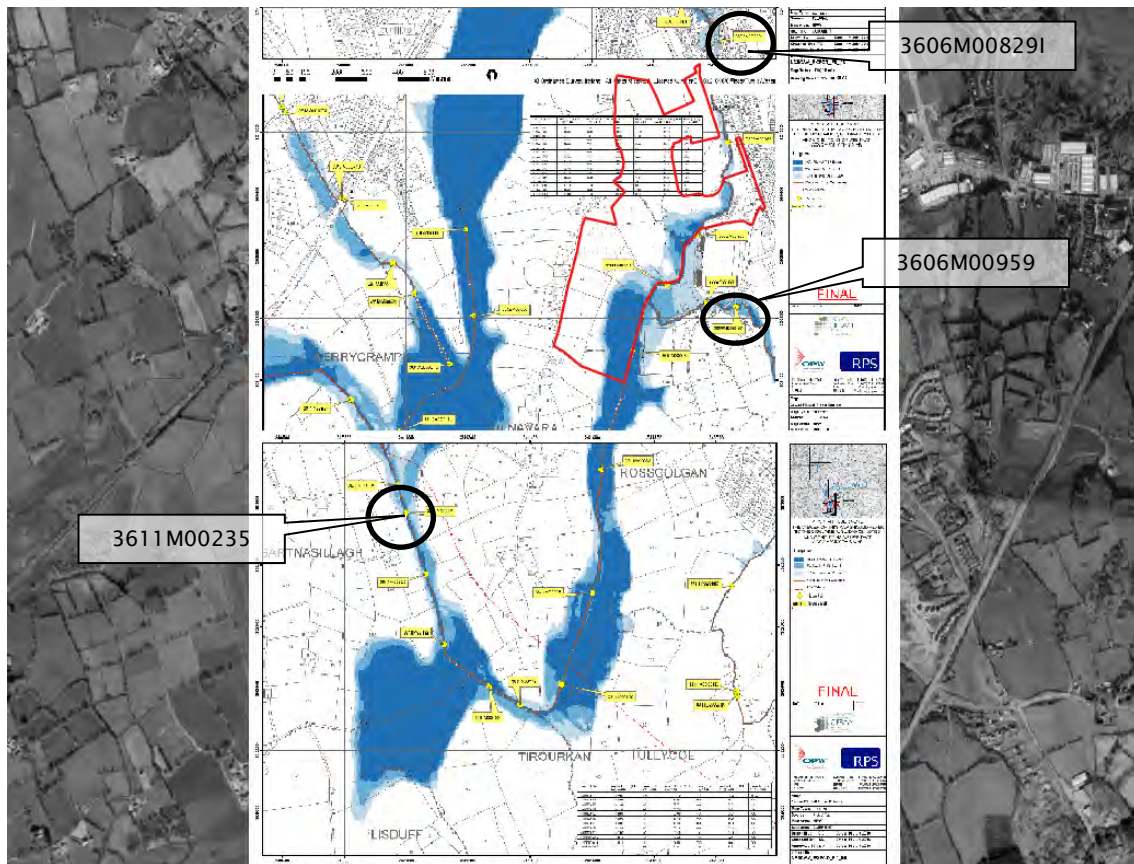


Table C-2: Peak downstream boundary levels from CFRAM

CFRAM Node	Description	1% AEP (m ³ /s)	0.1% AEP (m ³ /s)
3611M00235	Cavan River Inflow	6.89	11.87
3606M00959	Unnamed Trib Inflow	11.90	21.15
N/A	Lateral Inflow (Scaled by area)	0.17	0.29

Hydrograph shape

The FSU portal was used to develop a hydrograph shape. An HEP was set at the downstream extent of the model and a hydrograph was generated as per FSU methodologies. This copies the approach adopted by the modelling completed for the CFRAM that used an FSU hydrograph shape generator for all catchments greater than 10km².

A copy of calculations is included in Appendix D.

The hydrograph shape was scaled to the CFRAM peak for application to the model.

Downstream boundary

The downstream boundary was informed by the nearest model node in CFRAM (reference node 3606M00829I), see Figure C-1 above.

For climate change, the present day 0.1% AEP was assumed to represent the 1% AEP +CC. The ratio of the present day 1% AEP vs 0.1% AEP was calculated (1.02) and applied to provide a proxy for the 0.1% AEP +CC. The final peak water levels shown in Table C-2.

A water level hydrograph was extracted from an initial model simulation and scaled to match the respective CFRAM peaks for design flood events.

Table C-2: Peak downstream boundary levels from CFRAM

CFRAM Node	1% AEP (m OD)	0.1% AEP (m OD)	1% AEP +CC (m OD)	0.1% AEP +CC(m OD)
3606M00829I	61.38	62.82	62.82	64.29

Application to the Model

Point inflows were applied to upstream of modelled reach on Cavan River and the tributary. One lateral inflow was applied to the river reach downstream of the confluence of tributary with Cavan River.

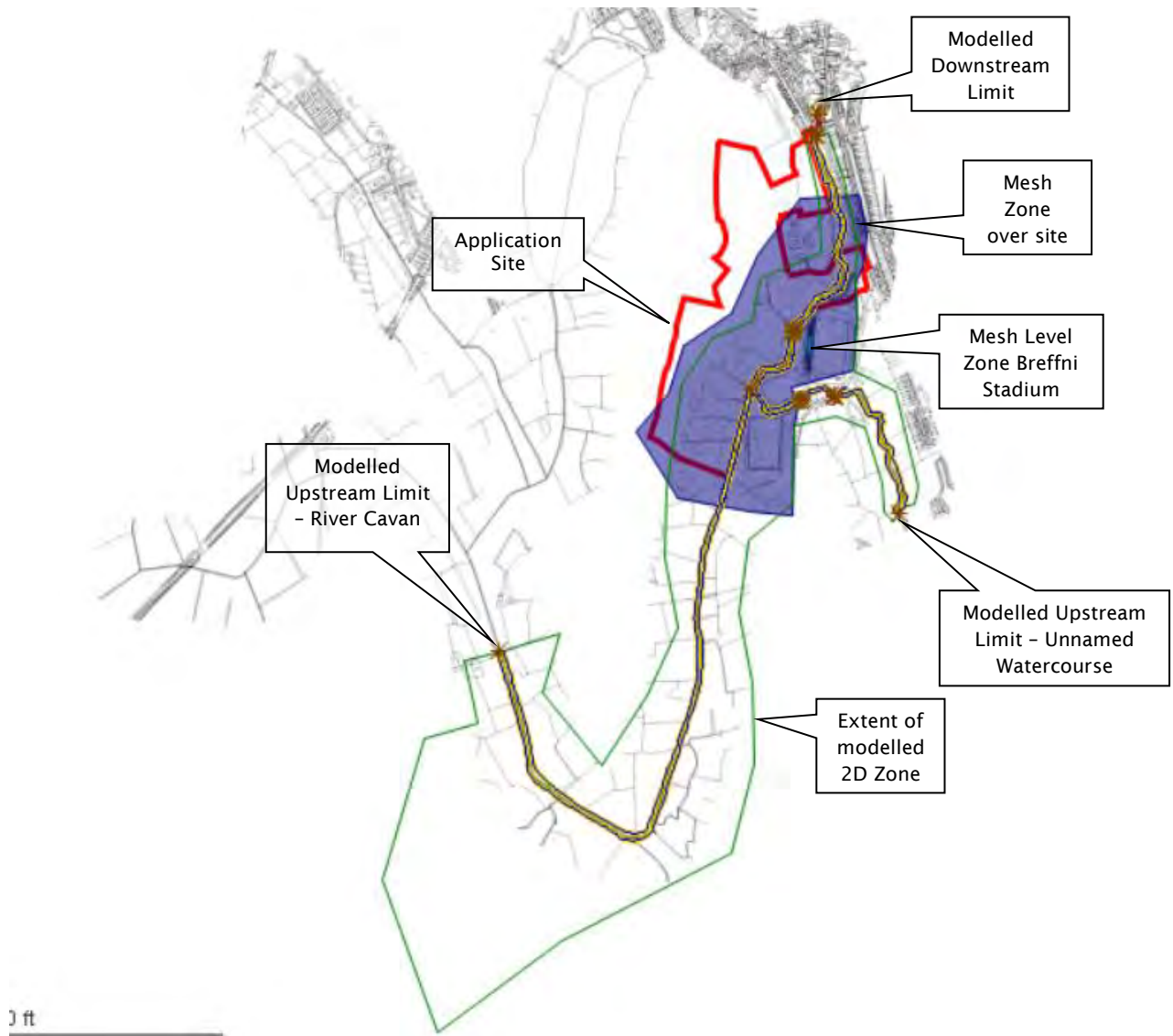
The application of flows derived for the downstream hydrological estimation point at the upstream extent of the modelled reach ensures a precautionary and conservative analysis. Additionally, it was assumed that hydrographs on all watercourses peak simultaneously to ensure conservative results.

HYDRAULIC MODEL SIMULATION

The hydraulic model for the site has the purpose of providing peak water levels from the derived design flow estimates for the unnamed watercourse in the vicinity of the site. The modelling has established the capacity of the watercourse adjacent to the proposed development site.

The river reach has been modelled using unsteady state techniques using ICM v2024.3 software, with the most conservative flood levels predicted at the site used for purposes of the flood risk assessment in accordance with the precautionary principle.

Figure C.2: Model Extent



1-Dimensional River Reaches

The extent of the river reach was determined to ensure that a likely significant hydraulic restriction that influences water levels at the site is captured in the model outcomes, and to ensure that the model extents sufficiently far upstream to allow estimation of any reasonably foreseeable effects of the proposed development, where it is normal to anticipate that land raising in a floodplain would cause a backwater (i.e. upstream) afflux effect.

River Sections

The geometry of natural channels is irregular and cannot be characterised using simple mathematical relationships. Therefore, representation in mathematical models requires that the stream geometry, in the form of discrete cross sections, be taken transversely at key locations in the watercourse.

Due to the nature and scale of development and associated risk, it was determined that a linked 1D-2D model would be of sufficient detail to generate conservative estimates of flood levels at the site.

The roughness of the river reach is represented by applying Manning's n roughness values to the river sections for floodplains and river channel. A conservative roughness value of 0.04 was used based on characteristics of the channel, which is straight, clean with some stones and weeds.

Structures

There are four structures represented within the model domain two located on the tributary and two on the River Cavan. The three upstream structures are short culverts providing local access over the watercourse whilst at the downstream extent of the model is a longer (60 m). STR101 were informed from as built and site topographic survey as this was constructed after CFRAM survey in 2013.

Refer to Table C.2 for specific detail.

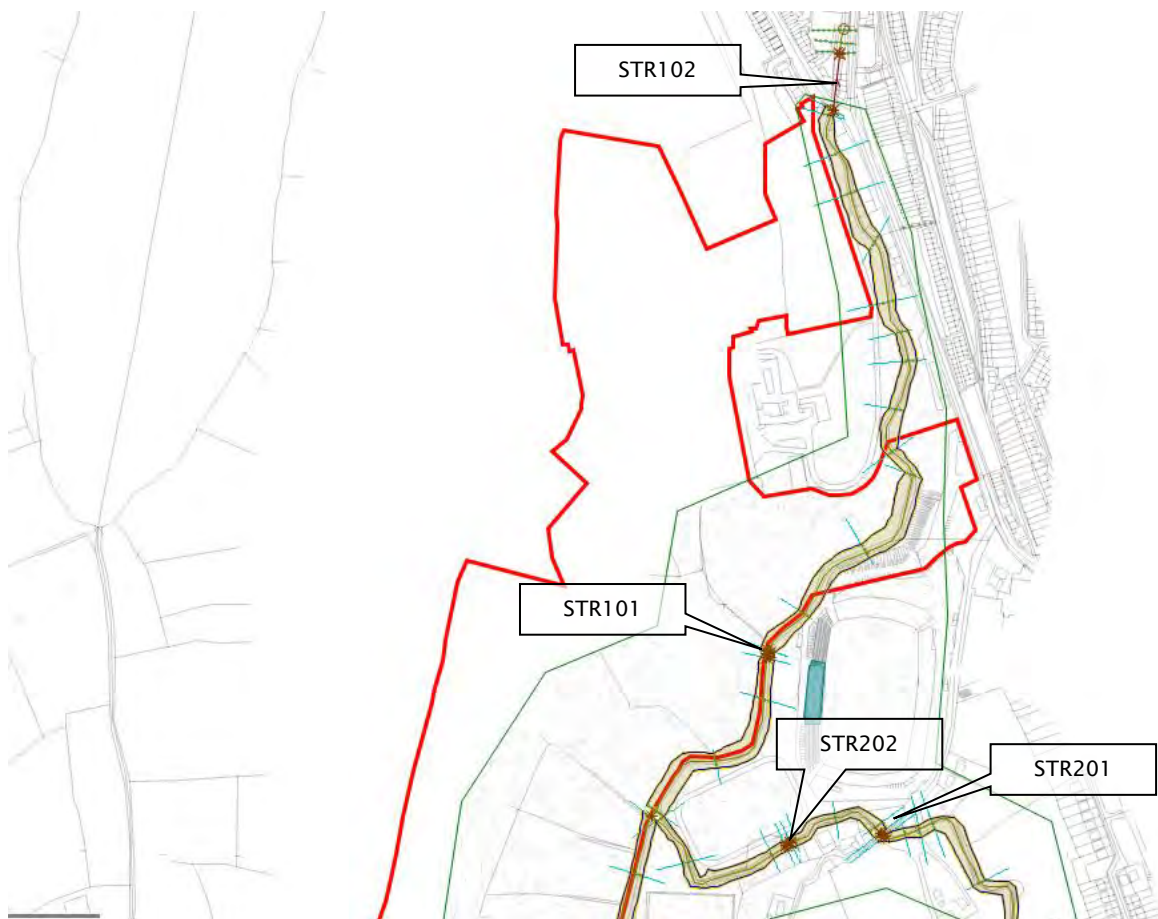


Table C.2: Structure Register

Location	Shape	Size	Roughness (Manning's n)	Upstream invert (mOD)	Downstream invert (mOD)
STR101	Clear span bridge (beam over abutments) – schematised in model as a box culvert with opening area adjusted to reflect hydraulic opening	Height 2280mm Width 6000mm	Bottom 0.040 Top 0.018	60.21	60.21
STR102	Sprung Arch	Height 2610mm Springing Height 1420mm Width 5970mm	Bottom 0.025 Top 0.025	60.16	60.13
STR201	Sprung Arch	Height 1770mm Springing Height 1180mm Width 4070mm	Bottom 0.040 Top 0.025	62.69	62.69
STR202	Double Box applied as one box with two barrels	Height 1550mm Width 2150mm	Bottom 0.040 Top 0.018	62.10	62.10

Manning's n roughness values for short culverts are reflective of in channel conditions, whilst specific roughness values were applied as top roughness representing the construction material of the conduits.

Upstream and Downstream Limits

The upstream limit of the two model reaches was defined using a break node with 100% of flows applied to the model entered through this node.

The downstream boundary of the model has been informed by water levels extracted from CFRAM mapping and applied to an outlet node.

2-Dimensional Surface Model Areas

Topography

Out of bank topography was based on detailed site topographic survey for the site area, with outlying areas derived from best available OSI 2 m DTM and wider floodplain using BlueSky 5m DTM. The datasets were combined in a single TIN mesh and exported as a single terrain model with 1 m resolution.

2D Zone

The terrain model was loaded into InfoWorks ICM as a ground model, and subsequently converted into 2D mesh elements (the surface used to simulate flows across the topography within the model). The 2D zone has a maximum triangle size of 64 m², minimum triangle size of 16 m². A mesh zone was used to reduce triangle size to a minimum of 8 m² within the site boundary.

Mesh zones were employed to represent the culvert deck at STR201 and STR202.

A mesh level zone was used to represent a structure at Breffni Stadium that would impede flow and was missing in the CFRAM model.

Boundary Conditions

Vertical wall was selected as the 2D boundary type for this model build. This means water cannot be lost off the 2D edge and is conservative to prevent loss of water at the top of the model. The 2D zone was extended to ensure all flow pathways were realised.

Surface Roughness

A Manning's n Roughness value of 0.05 has been applied to the whole 2D zone to represent the area over which water would flow which predominantly comprises of long grass.

Surface Infiltration

No infiltration has been included in the model in keeping with the approach used in similar OPW CFRAM detailed models. The absence of infiltration in the model is likely to ensure conservative results permitting a precautionary approach to flood risk analysis.

Proposed Model Geometry

A proposed scenario was developed to assess the effect of new development. The process was iterative in assessment ground models to determine unacceptable effects and inform refinements. A 3D ground model was supplied by the Civil Engineer which is consistent with the plans submitted in support of the planning application that included widespread land raising including a road embankment. The clear span bridge was schematised in model as a box culvert with opening area adjusted to reflect hydraulic opening with following dimensions:

- 25000mm width* x 4000mm height. *The width was reduced to account for the bridge skew. The original unobstructed width 30000mm, this was reduced to 25000mm to suit skew calculations.
- Assumed Manning's n roughness bottom 0.04 reflective of river bed and top roughness 0.025 reflective of brick joints.
- Proposed road deck level (65.66m OD). The proposed soffit 64.03m OD which allows for circa 1.6m construction depth.



Figure B-4: Proposed Model Extents

Assumptions and Limitations of Modelling

The representation of any complex system by a model requires a number of assumptions to be made. In the case of the hydraulic model developed for the purposes of the study it is assumed that:

- The topographic survey accurately represents the surface topography and associated flow paths and provides a representative channel geometry.
- The design flows are an accurate representation of flows of a given return period.
- Roughness does not vary with time.

The primary limitations of the study are noted as follows:

- Site drainage has not been modelled.
- No allowance for infiltration has been made within the model.
- The model does not represent any topographic features smaller than the minimum resolution of the underlying terrain model derived for the site.

Appendix D

Hydrological Calculations

Flood Estimation Report #16245 (M01959-12 Cavan Regional Sports)



Generated 12-02-2024 21:16

Subject site

Attributes

Name	Unit	Value
Coordinate [X]		-819385.255128709
Coordinate [Y]		7167888.43076296
Distance	km	18.0607439265038
Station Number		36_1920_3
Location		
Water Body		
Catchment		
Hydrometric Area		
Organisation		
FSU Rating Classification		
Drainage works	year	
Contributing Catchment Area	km ²	58.697
Center Northing	m	302800
Center Easting	m	243540
Northing	m	304485
Easting	m	241987
A-Max series gap in years	year	
A-Max series number of years	year	
A-Max series number of usable years	year	
A-Max series end year	year	
A-Max series start year	year	
FARL		0.954
ALLUV		0.0456
PEAT		0.0101
FOREST		0.0206
PASTURE		0.94
S1085	m/km	5.36482
MSL	km	14.11
DRAIND	km/km ²	1.098
ALTBAR		112.1
NETLEN	km	64.463
T4		

T3		
SAAPE	mm	474.02
T2		
ARTDRAIN2		0
ARTDRAIN		0
TAYSLO		0.409516
STMFRQ		65
BFISOIL		0.473103095
SAAR	mm	910.42
RWSEG_CD		36_1920
TOP_RWSEG		
Bankfull		
HGF	m ³ /s	
MAF	m ³ /s	
FAI		0.0981
FLATWET		0.67
URBEXT		0.0387
HGF/QMED		
centroidx3857		-816526.378213119
centroidy3857		7165001.66891185
x3857		-819385.255128709
y3857		7167888.43076296

Pivotal site

Attributes

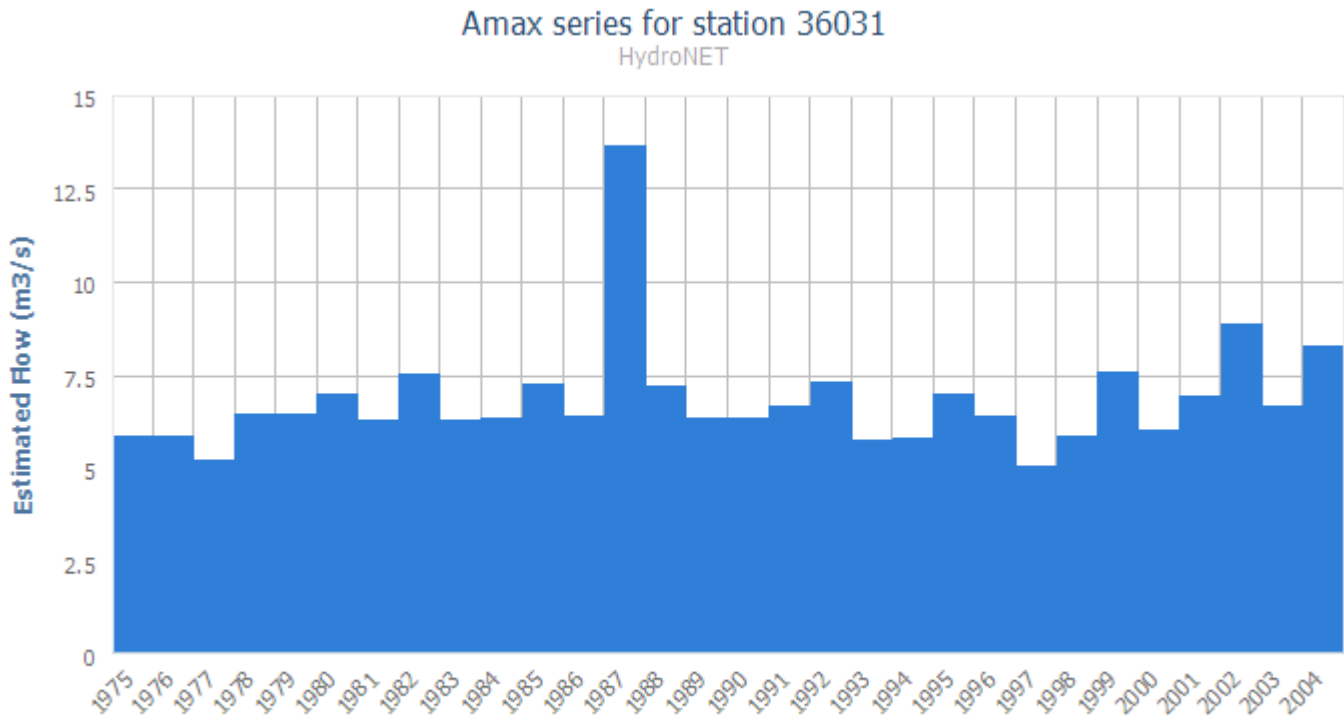
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Coordinate [X]		-820096.210458291
Coordinate [Y]		7170943.61638954
Station Number		36031
Location		LISDARN
Water Body		CAVAN
Catchment		Erne
Hydrometric Area		36
Organisation		EPA
FSU Rating Classification		A2
Drainage works	year	0
Contributing Catchment Area	km ²	63.7688
Center Northing	m	302970
Center Easting	m	243540
Northing	m	306277
Easting	m	241552
A-Max series gap in years	year	0
A-Max series number of years	year	30
A-Max series number of usable years	year	30
A-Max series end year	year	2004
A-Max series start year	year	1975
FARL		0.958
ALLUV		0.0433
PEAT		0.0093
FOREST		0.0209
PASTURE		0
S1085	m/km	4.25148
MSL	km	16.214
DRAIN	km/km ²	1.122
ALTBAR		0
NETLEN	km	71.538
T4		0.3911975202391
T3		0.36531416838206
SAAPE	mm	474.07
T2		0.09759481357109
ARTDRAIN2		0
ARTDRAIN		0
TAYSLO		0.404151
STMFRQ		67
BFISOIL		0.481
SAAR	mm	910.43
RWSEG_CD		36_1921
TOP_RWSEG		36_1916
Bankfull		?
HGF	m ³ /s	7.35
MAF	m ³ /s	6.8
FAI		0.1
FLATWET		0.67
URBEXT		0.06
HGF/QMED		1.1395348837209
x3857		-820096.210458291
y3857		7170943.61638954

centroidx3857		-816647.475950468
centroidy3857		7165485.10716699
Distance	km	0.498374566495689

Map



Amax Series Chart



QMED Estimates

Subject rural QMED	10.41
Subject urban QMED	11.01
Pivotal gauged QMED	6.45
Pivotal adjustment factor QMED	0.55
Subject adjusted QMED	6.04

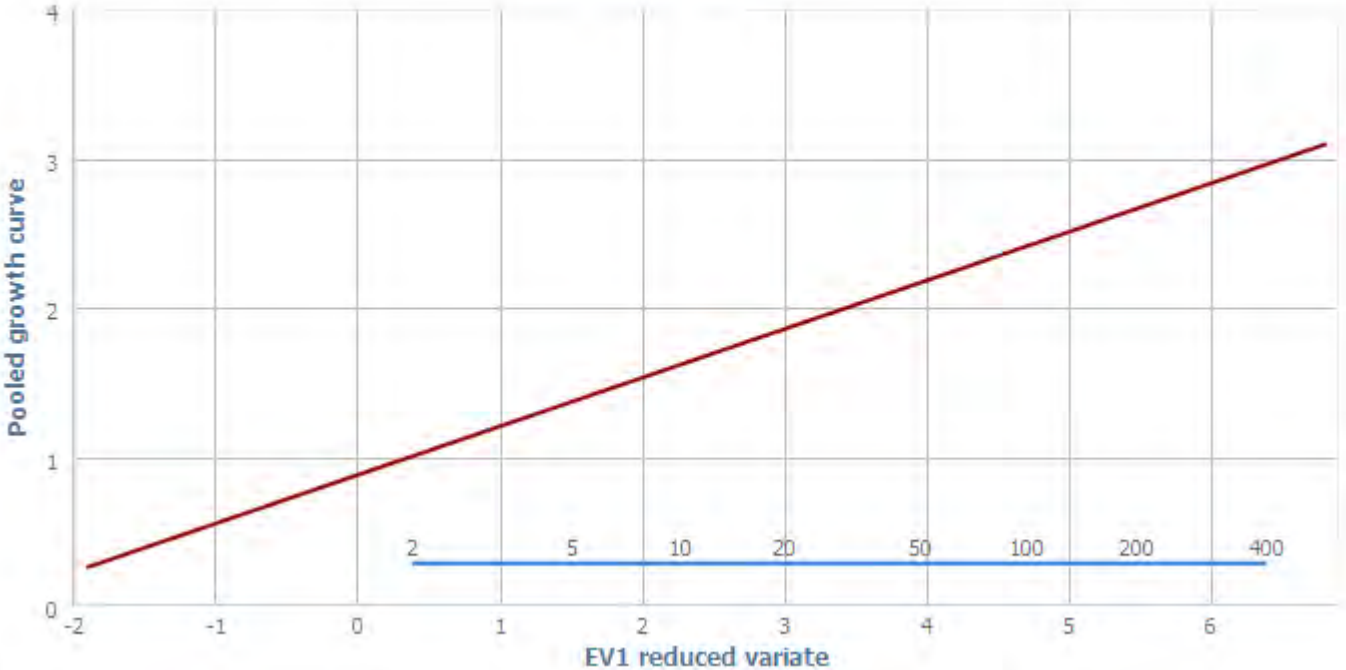
Pooling Group

Station	Amax years
36031 LISDARN	30
06033 CONEYBURROW BR.	25
08003 FIELDSTOWN	18
24022 HOSPITAL	20
11001 BOLEANY	33
06031 CURRALHIR	18
08008 BROADMEADOW	25
09010 WALDRONS BRIDGE	19
26022 KILMORE	33
08007 ASHBOURNE	15

26009 BELLANTRA BR.	35
07033 VIRGINIA HATCHERY	25
08012 BALLYBOGHIL	19
26020 ARGAR	33
07006 FYANSTOWN	19
25005 SUNVILLE	46
08011 DULEEK D/S	23
08009 BALHEARY	15
24004 BRUREE	52

Selected Flood Growth Curve

Flood growth curve



Pooled growth curve	EV1 reduced variate
0.26	-1.92
0.31	-1.75
0.34	-1.66
0.36	-1.6
0.38	-1.55
0.39	-1.51
0.4	-1.47
0.41	-1.43
0.42	-1.4
0.43	-1.38
0.44	-1.35
0.45	-1.33
0.45	-1.31
0.46	-1.28
0.47	-1.26
0.47	-1.25
0.48	-1.23
0.49	-1.21
0.49	-1.19
0.5	-1.18
0.5	-1.16
0.51	-1.15
0.51	-1.13
0.52	-1.12
0.52	-1.11
0.52	-1.09
0.53	-1.08
0.53	-1.07
0.54	-1.05

0.54	-1.04
0.54	-1.03
0.55	-1.02
0.55	-1.01
0.56	-1
0.56	-0.99
0.56	-0.97
0.57	-0.96
0.57	-0.95
0.57	-0.94
0.58	-0.93
0.58	-0.92
0.58	-0.91
0.59	-0.9
0.59	-0.89
0.59	-0.89
0.59	-0.88
0.6	-0.87
0.6	-0.86
0.6	-0.85
0.61	-0.84
0.61	-0.83
0.61	-0.82
0.61	-0.81
0.62	-0.81
0.62	-0.8
0.62	-0.79
0.63	-0.78
0.63	-0.77
0.63	-0.77
0.63	-0.76
0.64	-0.75
0.64	-0.74
0.64	-0.73
0.64	-0.73
0.65	-0.72
0.65	-0.71
0.65	-0.7
0.65	-0.7
0.66	-0.69
0.66	-0.68
0.66	-0.68
0.66	-0.67
0.67	-0.66
0.67	-0.65
0.67	-0.65
0.67	-0.64
0.67	-0.63
0.68	-0.63
0.68	-0.62
0.68	-0.61
0.68	-0.61
0.69	-0.6
0.69	-0.59
0.69	-0.59
0.69	-0.58
0.69	-0.57

0.7	-0.57
0.7	-0.56
0.7	-0.55
0.7	-0.55
0.7	-0.54
0.71	-0.53
0.71	-0.53
0.71	-0.52
0.71	-0.51
0.72	-0.51
0.72	-0.5
0.72	-0.49
0.72	-0.49
0.72	-0.48
0.73	-0.48
0.73	-0.47
0.73	-0.46
0.73	-0.46
0.73	-0.45
0.74	-0.45
0.74	-0.44
0.74	-0.43
0.74	-0.43
0.74	-0.42
0.75	-0.42
0.75	-0.41
0.75	-0.4
0.75	-0.4
0.75	-0.39
0.75	-0.39
0.76	-0.38
0.76	-0.37
0.76	-0.37
0.76	-0.36
0.76	-0.36
0.77	-0.35
0.77	-0.35
0.77	-0.34
0.77	-0.33
0.77	-0.33
0.78	-0.32
0.78	-0.32
0.78	-0.31
0.78	-0.31
0.78	-0.3
0.78	-0.29
0.79	-0.29
0.79	-0.28
0.79	-0.28
0.79	-0.27
0.79	-0.27
0.8	-0.26
0.8	-0.25
0.8	-0.25
0.8	-0.24
0.8	-0.24
0.8	-0.23

0.81	-0.23
0.81	-0.22
0.81	-0.22
0.81	-0.21
0.81	-0.2
0.82	-0.2
0.82	-0.19
0.82	-0.19
0.82	-0.18
0.82	-0.18
0.82	-0.17
0.83	-0.17
0.83	-0.16
0.83	-0.15
0.83	-0.15
0.83	-0.14
0.84	-0.14
0.84	-0.13
0.84	-0.13
0.84	-0.12
0.84	-0.12
0.84	-0.11
0.85	-0.11
0.85	-0.1
0.85	-0.09
0.85	-0.09
0.85	-0.08
0.85	-0.08
0.86	-0.07
0.86	-0.07
0.86	-0.06
0.86	-0.06
0.86	-0.05
0.87	-0.05
0.87	-0.04
0.87	-0.04
0.87	-0.03
0.87	-0.02
0.87	-0.02
0.88	-0.01
0.88	-0.01
0.88	0
0.88	0
0.88	0.01
0.88	0.01
0.89	0.02
0.89	0.02
0.89	0.03
0.89	0.03
0.89	0.04
0.9	0.05
0.9	0.05
0.9	0.06
0.9	0.06
0.9	0.07
0.9	0.07
0.91	0.08

0.91	0.08
0.91	0.09
0.91	0.09
0.91	0.1
0.91	0.11
0.92	0.11
0.92	0.12
0.92	0.12
0.92	0.13
0.92	0.13
0.93	0.14
0.93	0.14
0.93	0.15
0.93	0.15
0.93	0.16
0.93	0.17
0.94	0.17
0.94	0.18
0.94	0.18
0.94	0.19
0.94	0.19
0.95	0.2
0.95	0.2
0.95	0.21
0.95	0.21
0.95	0.22
0.95	0.23
0.96	0.23
0.96	0.24
0.96	0.24
0.96	0.25
0.96	0.25
0.97	0.26
0.97	0.26
0.97	0.27
0.97	0.28
0.97	0.28
0.97	0.29
0.98	0.29
0.98	0.3
0.98	0.3
0.98	0.31
0.98	0.32
0.99	0.32
0.99	0.33
0.99	0.33
0.99	0.34
0.99	0.34
0.99	0.35
1	0.36
1	0.36
1	0.37
1	0.37
1	0.38
1.01	0.38
1.01	0.39
1.01	0.4

1.01	0.4
1.01	0.41
1.02	0.41
1.02	0.42
1.02	0.42
1.02	0.43
1.02	0.44
1.02	0.44
1.03	0.45
1.03	0.45
1.03	0.46
1.03	0.47
1.03	0.47
1.04	0.48
1.04	0.48
1.04	0.49
1.04	0.5
1.04	0.5
1.05	0.51
1.05	0.51
1.05	0.52
1.05	0.53
1.05	0.53
1.06	0.54
1.06	0.54
1.06	0.55
1.06	0.56
1.06	0.56
1.07	0.57
1.07	0.57
1.07	0.58
1.07	0.59
1.07	0.59
1.08	0.6
1.08	0.61
1.08	0.61
1.08	0.62
1.08	0.62
1.09	0.63
1.09	0.64
1.09	0.64
1.09	0.65
1.09	0.66
1.1	0.66
1.1	0.67
1.1	0.68
1.1	0.68
1.11	0.69
1.11	0.7
1.11	0.7
1.11	0.71
1.11	0.72
1.12	0.72
1.12	0.73
1.12	0.74
1.12	0.74
1.12	0.75

1.13	0.76
1.13	0.76
1.13	0.77
1.13	0.78
1.14	0.78
1.14	0.79
1.14	0.8
1.14	0.8
1.14	0.81
1.15	0.82
1.15	0.82
1.15	0.83
1.15	0.84
1.16	0.85
1.16	0.85
1.16	0.86
1.16	0.87
1.17	0.87
1.17	0.88
1.17	0.89
1.17	0.9
1.18	0.9
1.18	0.91
1.18	0.92
1.18	0.93
1.18	0.93
1.19	0.94
1.19	0.95
1.19	0.96
1.19	0.96
1.2	0.97
1.2	0.98
1.2	0.99
1.2	0.99
1.21	1
1.21	1.01
1.21	1.02
1.21	1.03
1.22	1.03
1.22	1.04
1.22	1.05
1.23	1.06
1.23	1.07
1.23	1.07
1.23	1.08
1.24	1.09
1.24	1.1
1.24	1.11
1.24	1.12
1.25	1.12
1.25	1.13
1.25	1.14
1.26	1.15
1.26	1.16
1.26	1.17
1.26	1.18
1.27	1.18

1.27	1.19
1.27	1.2
1.28	1.21
1.28	1.22
1.28	1.23
1.28	1.24
1.29	1.25
1.29	1.26
1.29	1.27
1.3	1.28
1.3	1.29
1.3	1.29
1.31	1.3
1.31	1.31
1.31	1.32
1.32	1.33
1.32	1.34
1.32	1.35
1.32	1.36
1.33	1.37
1.33	1.38
1.33	1.39
1.34	1.4
1.34	1.41
1.34	1.42
1.35	1.44
1.35	1.45
1.36	1.46
1.36	1.47
1.36	1.48
1.37	1.49
1.37	1.5
1.37	1.51
1.38	1.52
1.38	1.53
1.38	1.55
1.39	1.56
1.39	1.57
1.4	1.58
1.4	1.59
1.4	1.61
1.41	1.62
1.41	1.63
1.42	1.64
1.42	1.65
1.42	1.67
1.43	1.68
1.43	1.69
1.44	1.71
1.44	1.72
1.45	1.73
1.45	1.75
1.45	1.76
1.46	1.77
1.46	1.79
1.47	1.8
1.47	1.82

1.48	1.83
1.48	1.84
1.49	1.86
1.49	1.87
1.5	1.89
1.5	1.91
1.51	1.92
1.51	1.94
1.52	1.95
1.52	1.97
1.53	1.99
1.53	2
1.54	2.02
1.54	2.04
1.55	2.05
1.56	2.07
1.56	2.09
1.57	2.11
1.57	2.13
1.58	2.15
1.59	2.16
1.59	2.18
1.6	2.2
1.61	2.22
1.61	2.25
1.62	2.27
1.63	2.29
1.63	2.31
1.64	2.33
1.65	2.35
1.66	2.38
1.66	2.4
1.67	2.43
1.68	2.45
1.69	2.48
1.7	2.5
1.7	2.53
1.71	2.56
1.72	2.58
1.73	2.61
1.74	2.64
1.75	2.67
1.76	2.7
1.77	2.74
1.78	2.77
1.79	2.8
1.81	2.84
1.82	2.88
1.83	2.91
1.84	2.95
1.86	2.99
1.87	3.04
1.88	3.08
1.9	3.13
1.92	3.18
1.93	3.23
1.95	3.28

1.97	3.34
1.99	3.4
2.01	3.46
2.03	3.53
2.05	3.6
2.08	3.68
2.11	3.76
2.14	3.85
2.17	3.95
2.21	4.07
2.25	4.19
2.29	4.33
2.35	4.5
2.41	4.7
2.49	4.95
2.6	5.28
2.76	5.77
3.1	6.8

Adopted Growth Factors

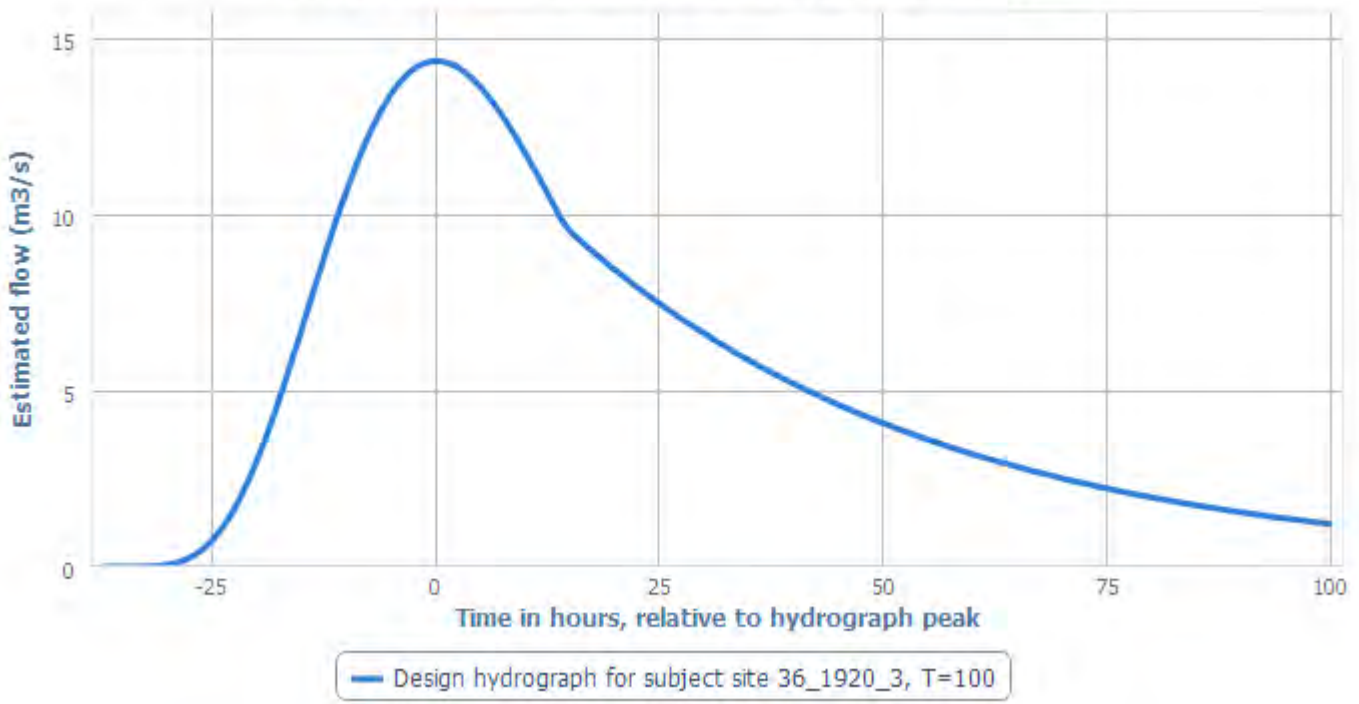
Return Period	Growth Factor	Design Peak Flow (m ³ /s)
1.3	0.76	4.59
2	1	6.04
5	1.37	8.27
10	1.61	9.72
20	1.85	11.17
30	1.98	11.95
50	2.15	12.98
100	2.38	14.37
200	2.61	15.76
500	2.91	17.57
1000	3.13	18.9

Hydrograph Width Estimation Summary

Name	Value
Pivotal site	22003 "RIVERVILLE"
Adjustment type	The user adopted the original PCD hydrograph
Transfer type	The user adjusted the subject site estimate with the pivotal site deformation factor
Deformation factor	1
Custom deformation factor	1
Accepted n	7.64678533529802
Accepted Tr	37.1981178610436
Accepted C	41.2373266191123

Return Period: 100

Design hydrograph for subject site 36_1920_3, T=100



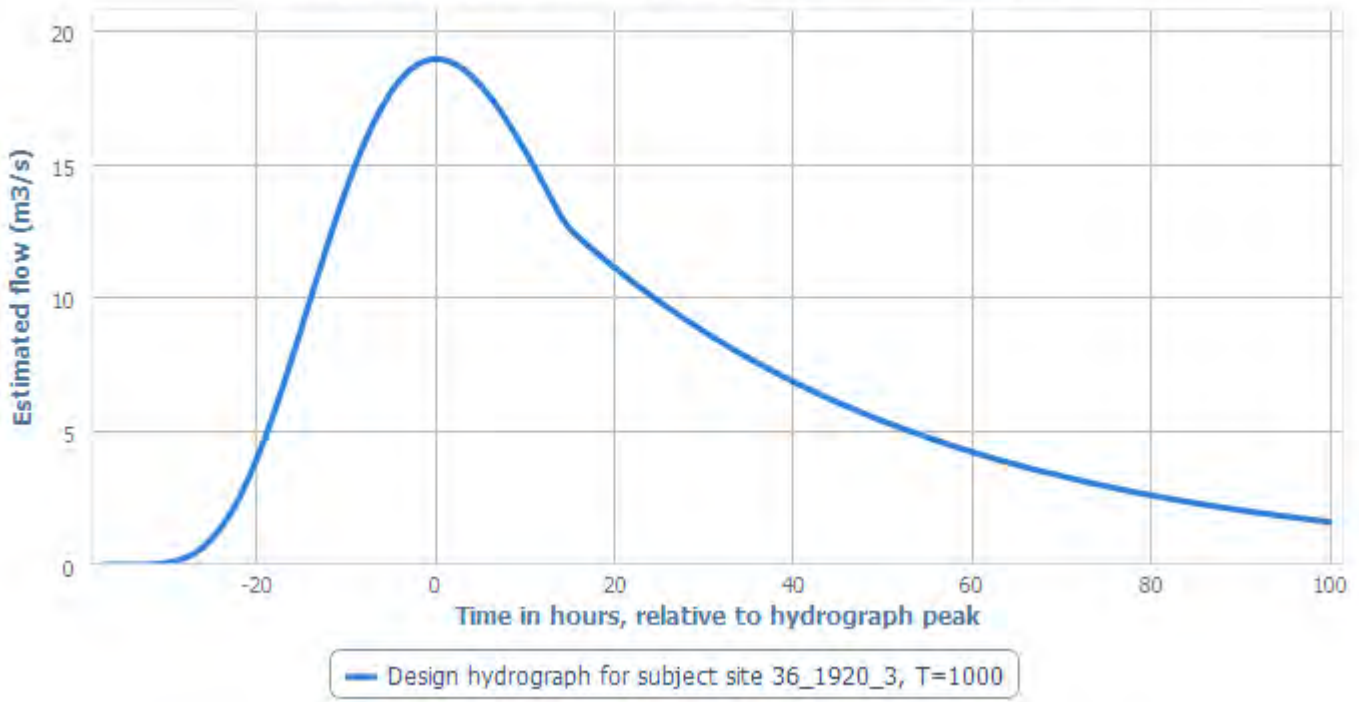
Hours relative to hydrograph peak	Estimated flow (m3/s)
-37.2	0
-37	0
-36	0
-35	0
-34	0
-33	0
-32	0.01
-31	0.02
-30	0.06
-29	0.11
-28	0.2
-27	0.33
-26	0.51
-25	0.76
-24	1.07
-23	1.45
-22	1.91
-21	2.44
-20	3.04
-19	3.7
-18	4.41
-17	5.17
-16	5.97
-15	6.78
-14	7.6
-13	8.41
-12	9.21
-11	9.98
-10	10.7
-9	11.38
-8	12

-7	12.55
-6	13.04
-5	13.45
-4	13.78
-3	14.04
-2	14.23
-1	14.33
0	14.37
1	14.33
2	14.24
3	14.08
4	13.86
5	13.6
6	13.29
7	12.94
8	12.56
9	12.15
10	11.71
11	11.26
12	10.8
13	10.32
14	9.84
15	9.5
16	9.28
17	9.05
18	8.84
19	8.62
20	8.42
21	8.22
22	8.02
23	7.83
24	7.64
25	7.46
26	7.28
27	7.1
28	6.93
29	6.77
30	6.61
31	6.45
32	6.29
33	6.14
34	5.99
35	5.85
36	5.71
37	5.57
38	5.44
39	5.31
40	5.18
41	5.06
42	4.94
43	4.82
44	4.7
45	4.59
46	4.48
47	4.37
48	4.27
49	4.17

50	4.07
51	3.97
52	3.87
53	3.78
54	3.69
55	3.6
56	3.52
57	3.43
58	3.35
59	3.27
60	3.19
61	3.11
62	3.04
63	2.97
64	2.9
65	2.83
66	2.76
67	2.69
68	2.63
69	2.57
70	2.5
71	2.44
72	2.39
73	2.33
74	2.27
75	2.22
76	2.16
77	2.11
78	2.06
79	2.01
80	1.96
81	1.92
82	1.87
83	1.83
84	1.78
85	1.74
86	1.7
87	1.66
88	1.62
89	1.58
90	1.54
91	1.5
92	1.47
93	1.43
94	1.4
95	1.37
96	1.33
97	1.3
98	1.27
99	1.24
100	1.21

Return Period: 1000

Design hydrograph for subject site 36_1920_3, T=1000



Hours relative to hydrograph peak	Estimated flow (m3/s)
-37.2	0
-37	0
-36	0
-35	0
-34	0
-33	0
-32	0.01
-31	0.03
-30	0.07
-29	0.15
-28	0.26
-27	0.43
-26	0.67
-25	1
-24	1.41
-23	1.91
-22	2.51
-21	3.21
-20	4
-19	4.87
-18	5.81
-17	6.81
-16	7.85
-15	8.92
-14	10
-13	11.07
-12	12.12
-11	13.13
-10	14.09
-9	14.98
-8	15.79

-7	16.52
-6	17.16
-5	17.7
-4	18.14
-3	18.48
-2	18.72
-1	18.86
0	18.91
1	18.86
2	18.73
3	18.52
4	18.24
5	17.89
6	17.49
7	17.03
8	16.52
9	15.98
10	15.41
11	14.82
12	14.21
13	13.58
14	12.95
15	12.51
16	12.21
17	11.91
18	11.63
19	11.35
20	11.08
21	10.81
22	10.55
23	10.3
24	10.05
25	9.81
26	9.58
27	9.35
28	9.12
29	8.91
30	8.69
31	8.48
32	8.28
33	8.08
34	7.89
35	7.7
36	7.52
37	7.34
38	7.16
39	6.99
40	6.82
41	6.66
42	6.5
43	6.34
44	6.19
45	6.04
46	5.9
47	5.76
48	5.62
49	5.48

50	5.35
51	5.22
52	5.1
53	4.98
54	4.86
55	4.74
56	4.63
57	4.52
58	4.41
59	4.3
60	4.2
61	4.1
62	4
63	3.9
64	3.81
65	3.72
66	3.63
67	3.54
68	3.46
69	3.38
70	3.3
71	3.22
72	3.14
73	3.06
74	2.99
75	2.92
76	2.85
77	2.78
78	2.71
79	2.65
80	2.59
81	2.52
82	2.46
83	2.4
84	2.35
85	2.29
86	2.24
87	2.18
88	2.13
89	2.08
90	2.03
91	1.98
92	1.93
93	1.89
94	1.84
95	1.8
96	1.75
97	1.71
98	1.67
99	1.63
100	1.59

Audit Trail Report #16245 (M01959-12 Cavan Regional Sports)



User ID:	duncan.hartwick@mccloyconsulting.ie
Name:	Hartwick, Duncan
Company:	
Address:	
Report date & time:	12-02-2024 21:17
Start of Calculation:	04-01-2024 20:29

Decisions made by the user:

Decision	User comment	System information	Date
2.1 Subject site accepted	N/A	Location 36_1920_3	04-01-2024 20:52
2.4 Pivotal site accepted	Reason for accepting: Gauged location directly downstream of the subject site Reason for ignoring warnings:	Station: 36031 LISDARN	04-01-2024 20:58
2.8 QMED data transfer performed	N/A		04-01-2024 22:01
2.11 Pooling group accepted	N/A	Pooled group accepted with the following stations: [36031, 06033, 08003, 24022, 11001, 06031, 08008, 09010, 26022, 08007, 26009, 07033, 08012, 26020, 07006, 25005, 08011, 08009, 24004] and distribution: EV1	04-01-2024 22:15
2.13 Module 2 finalized	N/A	Finished pooled analysis with the following distribution selected: EV1.	04-01-2024 22:21

2.1 Subject site accepted	N/A	Location 36_1920_3	04-01-2024 22:21
2.4 Pivotal site accepted	Reason for accepting: Gauged location directly downstream of the subject site Reason for ignoring warnings:	Station: 36031 LISDARN	04-01-2024 22:22
2.8 QMED data transfer performed	N/A		04-01-2024 22:23
2.11 Pooling group accepted	N/A	Pooled group accepted with the following stations: [36031, 06033, 08003, 24022, 11001, 06031, 08008, 09010, 26022, 08007, 26009, 07033, 08012, 26020, 07006, 25005, 08011, 08009, 24004] and distribution: EV1	04-01-2024 22:24
2.13 Module 2 finalized	N/A	Finished pooled analysis with the following distribution selected: EV1.	04-01-2024 22:25
3.1 Hydrograph pivotal site rejected	Hydrologically closest	Station: 22003 RIVERVILLE	04-01-2024 22:30
3.3 Proceeded from hydrograph display	N/A		04-01-2024 22:32
3.3 Proceeded from hydrograph display	N/A		04-01-2024 22:32
3.4 Hydrograph inspected and adjusted	N/A	The user adopted the original PCD hydrograph	08-01-2024 16:03
3.5 Hydrograph transferred to subject site	N/A	The user adjusted the subject site estimate with n = 7.64678533529802, Tr = 37.1981178610436, C = 41.2373266191123	08-01-2024 16:04

Appendix E

Flood Maps

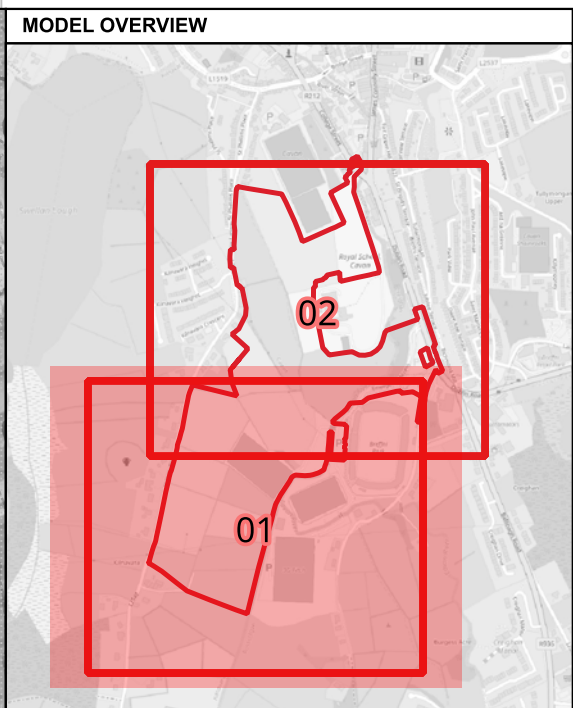
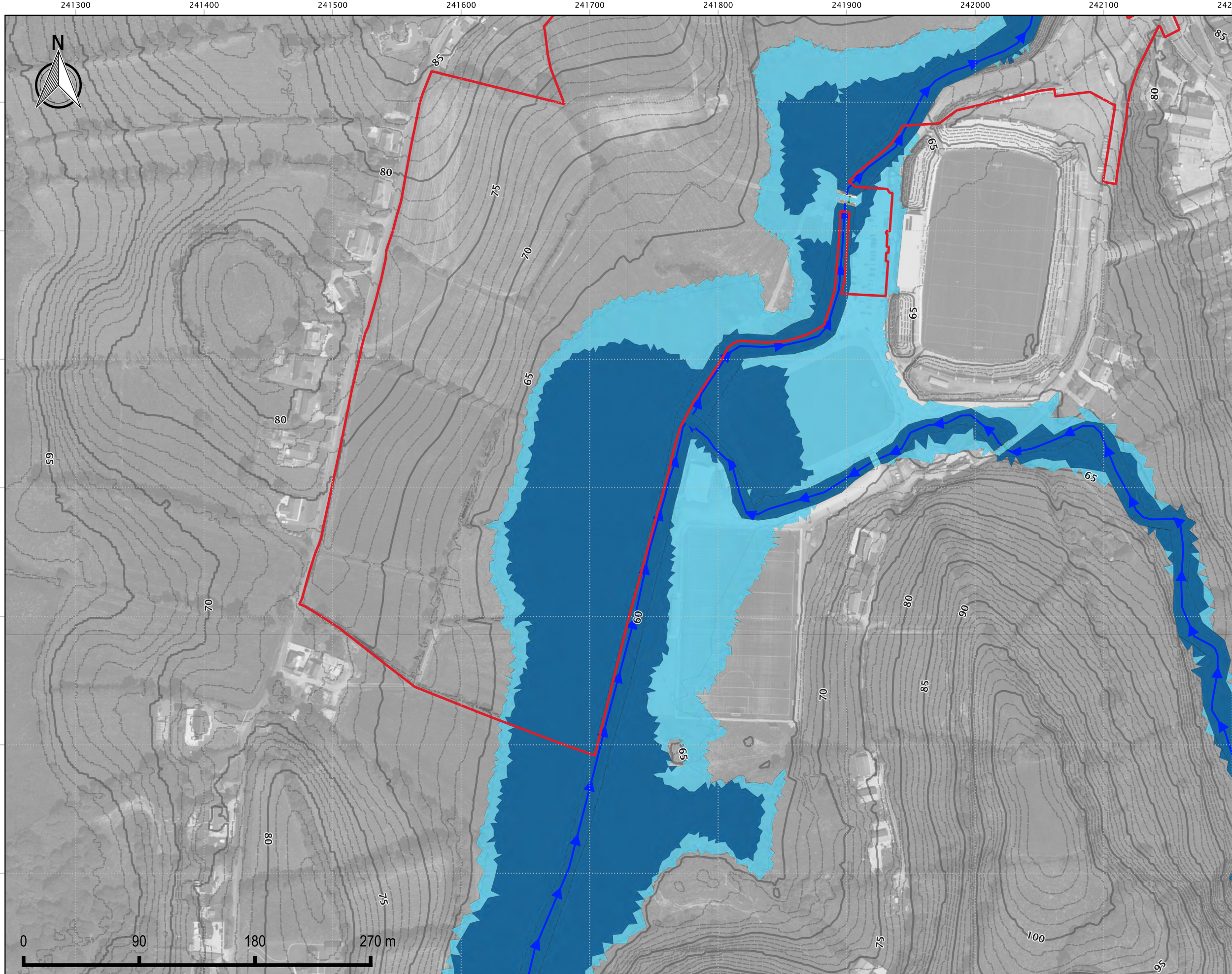
[FL100 Series - Flood Zone Mapping](#)

[FL 200 SERIES - Flood Extent by Depth - Proposed Scenario - 1% PD](#)

[FL 300 SERIES - Flood Extent by Depth - Proposed Scenario - 0.1% PD](#)

[FL 400 SERIES - Flood Extent by Depth - Proposed Scenario - 1% MRFS](#)

[FL 500 SERIES - Flood Extent by Depth - Proposed Scenario - 0.1% MRFS](#)



LEGEND

	SITE BOUNDARY
	CONDUIT
	OPEN WATERCOURSE
	1% AEP / FLOOD ZONE A
	0.1% AEP / FLOOD ZONE B

NOTES

1. ALL LEVELS INDICATED ARE TO ORDNANCE DATUM BELFAST.
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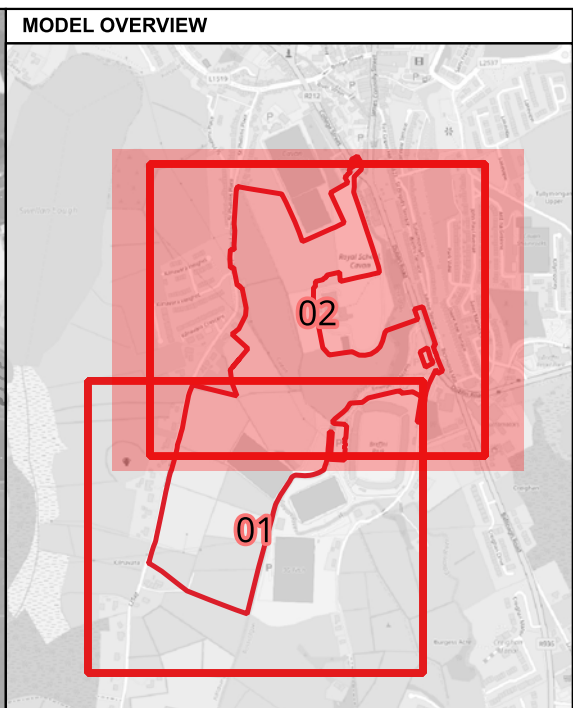
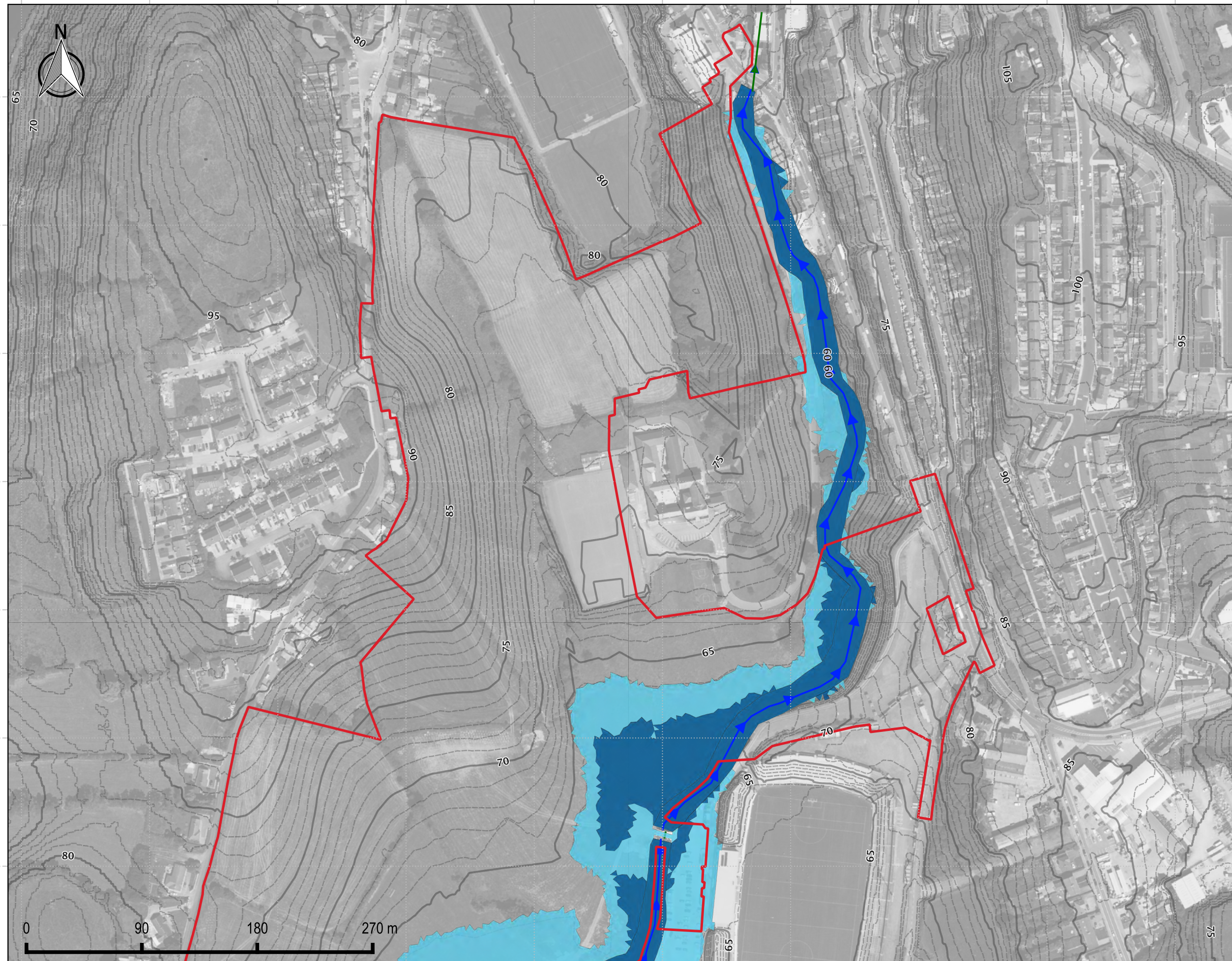
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W: www.mcclloyconsulting.ie

PROJECT CAVAN REGIONAL SPORTS CAMPUS		HYDROLOGY SCENARIO PRESENT DAY	SCALE AS SHOWN	ORIGINAL SIZE A3
MAP TYPE FLOOD ZONE MAP		GEOMETRY SCENARIO PRESENT DAY	DRAWN BY AS	APPROVED BY DKS
SOURCE FLUVIAL	FLOOD EVENT 1% / 0.1% AEP	FIGURE NUMBER M01959-12_FL101	REVISION 2	DATE 23/02/2024

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LEGEND

	SITE BOUNDARY
	CONDUIT
	OPEN WATERCOURSE
	1% AEP / FLOOD ZONE A
	0.1% AEP / FLOOD ZONE B

- ### NOTES
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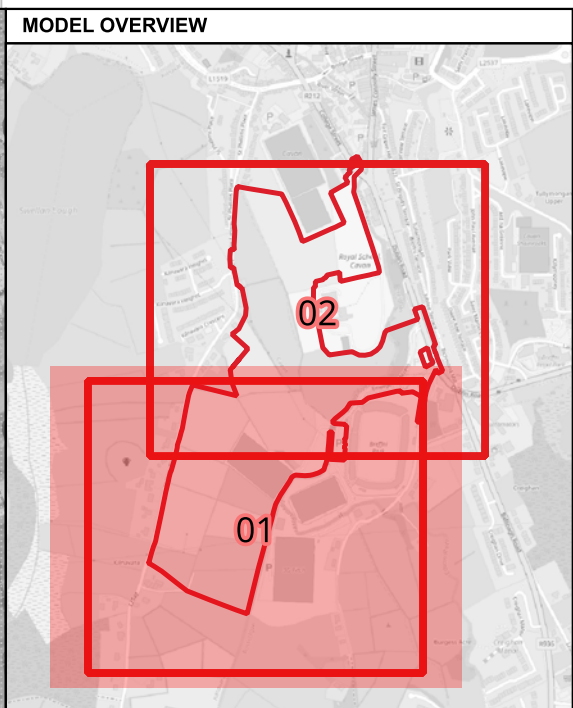
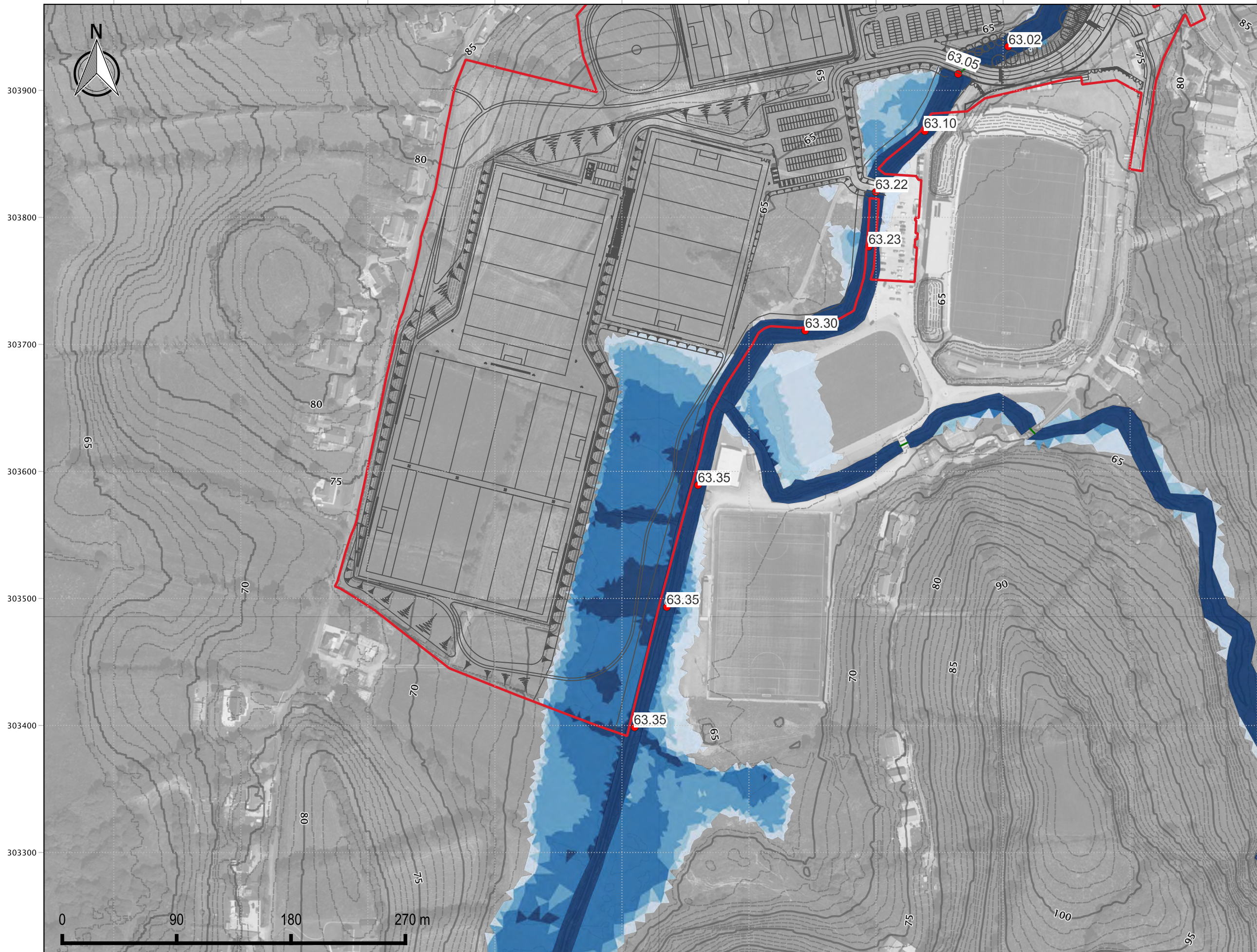
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PROJECT CAVAN REGIONAL SPORTS CAMPUS		HYDROLOGY SCENARIO PRESENT DAY	SCALE AS SHOWN	ORIGINAL SIZE A3
MAP TYPE FLOOD ZONE MAP		GEOMETRY SCENARIO PRESENT DAY	DRAWN BY AS	APPROVED BY DKS
SOURCE FLUVIAL	FLOOD EVENT 1% / 0.1% AEP	FIGURE NUMBER M01959-12_FL102	REVISION 2	DATE 23/02/2024

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LEGEND

- SITE BOUNDARY
- CONDUIT
- OPEN WATERCOURSE
- FLOOD LEVEL (m OD)
- FLOOD EXTENT Banded BY DEPTH (m)
 - < 0.3
 - 0.30 - 0.50
 - 0.50 - 1.00
 - 1.00 - 1.50
 - > 1.5

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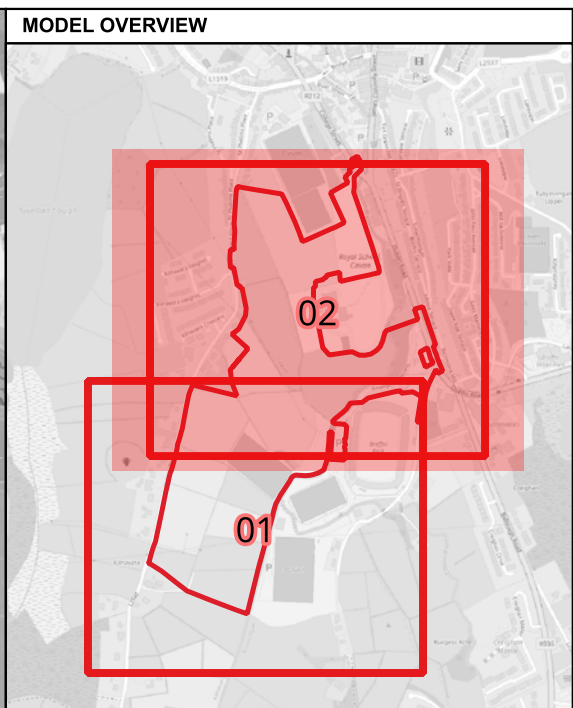
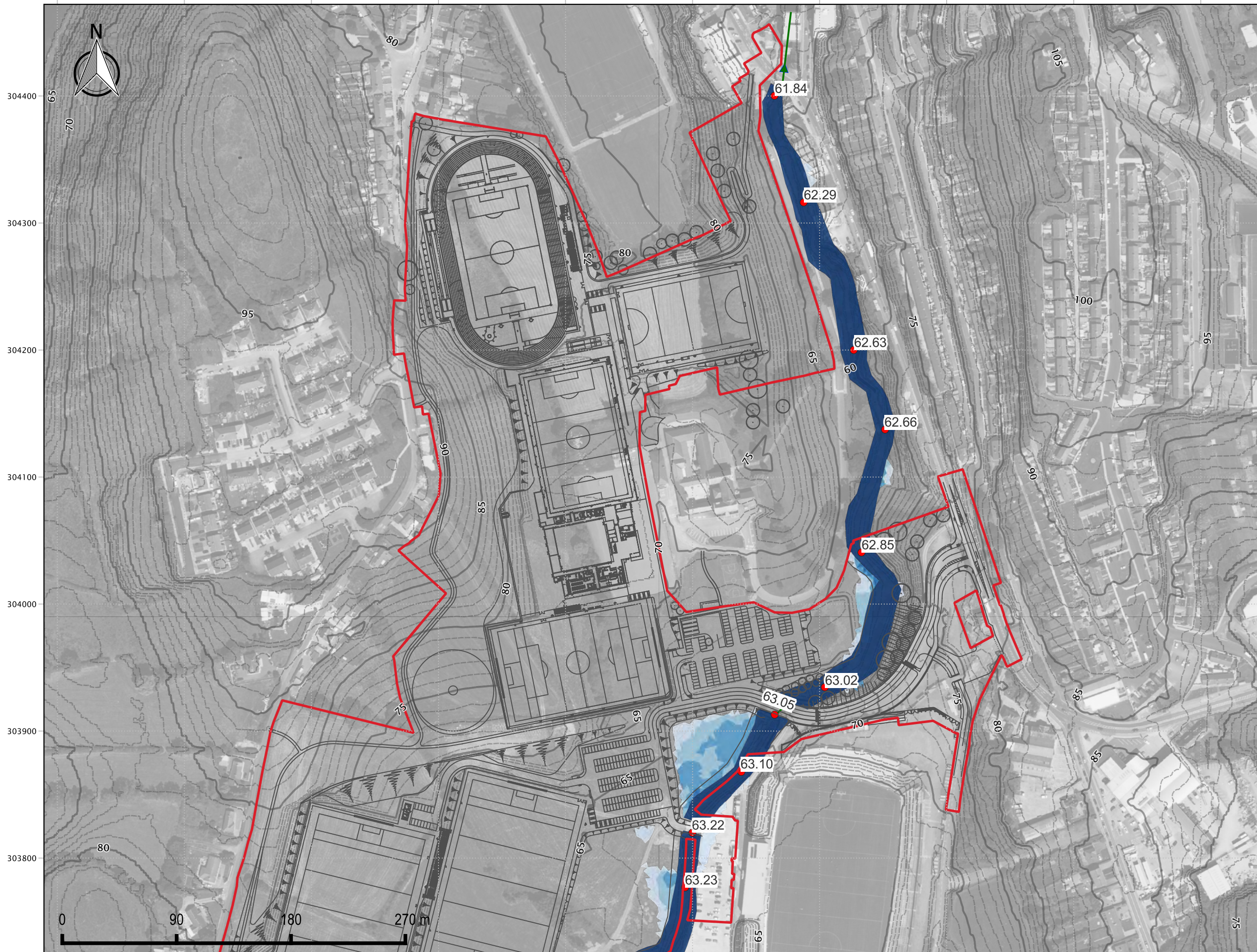
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PROJECT CAVAN REGIONAL SPORTS CAMPUS		HYDROLOGY SCENARIO PRESENT DAY		SCALE AS SHOWN	ORIGINAL SIZE A3
MAP TYPE FLOOD EXTENTS / DEPTH MAPPING		GEOMETRY SCENARIO PROPOSED		DRAWN BY BM	APPROVED BY DKS
SOURCE FLUVIAL	FLOOD EVENT 1% AEP	FIGURE NUMBER M01959-12_FL201		REVISION 2	DATE 23/02/2024

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LEGEND

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- CONDUIT
- OPEN WATERCOURSE
- FLOOD LEVEL (m OD)
- FLOOD EXTENT BANDED BY DEPTH (m)
 - < 0.3
 - 0.30 - 0.50
 - 0.50 - 1.00
 - 1.00 - 1.50
 - > 1.5

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PROJECT CAVAN REGIONAL SPORTS CAMPUS	
MAP TYPE FLOOD EXTENTS / DEPTH MAPPING	
SOURCE FLUVIAL	FLOOD EVENT 1% AEP

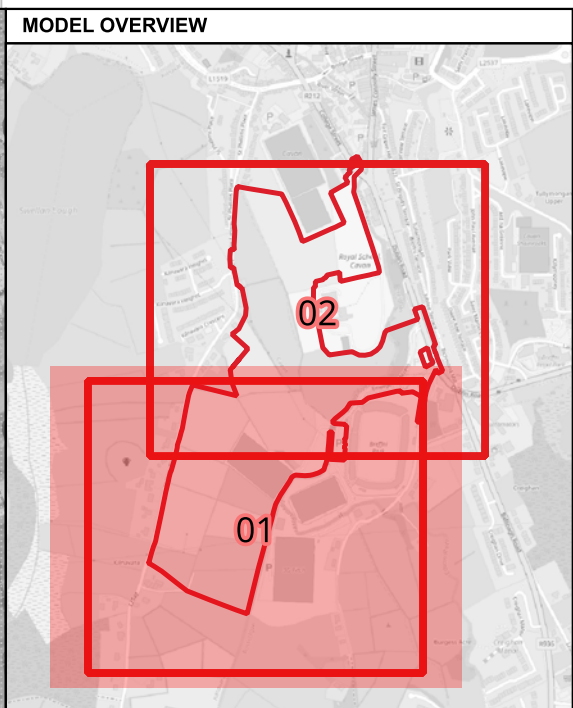
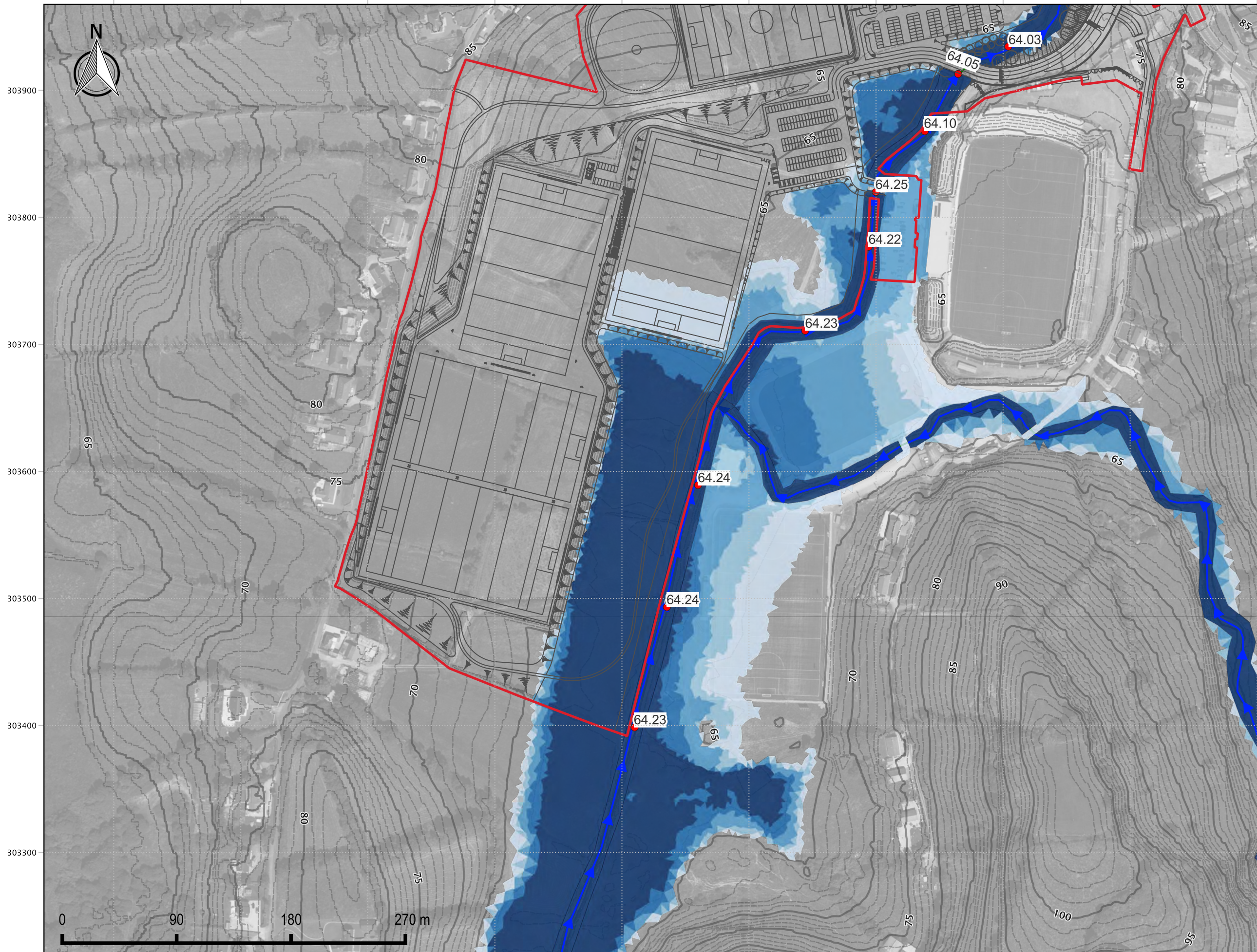
HYDROLOGY SCENARIO PRESENT DAY	GEOMETRY SCENARIO PROPOSED
FIGURE NUMBER M01959-12_FL202	

SCALE AS SHOWN	ORIGINAL SIZE A3
DRAWN BY BM	APPROVED BY DKS
REVISION 2	DATE 23/02/2024

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241300 241400 241500 241600 241700 241800 241900 242000 242100 242200



LEGEND

- SITE BOUNDARY
- CONDUIT
- OPEN WATERCOURSE
- FLOOD LEVEL (m OD)
- FLOOD EXTENT Banded BY DEPTH (m)
 - < 0.3
 - 0.30 - 0.50
 - 0.50 - 1.00
 - 1.00 - 1.50
 - > 1.5

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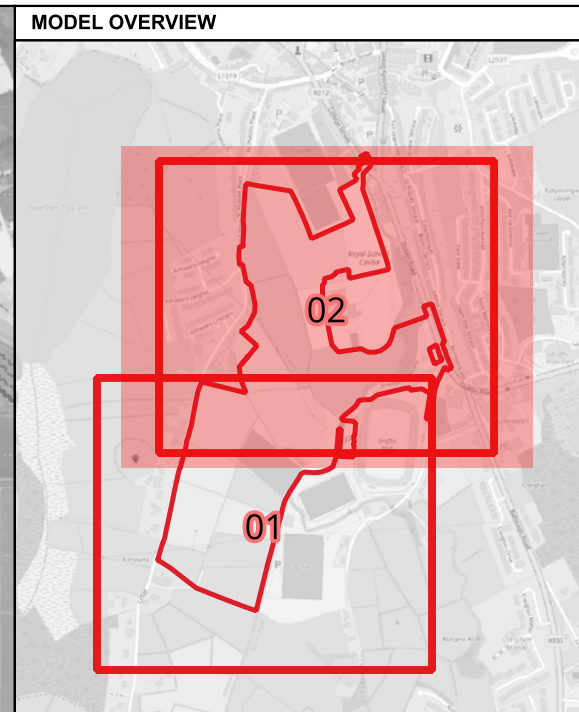
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MAP TYPE FLOOD EXTENTS / DEPTH MAPPING		GEOMETRY SCENARIO PROPOSED		DRAWN BY BM	APPROVED BY DKS
SOURCE FLUVIAL	FLOOD EVENT 0.1% AEP	FIGURE NUMBER M01959-12_FL301		REVISION 2	DATE 23/02/2024

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LEGEND

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- CONDUIT
- OPEN WATERCOURSE
- FLOOD LEVEL (m OD)
- FLOOD EXTENT BANDED BY DEPTH (m)
 - < 0.3
 - 0.30 - 0.50
 - 0.50 - 1.00
 - 1.00 - 1.50
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PROJECT CAVAN REGIONAL SPORTS CAMPUS	
MAP TYPE FLOOD EXTENTS / DEPTH MAPPING	
SOURCE FLUVIAL	FLOOD EVENT 0.1% AEP

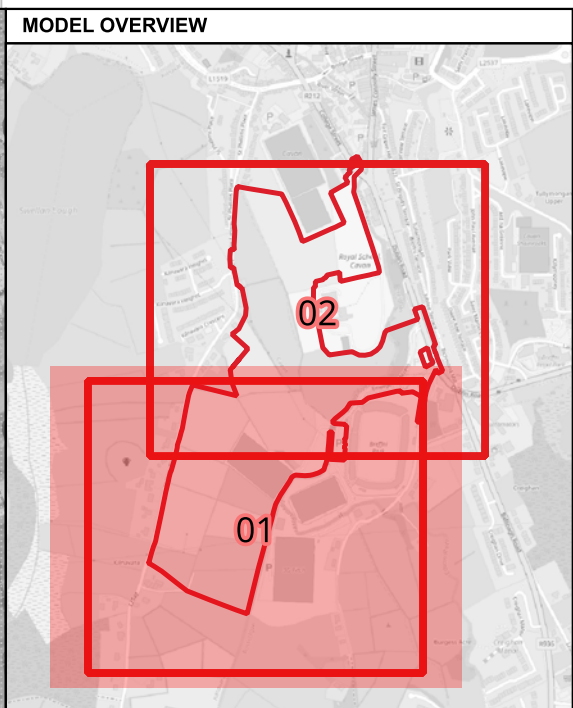
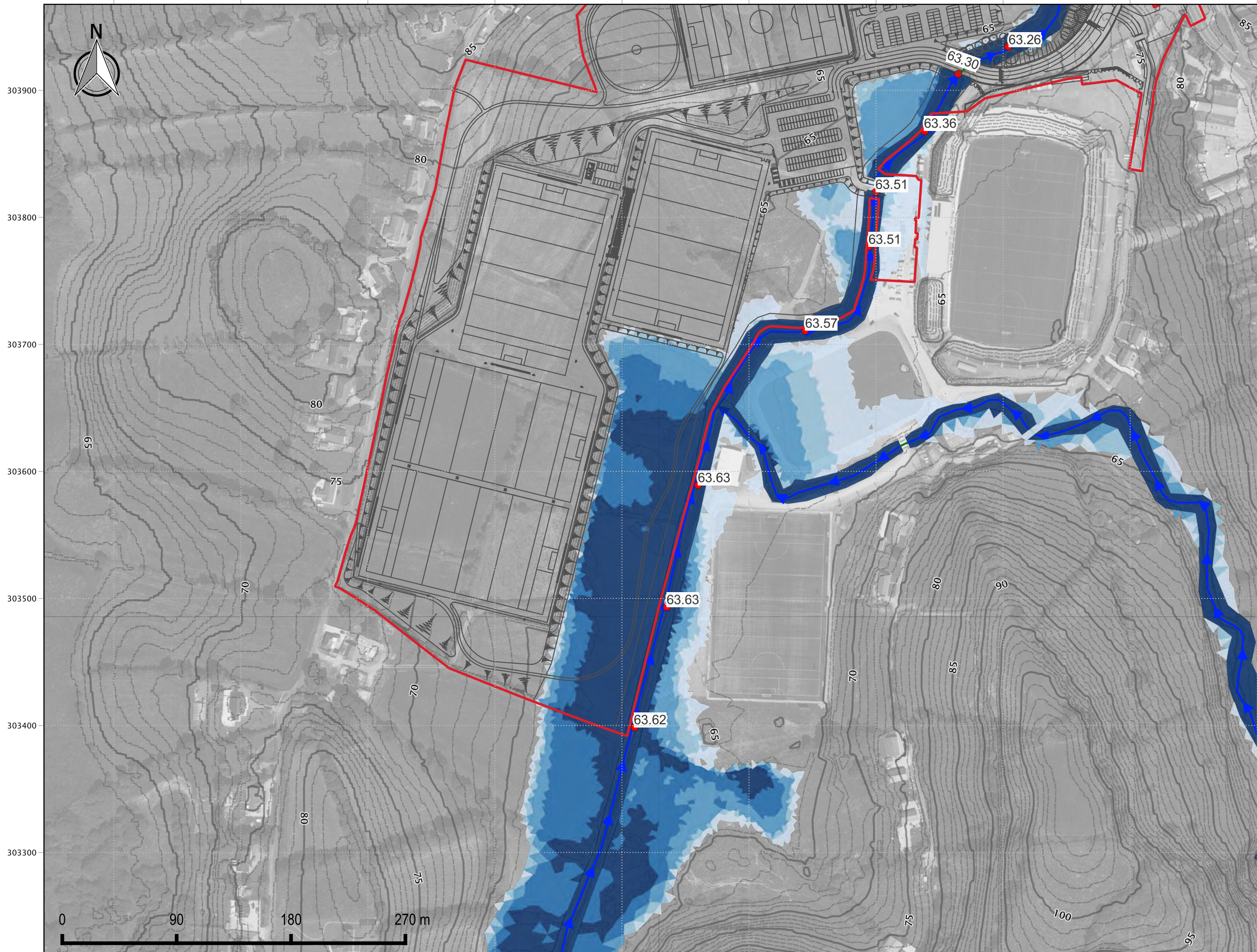
HYDROLOGY SCENARIO PRESENT DAY	GEOMETRY SCENARIO PROPOSED
FIGURE NUMBER M01959-12_FL302	

SCALE AS SHOWN	ORIGINAL SIZE A3
DRAWN BY BM	APPROVED BY DKS
REVISION 2	DATE 23/02/2024

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LEGEND

SITE BOUNDARY
 SITE BOUNDARY

CONDUIT
 CONDUIT

OPEN WATERCOURSE
 OPEN WATERCOURSE

FLOOD LEVEL (m OD)
 FLOOD LEVEL (m OD)

FLOOD EXTENT BANDED BY DEPTH (m)

	< 0.3
	0.30 - 0.50
	0.50 - 1.00
	1.00 - 1.50
	> 1.5

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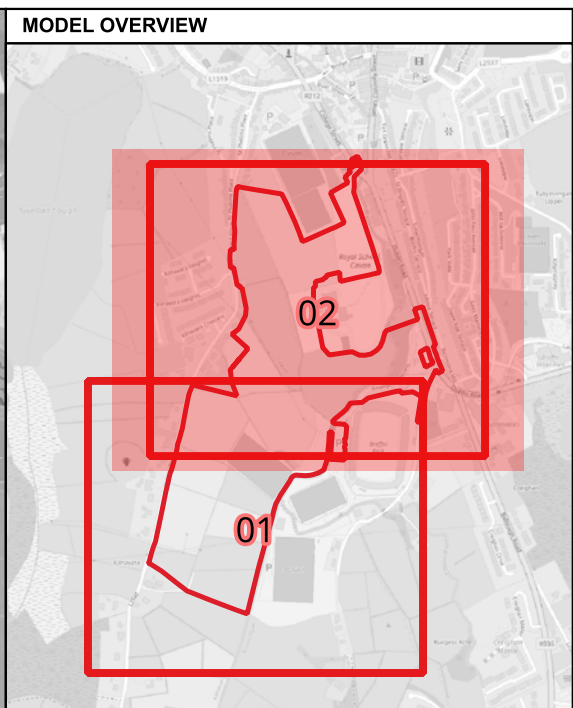
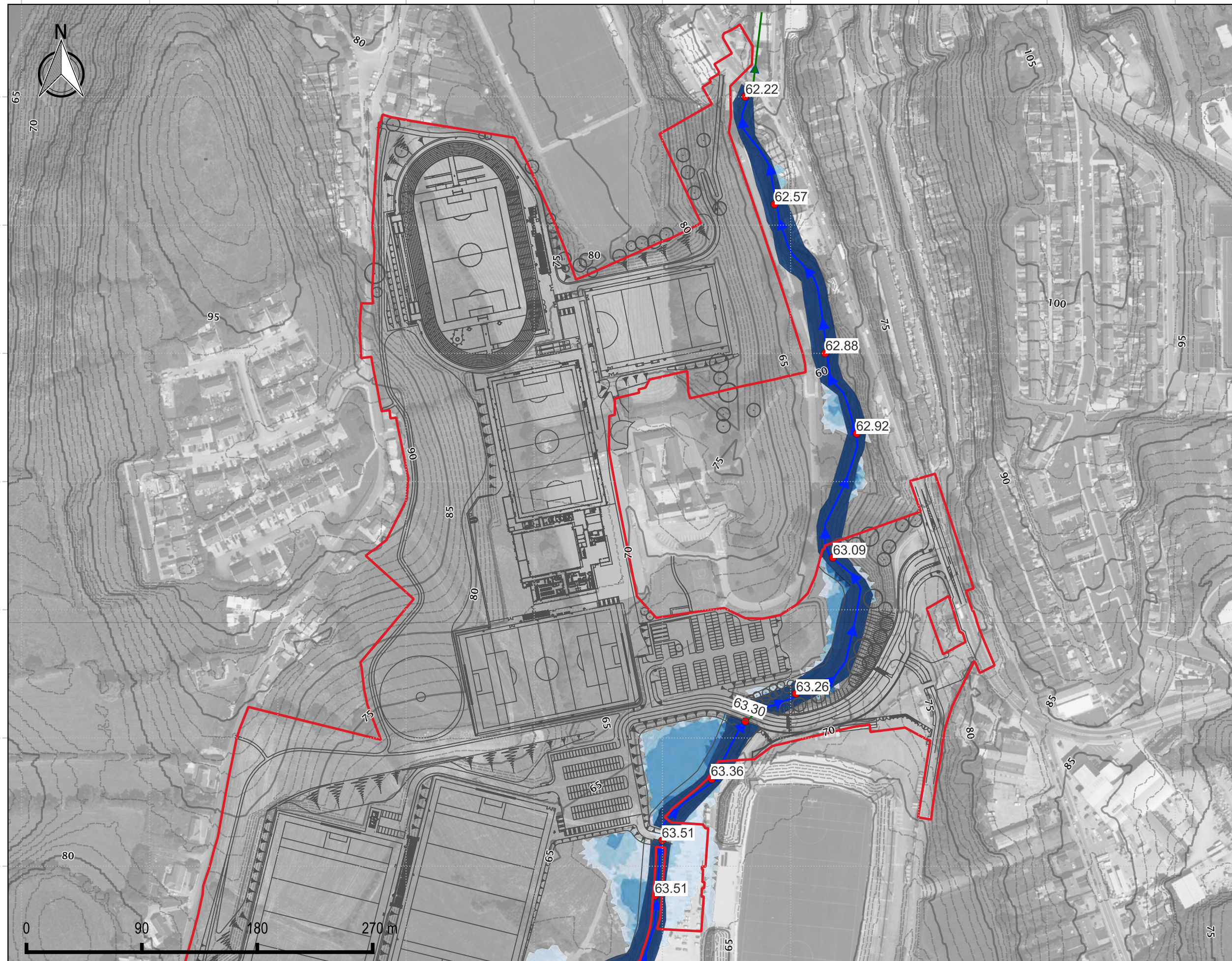
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PROJECT CAVAN REGIONAL SPORTS CAMPUS		HYDROLOGY SCENARIO CLIMATE CHANGE MRFS		SCALE AS SHOWN	ORIGINAL SIZE A3
MAP TYPE FLOOD EXTENTS / DEPTH MAPPING		GEOMETRY SCENARIO PROPOSED		DRAWN BY BM	APPROVED BY DKS
SOURCE FLUVIAL	FLOOD EVENT 1% AEP+CC	FIGURE NUMBER M01959-12_FL401		REVISION 2	DATE 23/02/2024

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LEGEND

- SITE BOUNDARY
- CONDUIT
- OPEN WATERCOURSE
- FLOOD LEVEL (m OD)

FLOOD EXTENT BANDED BY DEPTH (m)

- < 0.3
- 0.30 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- > 1.5

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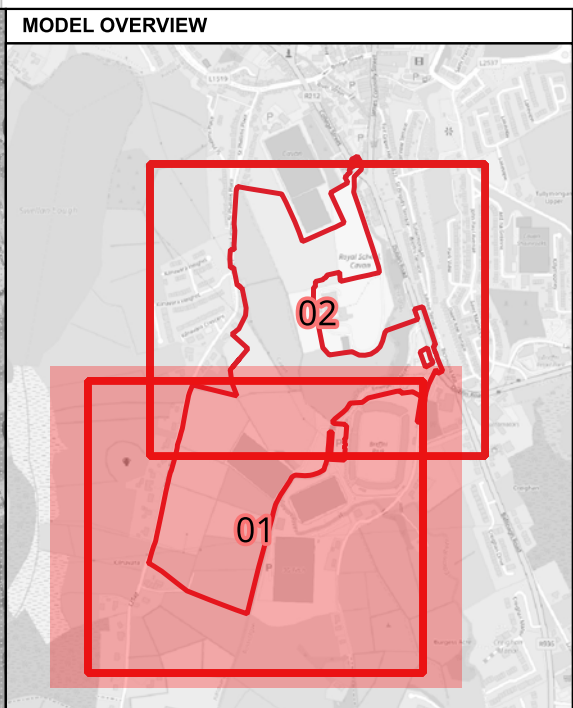
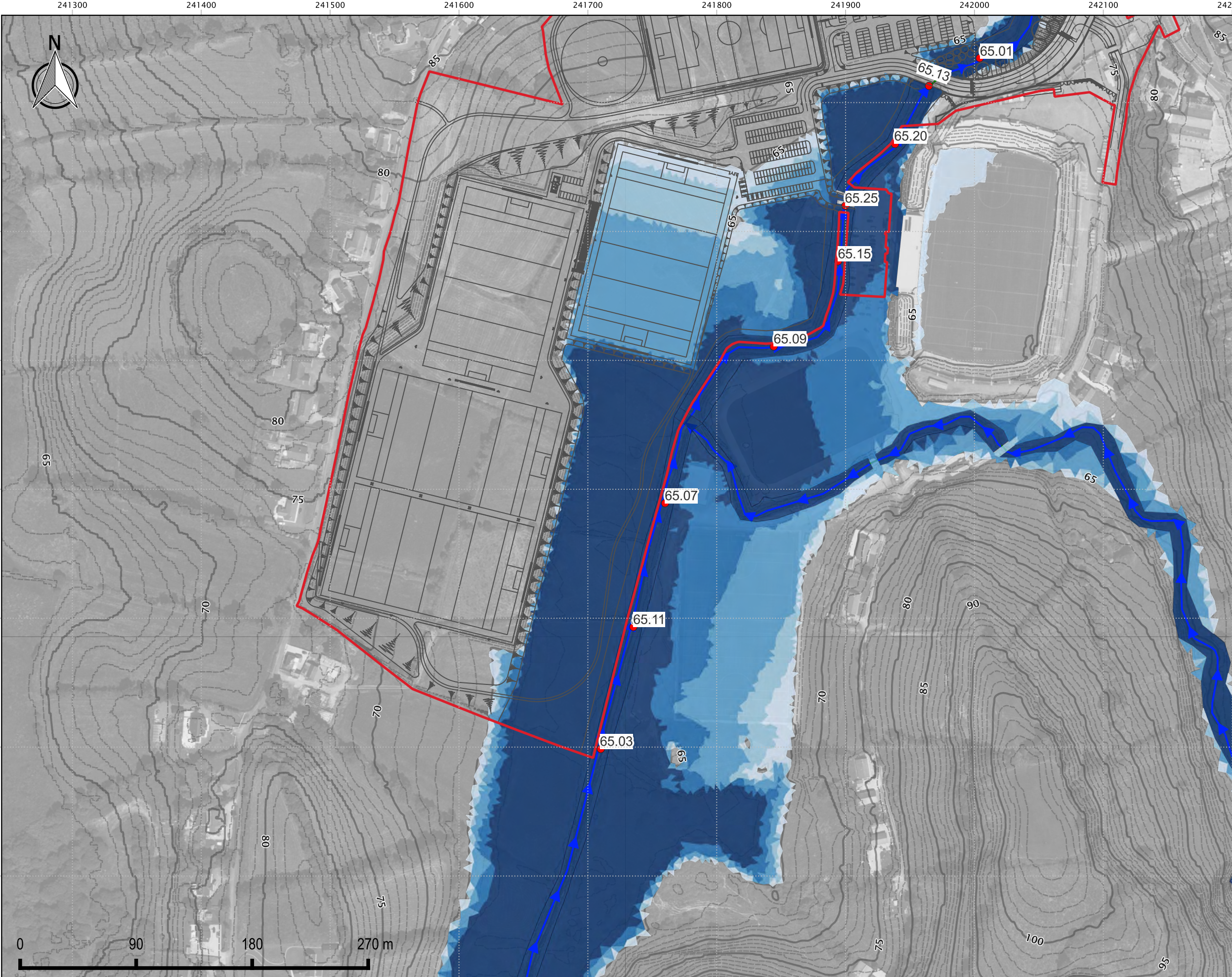
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PROJECT CAVAN REGIONAL SPORTS CAMPUS		HYDROLOGY SCENARIO CLIMATE CHANGE MRFS		SCALE AS SHOWN	ORIGINAL SIZE A3
MAP TYPE FLOOD EXTENTS / DEPTH MAPPING		GEOMETRY SCENARIO PROPOSED		DRAWN BY BM	APPROVED BY DKS
SOURCE FLUVIAL	FLOOD EVENT 1% AEP+CC	FIGURE NUMBER M01959-12_FL402		REVISION 2	DATE 23/02/2024

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LEGEND

SITE BOUNDARY
 SITE BOUNDARY

CONDUIT
 CONDUIT

OPEN WATERCOURSE
 OPEN WATERCOURSE

FLOOD LEVEL (m OD)
 FLOOD LEVEL (m OD)

FLOOD EXTENT BANDED BY DEPTH (m)

	< 0.3
	0.30 - 0.50
	0.50 - 1.00
	1.00 - 1.50
	> 1.5

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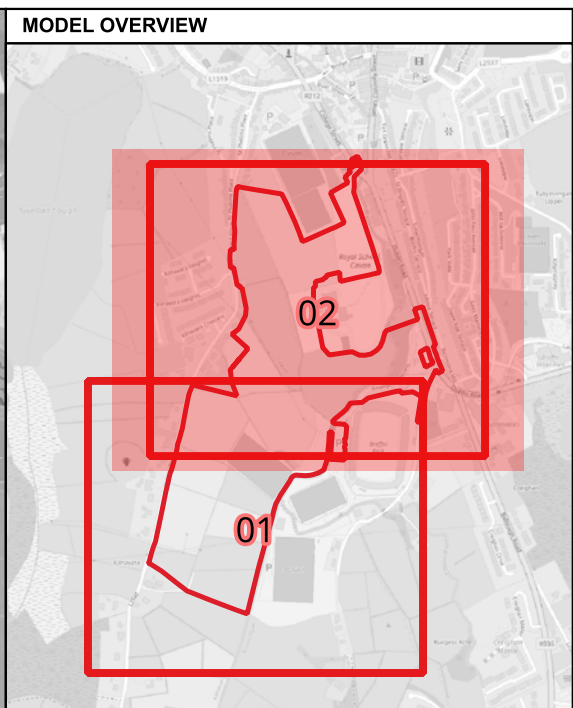
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PROJECT CAVAN REGIONAL SPORTS CAMPUS		HYDROLOGY SCENARIO CLIMATE CHANGE MRFS		SCALE AS SHOWN	ORIGINAL SIZE A3
MAP TYPE FLOOD EXTENTS / DEPTH MAPPING		GEOMETRY SCENARIO PROPOSED		DRAWN BY BM	APPROVED BY DKS
SOURCE FLUVIAL	FLOOD EVENT 0.1% AEP+CC	FIGURE NUMBER M01959-12_FL501		REVISION 2	DATE 23/02/2024

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LEGEND

- SITE BOUNDARY
- CONDUIT
- OPEN WATERCOURSE
- FLOOD LEVEL (m OD)

FLOOD EXTENT BANDED BY DEPTH (m)

- < 0.3
- 0.30 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- > 1.5

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PROJECT CAVAN REGIONAL SPORTS CAMPUS		HYDROLOGY SCENARIO CLIMATE CHANGE MRFS		SCALE AS SHOWN	ORIGINAL SIZE A3
MAP TYPE FLOOD EXTENTS / DEPTH MAPPING		GEOMETRY SCENARIO PROPOSED		DRAWN BY BM	APPROVED BY DKS
SOURCE FLUVIAL	FLOOD EVENT 0.1% AEP+CC	FIGURE NUMBER M01959-12_FL502		REVISION 2	DATE 23/02/2024

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Appendix F

Preliminary Flood Management Plan

1 INTRODUCTION

1.1 Purpose of the FMP

This Preliminary Flood Management Plan (FMP) is intended to satisfy the local planning authority that mitigation measures stated in the associated Flood Risk Assessment report have been fully considered.

This FMP establishes flood risk at the Cavan Regional Sports Campus site, identifies the roles and responsibilities of Flood Wardens and other relevant bodies and provides details of proposed flood actions. The FMP is designed to form part of site procedures to protect site occupants during a flood event.

However, it is noted that any plans / actions may be overruled by the emergency services should they attend the site during a flood incident. The advice and instruction of emergency services should be followed at all times and will supersede any action outlined in this FMP.

This FMP considers Met Eireann and local government guidance and arrangements relating to key contacts, evacuation arrangements and nature of occupancy at the site. **The FMP is designed to be a 'living' document and as such, should be reviewed periodically and updated to provide the most up-to-date information to staff and visitors regarding flood risk at the site.**

1.2 Flood Risk

The nature and level of flood risk at the site is determined by the FRA undertaken by McCloy Consulting Ltd. Flood outlines are shown on the following map.

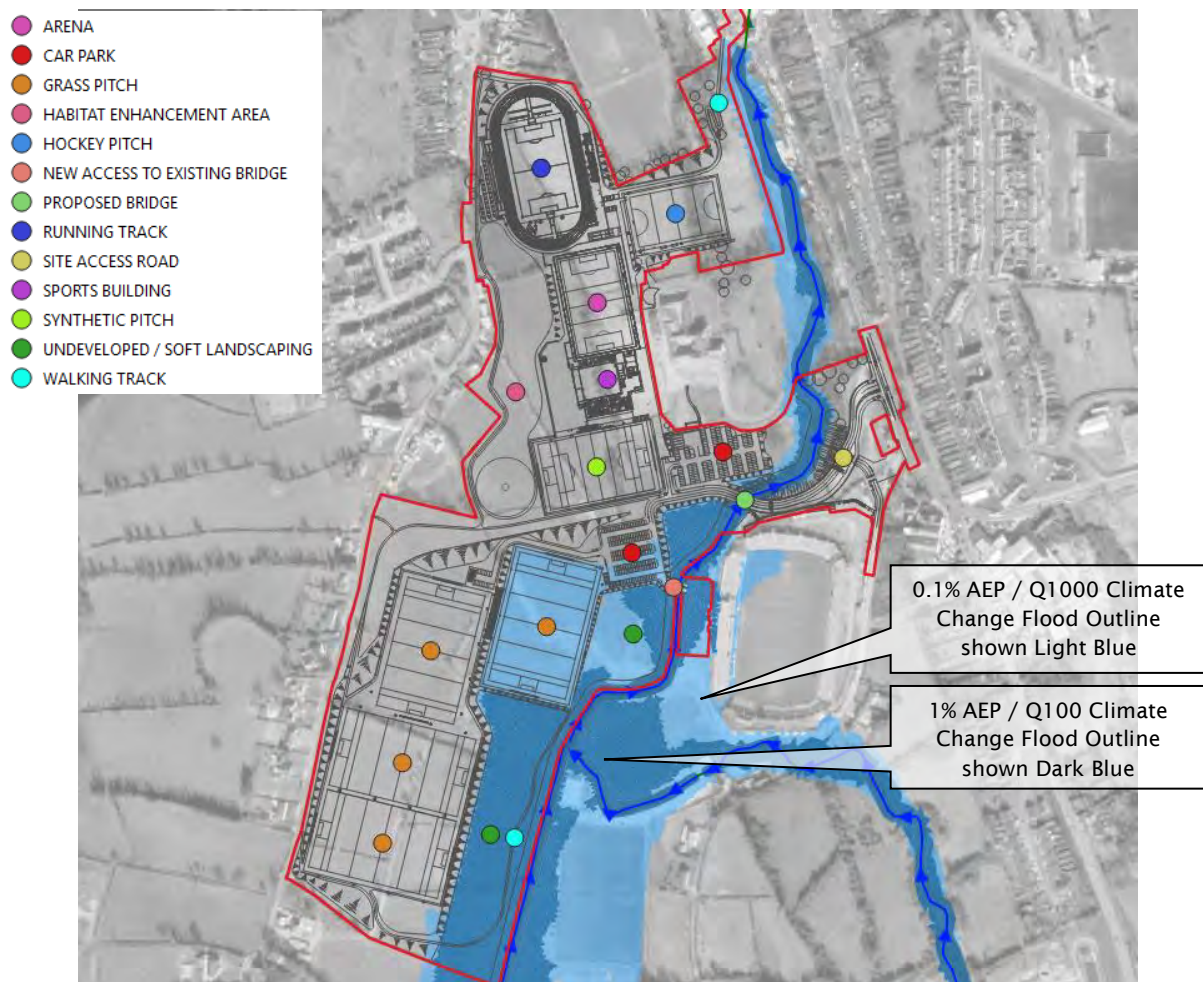


Figure 1-1 1% AEP / 1-in-100 Year MRFS Flood

The majority of the site and the proposed development is unaffected by flooding. The 1% AEP MRFS (Climate Change) scenario is considered the appropriate threshold for flood hazard requiring management. Two areas of the site are predicted to be affected by medium to high probability flooding and require careful consideration and management, as follows:

- Shallow flooding (<0.3m) is predicted to the deck of the existing bridge and access from Breffni Park carpark to the proposed development.
- The majority of the walking trail east of the grass pitches is predicted to flood to a depth exceeding 1.5m. The walking trail is likely to be subject to frequent flooding.

Onset of flooding from the Cavan River is likely to be relatively slow (in the order of several hours to days). The likelihood of flash flooding is low.

The locations most affected are highlighted on the map below.

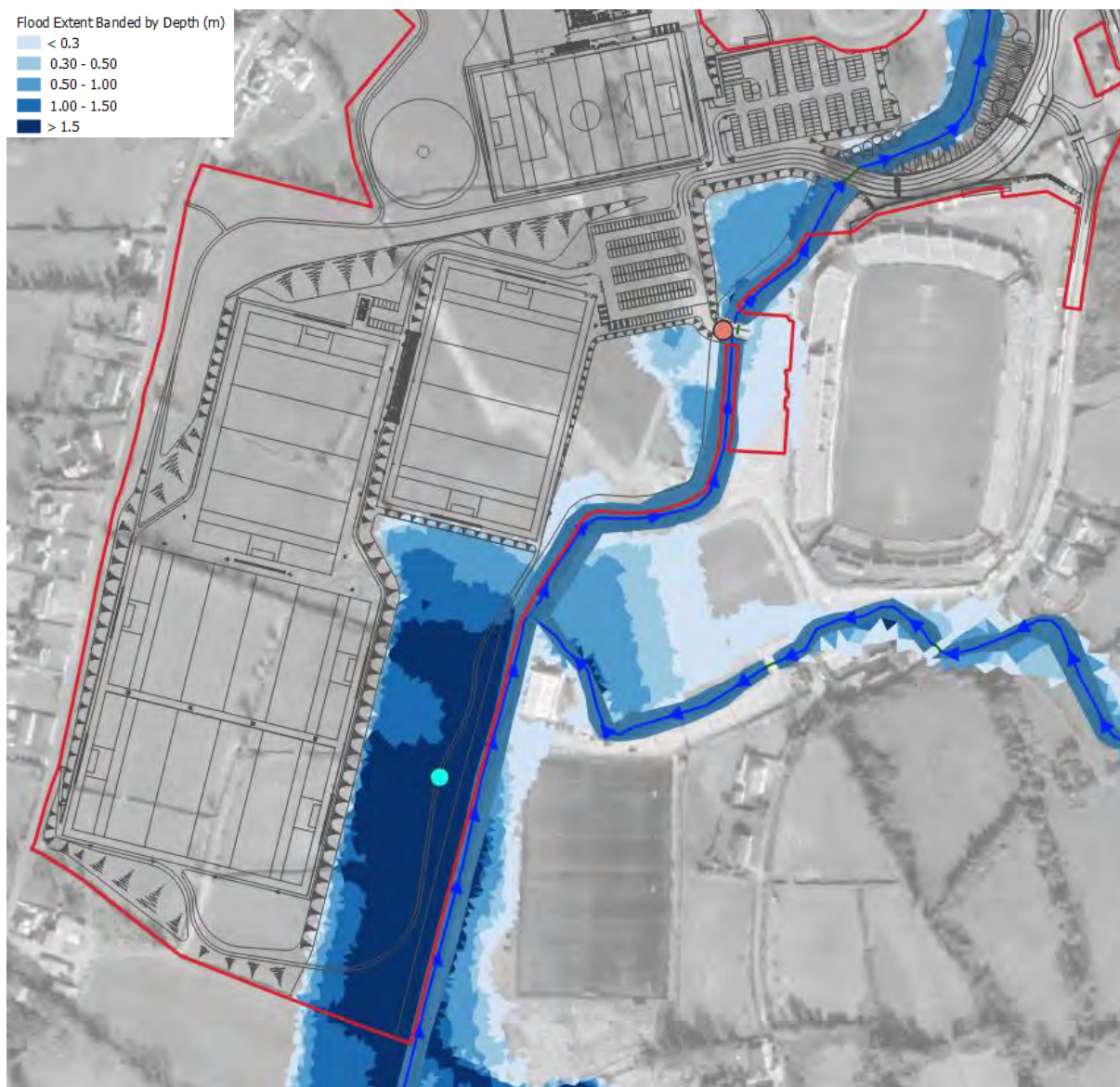


Figure 1-2 1% AEP / 1-in-100 Year MRFS Flood

2 FLOOD WARNINGS & LEVELS OF ALERT

2.1 Public Flood Warnings

There is no automated fluvial flood warning system in Ireland. The Met Eireann works with OPW and local authorities to forecast areas where floods are likely.

2.2 Met Eireann Weather Warnings

Met Eireann warnings are given a colour depending the impact the conditions may have. Weather warnings apply to a range of weather including rain, wind, snow, ice and fog. **In relation to predicting fluvial flooding, the main weather warning of interest will relate to extreme rainfall.**

Weather warning bands are as follows:

Yellow	Not unusual weather. Localised danger.
Orange	Infrequent. Dangerous/disruptive.
Red	Rare. Extremely dangerous/destructive.

Individuals responsible for implementation of this FMP (nominally facilities management, Flood Warden) should subscribe to the Met Eireann Weather Warning Alert Service at [MY WARNINGS LOGIN - WEATHER WARNING ALERTING SERVICE - LOGIN \(met.ie\)](#).

2.2.1 [Status Yellow](#)

Weather that does not pose a threat to the general population but is potentially dangerous on a localised scale.

Be aware about meteorological conditions and check if you are exposed to danger by nature of your activity or your specific location. Do not take any avoidable risks

2.2.2 [Status Orange](#)

Infrequent and dangerous weather conditions which may pose a threat to life and property.

Prepare yourself in an appropriate way depending on location and activity. All people and property in the affected areas can be significantly impacted.

Check your activity/event and delay or cancel as appropriate.

2.2.3 [Status Red](#)

Rare and very dangerous weather conditions from intense meteorological phenomena.

Take action to protect yourself and your property.

Follow instructions and advice given by the authorities under all circumstances and be prepared for exceptional measures.

2.3 National Emergency Coordination Group (NECG)

Local Authorities are the lead agencies for co-ordinating the response to severe weather emergencies. Where weather emergencies are judged to impact public safety at national level the National Emergency Coordination Group (NECG) is activated by the Office of Emergency Planning on request from the Department of Housing, Planning and Local Government. This is the Lead Government Department for weather emergencies.

NECG warnings are distributed by local and national media outlets.

3 FLOOD MANAGEMENT PROCEDURES

3.1 Flood Warnings / Alerts

Sources of Flood Alerts / Warnings are outlined in Section 2. To ensure ongoing monitoring of potential flood information, a nominated Flood Warden for the site should check with the Met Eireann Weather Warnings portal weather warnings and in the event of a warning being in place, follow the procedures outlined in this FMP.

This point of contact designated to check and communicate flood warnings shall be specified within this plan and updated on an ongoing basis.

Local media can also be used to check Flood Warnings in place at any given time.

3.2 Communication

An appropriate means of communication should be established to suit the nature of the facility and its occupiers in order to allow communication of a flood event by the Flood Warden.

The appointed Flood Warden will be responsible for communicating flood related information to site users and coordinating actions outlined in this FMP. The Flood Warden will ensure the FMP is regularly maintained, reviewed and kept up to date.

3.3 Flood Event Actions

The key outcomes of this Plan are as follows:

- i. Site users are removed from, and future use of the grass pitch walking trail is prevented prior to and during flooding.
- ii. Access between Breffni Park carpark and the CRSC site via the existing Cavan River bridge is prevented prior to and during flooding.
- iii. Site users should be prevented from accessing floodwater on / adjacent to the site.

In the event of receipt of any Flood Alerts or Warnings, actions described in this Plan are to be undertaken by the nominated Flood Warden. The procedure required for each alert level is outlined in Table 3 1.

Table 3-1: Flood Warning Action Plan

		Site Specific Actions		
Source of Warning	What it means	Recommended Action	Communication	Responsible Persons
Met Eireann Status Yellow Be Aware	Severe weather is possible over the next few days	Flood Warden to continue to check Met Eireann warning status and other sources of weather / flood information. Pre-emptively close and prevent further access to the Grass Pitch walking trail. Plan ahead thinking about possible disruption requiring closure / management of Breffni carpark access.	Inform staff/visitors of action and potential requirement for further action if situation worsens	Flood Warden
Met Eireann / NECG Status Orange Be Prepared	There is an increased likelihood of bad weather affecting you, which could potentially cause disruption and risk to life and property	Flood Warden to continue to check Met Eireann warning status and other sources of weather / flood information. Pre-emptively close and prevent further access to the Grass Pitch walking trail and close the Breffni carpark access bridge.	Inform staff / visitors of implementation of flood action procedures	Flood Warden
Met Eireann / NECG Status Red Take Action	Flooding is predicted Extreme weather is expected Widespread damage, travel and power disruption and risk to life is likely	Pre-emptively close and prevent further access to the Grass Pitch walking trail and close the Breffni carpark access bridge.	Inform staff / visitors of implementation of flood action procedures	Flood Warden Site Management Site Visitors
Flood Warden or other site occupant observes flooding adjacent to building	Flooding is imminent or currently occurring	Close and prevent further access to the Grass Pitch walking trail and close the Breffni carpark access bridge. If no previous warning has been received, follow the advice of emergency services and local authority	Inform staff / visitors of implementation of flood action procedures	Flood Warden Site Management Site Visitors

Table 3-1: Flood Warning Action Plan

		Site Specific Actions		
Source of Warning	What it means	Recommended Action	Communication	Responsible Persons
Occupants are trapped in a flooded area	Visitors have entered an area where flooding has occurred.	Follow the advice of emergency services and local authority.	Contact Emergency Services Await assistance.	Flood Warden Site Management Site Visitors
Met Eireann Green Alert: No Severe Weather Emergency Services give 'all-clear'	No further flooding is currently expected in the area Localised flooding of low-lying land and standing water possible	If flooding occurred: <ul style="list-style-type: none"> inspect and / or arrange for external inspection of the bridge, parapets, and condition of the walking trail prior to their being reopened to visitors. Undertake remedial measures / limit use until rectified. If no flooding has occurred, inform all occupants and re-open access to site. 	Confirm that no Flood Warnings are in place Arrange for suitably qualified professionals to review any suspected flood damage Contact insurance company if necessary	Flood Warden Site Management

3.4 Other Bodies

There are a number of organisations that will play a part in the response to a major flood incident including emergency services, utility companies and voluntary agencies. The roles and responsibilities of the main bodies, and how that impacts this FMP is summarised below.

3.4.1 [Office of Public Works](#)

OPW is responsible for predicting flooding from rivers and seas including the location and magnitude. OPW is likely to maintain a significant role in assisting or advising Donegal County Council in managing the condition of flood defence embankments at the site.

3.4.2 [Emergency Services](#)

Local police and fire and rescue will co-ordinate response during major flood events and help to save lives and property. The response may include rescuing persons in danger, establishing cordons and pumping of floodwater.

Direction or instruction from emergency services would take precedence over any guidance within this FMP. It is also noted that emergency services should only be contacted when there is a threat to life and that evacuation of the site does not require informing police or fire and rescue.

3.4.3 [Cavan County Council](#)

The County Council as the Local Authority, are the lead agency for co-ordinating the response to severe weather emergencies and will work with other agencies to plan for and help respond effectively to all emergency situations.

In the event of a major emergency, the Council can assist in a number of ways:

- Make buildings such as leisure and community centres temporarily available as shelters for people who have been displaced;
- Provide advice and guidance on cleaning up after major flooding or pollution;
- Assess structural damage to buildings;
- Provide staff/equipment to responding agencies as requested;
- Co-ordinate and lead multi-agency meetings to plan for recovery.

The Local Authority will assess each incident and decide on the level of response. In the event that flooding at the site was declared an emergency that warranted input from the council, the council's procedures and requirements would be adhered to and would take precedence over the recommendations within this site-specific FMP.

3.4.4 [Met Eireann](#)

The Met Eireann issues severe weather warnings for rain and other extreme weather events. These warnings are provided to local authorities and emergency services. While no flood evacuation is required due to a Met Eireann warning, the information they provide may be useful in fully considering flood risk at the site.

4 FLOOD RISK SUMMARY

The FRA carried out for the site demonstrates the nature and severity of flood risk at the site. This FMP outlines that actions to be taken should it become clear that the risk is at risk imminent risk of flooding. Table 5 1 summarises flood risk at the site and details relating to potential evacuation of the site.

Table 5 1: Flood Risk Summary

Flood Risk Source	Warning System in Place	Estimated Warning Time	Frequency / Probability of Flooding
Fluvial / Rivers	Flood Warden to check Met Eireann and local media for information. Visual check of watercourses in the vicinity.	Weather advisories up to 1 week in advance. 60 hours (<3 days) for Met Eireann weather warning	Likely >10% per year for walking trail. c.1% chance per year for Breffni access bridge. <1% for all other areas on the site (not significant).
Coastal / Tidal	N/A	N/A	Not significant
Surface Water	N/A	N/A	Not significant
Groundwater	N/A	N/A	Not significant
Reservoir	N/A	N/A	Not significant

5 SPECIFIC FLOOD PLAN DETAILS

FLOOD PLAN FOR: Cavan Regional Sports, Cavan

EMERGENCY CONTACT LIST: Flood Warden - Name: _____

Phone: _____

Site Office - Phone: _____

Cavan County Council Emergency Number 049 4378468

Emergency Services - 999

UTILITIES CONTACT LIST: ESB Networks: 1800 372 999

Irish Water: 1850 278 278

Gas Networks Ireland: 01 920 5050 / 066 971 4088

CONTACT LIST

Name	Address	Telephone	Emergency Contact	Emergency Contact Details

PERSONS WHO MAY REQUIRE EVACUATION ASSISTANCE

Name	Office / Site Location	Assistance Required	Person Responsible

SERVICES LOCATIONS / CONTACTS

Service	Cut-off Location	Company Name	Telephone
Electricity			
Gas			
Water			

PROTECTIVE ACTIONS

Identify possessions that may need special protective measures, and describe the actions that will be taken to prevent damage in the event of a flood.

Protective Actions may include make a copy and store safely, raise above ground level, purchase flood protection measures, move items to safer locations etc.

Valuable Item	Protective Action	New Location (if applicable)	Done?