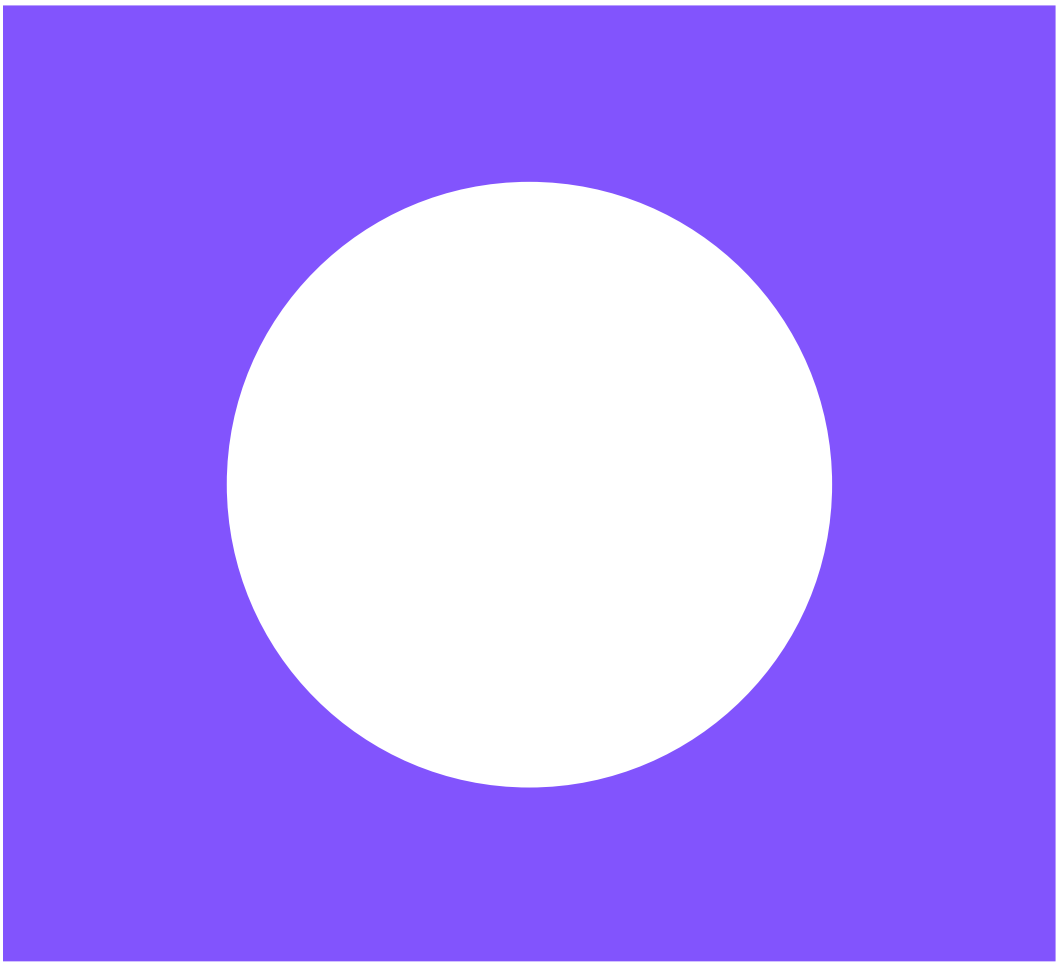
MOTT MACDONALD



A494 River Dee Bridge Improvement Scheme

Flood Consequences Assessment

March 2026

This page left intentionally blank for pagination.

Mott MacDonald
2 Callaghan Square
Cardiff CF10 5BT
United Kingdom

T +44 (0)29 2046 7800
mottmac.com

A494 River Dee Bridge Improvement Scheme

Flood Consequences Assessment

March 2026

Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
P01	05/09/25	N H O C	A L	C P	First issue
P02	04/03/26	N H O C	CN	RG	Updated to reflect revised Ree Dee Modelling data as detailed ion River Dee Hydraulic Modelling Report, ref. 395318-MMD-00-XX-RP-D-0010 dated March 2026.

Document reference: 395318-MMD-00-XX-RP-D-0009

Contents

Tables

Figures

Executive summary

The Scheme

The North & Mid Wales Trunk Road Agent (NMWTRA) has appointed Mott MacDonald Ltd as the lead consultant to provide multi-disciplinary consultancy services for the A494 River Dee Bridge Replacement Scheme ("the Scheme"), covering Welsh Government's Key Stage Approval Stages 3 and 4.

Following the Welsh Government's response to the Roads Review in February 2023, the Scheme was re-appraised to ensure that it would not result in additional traffic, it would minimise carbon and encourage modal shift. As an outcome of this re-appraisal, a revised layout was developed and incorporates:

- A new bridge to carry two lanes of traffic in both directions. The new bridge would be located approximately 12 metres to the southeast of the existing A494 River Dee Bridge.
- A new shared use path for pedestrians and cyclists
- Improvements to the existing A494 and a new access/exit to leave the A494 towards the Riverside area
- Diversion of the Queensferry Drain (Main River) situated on the southeast side of the A494. New sections of open channel would be provided either side of the railway as well as a new river pumping station and drainage outfall to the River Dee.
- Environmental mitigation and biodiversity enhancement works including wildflower verges, swales, native woodland plantations, hedgerows and amenity grassland.
- Demolition of the existing A494 River Dee Bridge, except for the river piers.

Flood assessment

This Flooding Consequences Assessment Report (FCA) will be used to inform the Environmental Impact Assessment (EIA) for the Scheme, and draws upon the guidance provided in Planning Policy Wales and Technical Advice Note 15: Development, flooding and coastal erosion (TAN 15) (dated March 2025). The FCA was undertaken in consultation with Natural Resources Wales (NRW) and Flintshire County Council, Lead Local Flood Authority for the area.

The Flood Map for Planning indicates that the scheme is in Flood Zone 3 for tidal (defended), fluvial and surface water and small watercourses. The FCA considers all sources of flood risk to the Scheme with appropriate allowances for sea level rise and increases in rainfall due to climate change based on the assumed lifetime of the development (2100, 75 years). The predominant sources of flood risk for the scheme are River Dee (tidal and fluvial) and Queensferry Drain (fluvial). The Scheme benefits from substantial flood defences set alongside the River Dee, that offer a good standard of protection and are strategically important in the area, so likely to be maintained in perpetuity by NRW.

As a replacement bridge, the Scheme is classed as a Less Vulnerable re-redevelopment and secures this critical link between north Wales and England and is identified in the Local Development Plan. The Scheme is therefore considered justifiable in accordance with the principles set out in section 8 of TAN15.

The evidence and assessments contained within this FCA confirm that the redevelopment has predominantly met or is consistent with the acceptability considerations in section 11 of TAN15.

- The desired standards for less vulnerable development (flood free during the 1% Annual Exceedance Probability (AEP) fluvial and the 0.5% AEP tidal events, incorporating climate

change) are not met for River Dee Tidal flooding. However, as permitted by the TAN, these criteria can be more flexibly applied for redevelopment, and the FCA concludes that the Scheme provides betterment, with the proposed levels of all built infrastructure maximised as far as reasonably practicable.

- For less vulnerable development**,** under extreme event flood conditions, the maximum depth of flooding should not exceed 600mm and velocity of flood waters should not exceed 0.3 m/s. The FCA shows that exceedance of these conditions is only expected in discrete, water-compatible areas e.g. area of the proposed new Queensferry Ditch Pumping Station and in residual flood risk scenarios – i.e. where the defences have breached. TAN15 allows for the application of judgement and accordingly the FCA concludes that proposed levels of the new carriageway are maximised at this location.
- The owner of the Scheme (NWMTRA) is aware of the scale and nature of flood risk posed to the Scheme, evacuation routes are present, and the Local Contingency Plan will be updated and in place prior to use, so the Scheme poses minimal risk to life to people living and working in the area.
- The redevelopment will be resilient to flooding for the duration of its lifetime, and can be inspected, repaired, cleaned and returned to use quickly after a flooding event, minimising disruption to people living and working in the area. The new Queensferry Drain Pumping Station will be designed with electrics and control kiosks located above floodwater levels so they remain operational and maintainable during times of flooding.
- In the majority of flood events and cases, the Scheme is not expected to cause nor increase the frequency of flood risk elsewhere. Furthermore, with respect to Queensferry Drain flood risk, the expected overall trend is for flood depths to reduce across the catchment. However, in relation to River Dee tidal sources, in the extreme 0.1% AEP 2100 event only, the hydraulic modelling completed for the Scheme predicts flood extents and depths may marginally increase in the order of 0.006 m (6mm) for residential areas of Garden City, 0.010 m (10mm) for open spaces in Northern Gateway and 0.002m (2mm) in commercial areas of Queensferry. The magnitude, spatial and temporal scale of the increases reported are not considered to pose an unmanageable risk and therefore no further mitigations to manage these impacts are proposed.

Surface water management

Section 7 of TAN15 has been satisfied. The proposed surface water drainage strategy has been developed into an appropriate detailed SuDS drainage design, based upon the constraints of the Scheme, and the proposed design does not increase flood risk elsewhere.

Conclusions and recommendations

The FCA provides a full understanding of the potential risks and consequences, and sufficient information to consider flooding implications and to balance them against other considerations. The Scheme design delivers a development that is considered safe and there is minimal risk to life or disruption to people living and working in the area. The FCA demonstrates that flood risk can be managed within acceptable limits, and there is no reason from a flood risk standpoint not to proceed.

The assessment has identified the following activities, or further works will be required in relation to flood risk matters:

- Prior to the Scheme being operational, the local contingency plan should be updated with flood risk procedures, roles, responsibilities, and triggers for evacuating
- The Environmental Permitting (England and Wales) Regulations 2016 require a Flood Risk Activity Permit (FRAP) is obtained for any works in, over, under or adjacent to Main Rivers.

- During subsequent design development, further work is undertaken to the River Dee model in the Wepre and Chester Racecourse areas, to address known limitations in areas in those areas, and improve confidence in the model results.

1 Introduction

The North & Mid Wales Trunk Road Agent (NMWTRA) has appointed Mott MacDonald Ltd as the lead consultant to provide multi-disciplinary consultancy services for the A494 River Dee Bridge Replacement Scheme ("the Scheme"), covering Welsh Government's Key Stage Approval Stages 3 and 4.

Key Stage 3 involves development of the business case, preliminary Scheme design, Environmental Impact Assessment, and preparation of draft Orders documentation.

Key Stage 4 covers completion of statutory processes, including publication of the draft Orders, public exhibitions, managing objections and representations, and preparation for and participation in a Public Inquiry (if required).

This Flooding Consequences Assessment Report (FCA) will be used to inform the Environmental Impact Assessment (EIA) for the Scheme. The purpose of the FCA is to identify the acceptability of flooding consequences in accordance with Planning Policy Wales and Technical Advice Note 15: Development, flooding and coastal erosion (TAN 15) (dated March 2025).

This assessment has been carried out by suitably qualified, competent persons, and has informed the process of detailed design and the selection of mitigation measures, where appropriate.

1.1 Project history

The A494 River Dee Bridge provides a vital connection for cross border traffic between north Wales, the north-west of England and beyond, connecting people, communities and businesses.

The high volume of traffic using the bridge means that closure of the bridge to replace the deteriorated parts would cause severe disruption for people travelling in the area and adversely impact the economy in north Wales.

The need for a new bridge is driven by the poor structural condition of the existing bridge deck. The inspections and monitoring to date have concluded that the frequency of repairs and the risk of major repair and intervention requiring the closure of the bridge is growing year-on-year. If nothing is done, the bridge will continue to deteriorate which may require measures such as further weight restrictions and lane closures in the short to medium term and result in closure in the medium to long term.

In 2018, the Welsh Government undertook an appraisal that looked at options to replace the A494 River Dee Bridge. Following the Welsh Government's response to the Roads Review in February 2023 the Welsh Government reviewed the Scheme Transport Planning Objectives to align with the new four road building tests. The Scheme was the re-appraised using the February 2024 publication of the Welsh Transport Appraisal Guidance (WelTAG). Considerations for the Scheme include not creating additional traffic, minimising carbon and encouraging modal shift. As an outcome of the re-appraisal, a revised layout for the proposed works has been developed (see Section 1.3).

1.2 Location and description

The existing A494 River Dee Bridge is located in Queensferry, Flintshire, north Wales and is centred at National Grid Reference SJ 32387 68597 (Figure 1.1 overleaf).

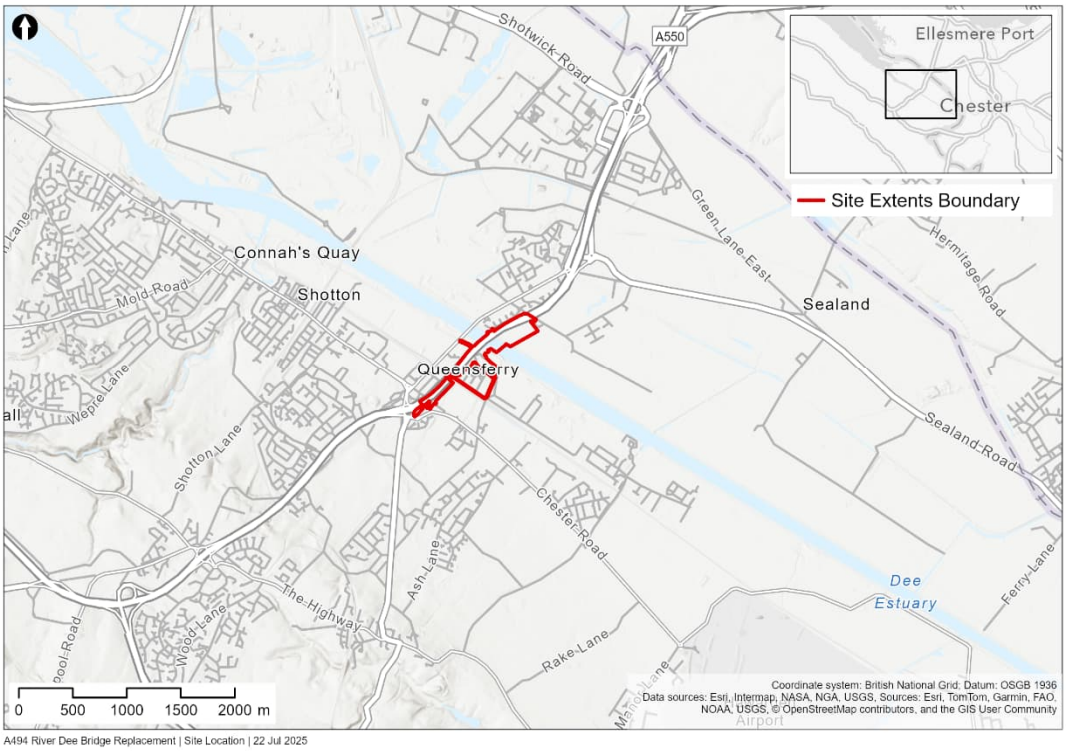
The A494 from the River Dee Bridge to the Queensferry roundabout consists of a dual carriageway. To the north-west of this section of the A494 is the town of Queensferry, comprising a mix of residential and commercial properties. To the south-east of this section of the A494 there is a sewage treatment works and a number of derelict buildings. A railway line passes over the A494 south of the River Dee Bridge.

The existing dual carriageway from the River Dee Bridge to the Queensferry roundabout is approximately 1km in length and covers an area of approximately 1.9ha.

The Scheme spans and lies adjacent to the River Dee, which is classified as a 'Main River' by NRW and is tidally influenced. There is a second 'Main River' in the vicinity of the Scheme, the Queensferry Drain, which flows along the south-east boundary of the A494. The Queensferry Drain is culverted upstream of the railway crossing but is an open watercourse downstream of the railway. The Queensferry Drain discharges into the River Dee via gravity during periods of low water / tide levels in the River Dee and is pumped during periods of high water / tide levels. The pumping station is located on the south bank of the River Dee, adjacent to the sewage treatment works.

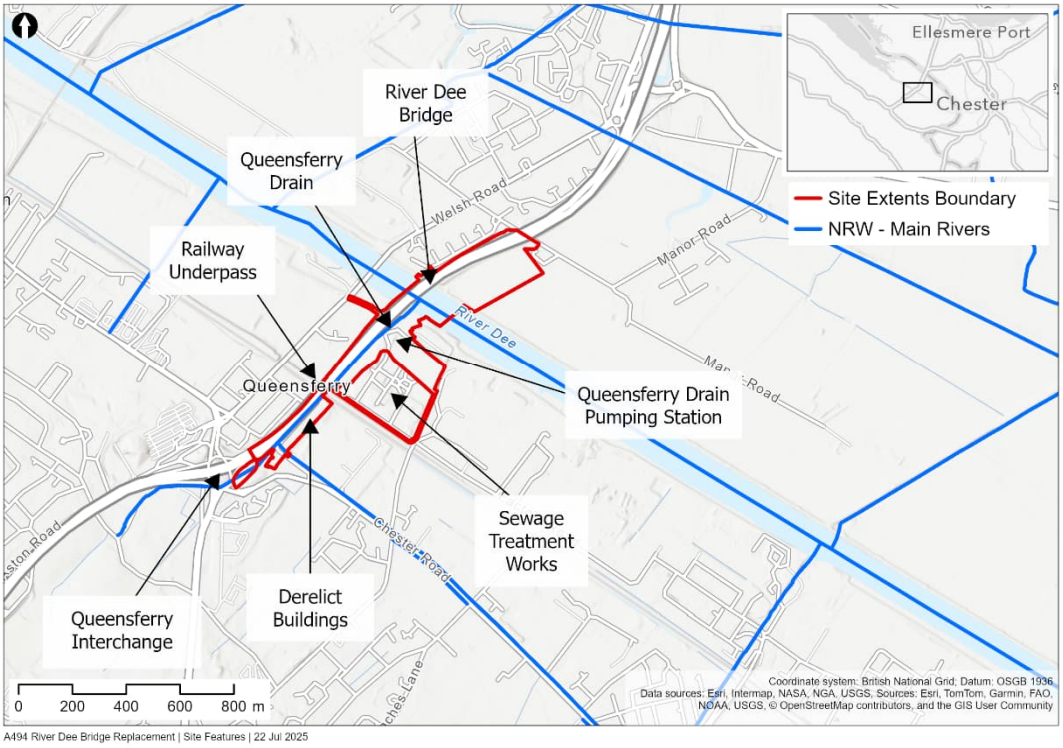
The locations of key features in the vicinity of the Scheme are shown in Figure 1.2.

Figure 1.1: Scheme location plan



Source: Mott MacDonald 2026. Contains OS data © Crown copyright and database right 2019

Figure 1.2: Key features plan



Source: Mott MacDonald 2026. Contains OS data © Crown copyright and database right 2019

A topographic survey of the existing area was undertaken in 2018 and is provided in Appendix A for reference. The existing River Dee crossing is at a maximum elevation of approximately 11.9m AOD and the Queensferry Interchange bridge at a maximum of around 14.7m AOD.

1.3 Scope of works

A general arrangement plan of the proposed works is included in Appendix B.

The proposed works consists of constructing a new bridge to carry two lanes of eastbound and westbound traffic and a shared use path for cyclists and pedestrians. The new bridge would be located approximately 12 metres to the southeast of the existing A494 River Dee Bridge.

Construction works are proposed to take place ‘offline’ of the existing highway to allow the road to remain open during the majority of construction.

The key features of the Scheme are:

1. A new bridge to carry two lanes of traffic in both directions.

2. A new shared use path for pedestrians and cyclists, running along the southeast side of the westbound carriageway. This would connect to the Wales Coast Path and other active travel routes in the area.

3. Improvements to the existing A494 to the east of where the road passes under the North Wales Coast Railway Line. This would include introducing a new hard shoulder in each direction connecting to the existing hard shoulders to the east of the River Dee, alignment improvements and sustainable drainage systems.

4. A new access/exit to leave the A494 towards the Riverside area just past the river crossing. Road users will also be able to join the A494 from the same junction, turning left towards Queensferry.

5. Diversion of the Queensferry Drain (a NRW Main River), which is situated on the southeast side of the A494 and currently flows in a culvert beneath it, west of the North Wales Coast Railway Line and in open channel east of the railway line. New sections of open channel would be provided either side of the railway with a section of existing culvert beneath the railway line being retained.

6. A new river pumping station and drainage outfall to the River Dee for Queensferry Drain.

7. Environmental mitigation and biodiversity enhancement works with earthworks and areas of soft estate including wildflower verges, swales, native woodland plantations, hedgerows and amenity grassland.

8. Demolition of the existing A494 River Dee Bridge, with the exception of the river piers, which will remain in-situ.

The Scheme will cover an area of approximately 18.6ha.

Analysis of the design estimates that the entire development (Features 1-8 above) will result in a net volume, in the order of 2468 m^3, of material being imported.

1.4 Assessment limitations

The information presented within this report is dependent upon the accuracy and reliability of the supplied information, correspondence, and data available to Mott MacDonald, at the time of the assessment. In particular, Section 6 of the River Dee and Queensferry Drain Hydraulic Modelling Reports (ref. 395318-MMD-00-XX-RP-D-0010 or -0011) provide information on the assumptions and known limitations of the site-specific flood modelling prepared to support this FCA. Any third parties developing any design should not rely on assumptions made in these reports but should satisfy themselves in that regard.

The FCA, River Dee and Queensferry Drain Hydraulic Modelling Reports include an assessment of the predicted effects of climate change over the lifetime of the development. The assessment of the effects of climate change is based on guidance provided by Welsh Government in place at the date of this report. These recommendations may change in the future, increasing the extent of predicted effects, and we would recommend that further advice is sought should this occur during the lifetime of the project.

Mott MacDonald has followed accepted procedure in providing the services, but given the residual risk associated with any prediction and the variability which can be experienced in flood conditions, Mott MacDonald takes no liability for and gives no warranty against actual flooding of any property (client's or third party) or the consequences of flooding in relation to the performance of the service. This FCA has been prepared for the purposes of supporting an EIA for the proposed development to replace the A494 River Dee crossing only.

2 Sources of information

2.1 Information used

Mott MacDonald accessed the following sources of information in the preparation of this FCA:

- Planning Policy Wales (PPW) Edition 12, dated February 2024[1].
- Technical Advice Note 15: Development, flooding and coastal erosion (TAN 15) (dated March 2025)[2].
- Welsh Government guidance on climate change allowances for flood consequence[3]
- Recorded Flood Extents[4]
- NRW Flood Risk Assessment Wales Map[5]
- NRW Flood Map for Planning (FMfP)[6]
- Flintshire Strategic Flood Consequences Assessment (SFCA) dated July 2018[7]
- Flintshire Strategic Flood Consequence Assessment Draft, dated July 2020[8]
- Flintshire County Council Preliminary Flood Risk Assessment, dated June 2011[9].
- Flintshire County Council Local Flood Risk Management Strategy, dated December 2013[10].
- Flintshire County Council Local Flood Risk Management Strategy (Draft for Public Consultation), dated April 2025[11].
- Flintshire County Council – Northern River Dee Embankment Strengthening Works - Planning Application, dated April 2013[12].
- Welsh Government "Flood Consequences Assessments: Climate change Allowances", dated September 2021 Climate change allowances and flood consequence assessments | GOV.WALES, last accessed March 2022.
- Natural Resources Wales – North Wales Routine Maintenance Program, 2019/20[13]

[1] Welsh Government (2024). Planning Policy Wales (PPW): Edition 11. Available online: Planning Policy Wales - Edition 12. Last accessed by Mott MacDonald: April 2025.

[2] Welsh Government (2025). Technical Advice Note 15: Development, flooding and coastal erosion. Available online: Technical Advice Note 15: Development, flooding and coastal erosion. Last accessed by Mott MacDonald: April 2025.

[3] Welsh Government (2018). Flood Consequence Assessments: Climate change allowances,. Available online: FCA's - draft climate change allowances Last accessed by Mott MacDonald: July 2025.

[4] DataMapWales (2025). Recorded Flood Extents. Available online: Recorded Flood Extents | DataMapWales. Last accessed by Mott MacDonald: February 2026.

[5] NRW (2025). Flood Risk Assessment Wales (FRAW). Available online: Flood and Coastal Erosion Risk Maps. Last accessed by Mott MacDonald: February 2026.

[6] NRW (2025). Flood Map for Planning. Available online: https://flood-map-for-planning.naturalresources.wales/ . Last accessed by Mott MacDonald: February 2026.

[7] LDP-EBD-EN1 Strategic Flood Consequences Assessment Final Report 2018 (flintshire.gov.uk) Last accessed by Mott MacDonald: April 2025.

[8] Flintshire Strategic Flood Consequence Assessment Draft (2020), Available at: LDP-EBD-EN2 Updated SFCA re PE1 Employment Allocations and PE2 Principal Employment Areas, Last accessed by Mott MacDonald: July 2025

[9] Flintshire County Council Preliminary Flood Risk Assessment (2011), Available at: Preliminary Flood Risk Assessment June 2011 (PDF 1MB new window), Last accessed by Mott MacDonald: July 2025.

[10] Flintshire County Council Local Flood Risk Management Strategy (2013), Available at: Flintshire Local Flood Risk Management Strategy 2013, Last accessed by Mott MacDonald: July 2025.

[11] Flintshire County Council Draft Local Flood Risk Management Strategy (2025), Available at: Local Flood Risk Management Strategy 2025 - Public Consultation Draft, Last accessed by Mott MacDonald: July 2025.

[12] 050730 - Full Application - Engineering works to provide flood defence strengthening along 1.5 km of.pdf, Last accessed by Mott MacDonald: July 2025.

[13] https://cdn.cyfoethnaturiol.cymru/688477/north-wales-routine-maintenance-2019_20eng.xlsx?rmode=pad&v=1d4e2ffb0121560, Last accessed by Mott MacDonald: July 2025.

- Natural Resources Wales - Developing hydraulic models for flood risk, dated 8 January 2026[14]
- Natural Resources Wales - Modelling for Flood Consequence Assessments, dated 23 December 2025[15]
- River Dee Hydraulic Modelling Report, ref. 395318-MMD-00-XX-RP-D-0010 dated March 2026, by Mott MacDonald (see further details below).
- Queensferry Drain Hydraulic Modelling Report, ref. 395318-MMD-00-XX-RP-D-0011, dated September 2025, by Mott MacDonald (see further details below).
- Highway Drainage Developed Design Strategy Report, ref. 395318-MMD-00-XX-RP-D-0007, by Mott MacDonald
- Canal and River Trust: Wales and South West waterways map online mapping data[16]
- British Geological Survey GeoIndex Map[17]
- Soilscapes Viewer[18]
- Statement of Intent, 395318-MMD-00-XX-RP-C-0014, dated March 2025, by Mott MacDonald
- Preliminary Sources Study Report, 395318-0044 Rev C, dated April 2025, by Mott MacDonald
- Ground Investigation Report, 395318-0022 Rev F, dated April 2025, by Mott MacDonald
- 1m Digital Terrain Model (DTM) Light Detection and Ranging (LiDAR) data[19]
- Flood Consequences Assessment submitted in support of a Reserved Matters application for Phase 1A (Enabling Working and associated residential development) of the Northern Gateway Development (prepared by Arcadis, on behalf of Pochin Goodman (Northern Gateway Ltd), dated August 2018)[20]

2.2 Hydraulic models

The following site-specific models have been used for the detailed assessment of fluvial and tidal flooding consequences (Section 5).

River Dee

NRW first provided the River Dee hydraulic model to Mott MacDonald in August 2018. This was used by Mott MacDonald to create an updated model, which was used as the starting point for the development of the final model. This was updated with information from the latest hydraulic model held by NRW, and provided to Mott MacDonald in June 2024. The final model (2026) has been used to inform this FCA. The approach has been laid out and agreed with NRW through consultation as recorded in the Scoping Report[21]and further correspondence and meetings that took place in during January and February 2026. The results from the final model are provided in River Dee Hydraulic Modelling Report.

[14] Natural Resources Wales / Developing hydraulic models for flood risk (2026), Last accessed by Mott MacDonald: February 2026

[15] Natural Resources Wales / Modelling for Flood Consequence Assessments (2025), Last accessed by Mott MacDonald: February 2026

[16] Canal and River Trust (2022). Our canal and river network. Available online: https://canalrivertrust.org.uk/enjoy-the-waterways/canal-and-river-network . Last accessed by Mott MacDonald: April 2025.

[17] The British Geological Society (BGS) (2025). British Geological Survey GeoIndex. Available online: BGS Geology Viewer (BETA). Last accessed by Mott MacDonald: June 2025.

[18] Cranfield University (2025). Soilscapes Viewer. Available online: LandIS - Land Information System - Soilscapes soil types viewer. Last accessed by Mott MacDonald: June 2025

[19] Welsh Government (2023). LiDAR viewer. Available online: LiDAR viewer | DataMapWales. Last accessed by Mott MacDonald: June 2025.

[20] Northern gateway

[21] 395318-1015 – A494 River Dee Bridge Replacement Scheme – River Dee Model, Emerging Preferred Option Modelling Scoping Report, by Mott MacDonald, Oct 2024

Queensferry Drain

NRW provided Mott MacDonald with the current hydraulic model for Queensferry Drain in July 2024. This was used as the starting point for the development of the final model (2025). The approach has been laid out and agreed with NRW through consultation as recorded in the Scoping Report[22]. The results from the final model are provided in Queensferry Drain Hydraulic Modelling Report.

[22] 395318-1016 A494 Queensferry Scoping Report.docx, October 2024

3 Flood risk and development planning policy and guidance

3.1 National planning policy and guidance (TAN15)

3.1.1 Context

Technical Advice Note 15 (TAN 15) provides technical guidance relating to development planning and managing flood and coastal erosion risks in Wales. TAN 15 provides a framework within which the flood risks arising from rivers, the sea and surface water, and the risk of coastal erosion can be assessed. The approach set out in the most recent update to TAN 15 ensures flooding and coastal erosion are carefully considered in the context of planning and development management decisions.

TAN 15 reflects the core principles of the National Strategy for Flood and Coastal Erosion Risk Management in Wales[23] to adopt a risk-based approach in respect of development in areas at risk of flooding and coastal erosion. The National Strategy recognises the varying degrees of flood risk, now and in the future.

Section 6 of TAN 15 states that "*The prime objective of a Flood Consequences Assessment is to develop a full appreciation of:*

- *The risk and consequences of flooding on the development; and*
- *The risk and consequences (i.e. the overall impacts) of the development on flood risk elsewhere*"

It is to be noted that the latest TAN 15 on 'Development, flooding and coastal erosion' issued in March 2025 supersedes the 2004 edition of TAN 15 on 'Development and flood risk' and the 1998 release of TAN 14 on 'Coastal Planning'. As such, the latest TAN 15 also incorporates guidance on coastal erosion and, by its nature, is not intended to be considered within the scope of FCAs. Information and assessment of impacts on sedimentation and coastal processes can be found in Volume 3 Technical Appendix 7E.

3.1.2 Flood Map for Planning

Section 4 of TAN 15 states that "*The Flood Map for Planning is the starting point for consideration of flood risk in the planning system. The map uses flood zones to indicate the degree to which land is at risk of flooding from rivers, the sea, surface water and small watercourses. This TAN outlines the actions that should be taken when considering development in the different flood zones*."

Figure 1 of TAN 15 outlines the definitions for different flood zones, which are the basis for considering development, reproduced as Table 3.1 below. The Flood Map for Planning displays predicted future flood risk with an allowance made for climate change over a 100-year lifetime of the development under the central climate change estimate.

[23] Welsh Government (2021). National Strategy for Flood and Coastal Erosion Risk Management in Wales. Available online: National Strategy for Flood and Coastal Erosion Risk Management in Wales | GOV.WALES. Last accessed by Mott MacDonald: May 2025.

Table 3.1: Definition of Flood Map for Planning Zones

Zone	Flooding from rivers	Flooding from the sea	Flooding from surface water and small watercourses
1	Less than 1 in 1000 (0.1%) (plus climate change) chance of flooding in a given year		
2	Less than 1 in 100 (1%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate	Less than 1 in 200 (0.5%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change.	Less than 1 in 100 (1%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change.
3	A greater than 1 in 100 (1%) chance of flooding in a given year, including climate change.	A greater than 1 in 200 (0.5%) chance of flooding in a given year, including climate change.	A greater than 1 in 100 (1%) chance of flooding in a given year, including climate change.
TAN 15 Defended Zones	Areas where flood risk management infrastructure provides a minimum standard of protection against flooding from rivers of 1:100 (plus Areas where flood risk management infrastructure provides a minimum standard of protection against flooding from rivers of 1:100 (plus climate change and freeboard).	Areas where flood risk management infrastructure provides a minimum standard of protection against flooding from the sea of 1:200 (plus climate change and freeboard).	Not applicable.

Source: Adapted from Figure 1 of TAN 15.

Table 3.2 summarises the flood risk posed to the Scheme from tidal, fluvial, and surface water sources, based on the FMfP zones.

Table 3.2: Assessment of flooding based on FMfP zones

Zone	Flooding from rivers	Flooding from the sea	Flooding from surface water and small watercourses
1	✓	✓	✓
2	✓	✓	✓
3	✓	✓	✓
TAN 15 Defended Zones	✗	✓	Not applicable.

Source: NRW, 2025. Collated by Mott MacDonald Ltd. 2026.

3.1.3 Form of development

TAN 15 recognises two key forms of development, defined as follows:

- **New Development**: Any development on greenfield land
- **Redevelopment**: Any development on previously developed land as defined in Planning Policy Wales

The ability to avoid or minimise risk when undertaking development varies according to the type of development proposed. The proposed construction of a new bridge structure and highway to replace an old bridge crossing will be on predominantly ‘brownfield’ previously developed land. As such, the proposed development is considered to be classed as ‘Redevelopment’.

3.1.4 Vulnerability classification

TAN 15 classifies developments under one of the three following flood risk vulnerability categories, as shown in Table 3.3.

Table 3.3: TAN 15 Vulnerability classification

Vulnerability category	Types
Highly vulnerable development	All residential premises (including hotels, Gypsy and Traveller sites, caravan parks and camping sites).
	Schools and childcare establishments, colleges and universities. Hospitals and GP surgeries.
	Especially vulnerable industrial development (e.g. power generating and distribution elements of power stations, transformers, chemical plants, incinerators), and waste disposal sites.
	Emergency services, including: ambulance stations, fire stations, police stations, command centres, emergency depots.
	Buildings used to provide emergency shelter in time of flood.
Less vulnerable development	General industrial, employment, commercial and retail development.
	Transport and utilities infrastructure.
	Car parks.
	Mineral extraction sites and associated processing facilities (excluding waste disposal sites).
	Public buildings including libraries, community centres and leisure centres (excluding those identified as in Highly Vulnerable category and emergency shelters).
	Places of worship.
	Cemeteries.
	Equipped play areas.
	Renewable energy generation facilities (excluding hydro generation)
Water compatible development	Boatyards, marinas and essential works required at mooring basins.
	Development associated with canals.
	Flood defences and management infrastructure.
	Open spaces (excluding equipped play areas).
	Hydro renewable energy generation.

Source: Reproduction of Figure 4, TAN15

As a form of transport infrastructure, the proposed development is considered to be classed as ‘Less vulnerable development’.

However, it should be noted that Paragraph 9.4 of TAN 15 states that “*Water compatible developments include developments which are required to be located near water by virtue of their nature, and developments that are resilient to the effects of occasional flooding.”* As such, there may also be an argument that the bridge element of the development be classed as ‘Water compatible development’.

Paragraph 9.6 of TAN 15 recognises that for larger developments a single vulnerability category may not be appropriate. However, based on professional judgement and assuming worst case

scenario for the purposes of this assessment, a single 'Less vulnerable development' classification has been adopted for this FCA.

3.1.5 Lifetime of development

Section 10.28 of TAN 15 states that '*Generally, it is appropriate to think of new dwellings as having a lifetime of 100 years. Lifetimes for other types of development will vary, but 75 years is considered a reasonable rule of thumb'.* In line with the TAN, a 75-year lifetime of the development has been adopted for the Scheme, which has also been agreed in pre-application discussions with NRW.

3.1.6 Climate change allowances

Fluvial

Welsh Government guidance on climate change allowances for flood consequence assessments recommends that the central allowance (20% uplift) for the 2080s epoch for the relevant river basin district is used to assess the potential impact of climate change as part of a FCA and to inform design levels.

If a figure other than the central estimate is used, applicants are expected to provide full justification within the FCA. It also recommended that, where appropriate, an assessment of risk should be made using the upper end allowance (45% uplift) to inform mitigation measures that help to ensure the long-term resilience of the development.

Tidal

Sea level rise has been calculated in accordance with Table 2 of Welsh Government guidance on climate change allowances for FCAs. This gives a 0.66m rise in sea levels between 2025 and 2100.

3.1.7 Principles of the TAN for development plan and development management purposes

The proposed redevelopment secures this critical link between north Wales and England and the Scheme has been identified in the Local Development Plan (LDP) see Section 3.3.1. The Scheme is therefore considered justifiable in accordance with the principles set out in Section 8 of TAN15

3.2 Local planning policy and flood risk management plans

3.2.1 Local Development Plan (LDP)

The proposed A494 road improvement Scheme is included in the Flintshire County Council LDP[24]. The Scheme has been safeguarded under the Development Management Policies – Creating Sustainable Places and Communities as the road is part of the core highway network and the Scheme aims to provide the following benefits to the local area:

- Improve reliability and journey times;
- Improve safety;
- Improve connections for business;
- Improve access between residential areas and places of employment;
- Reduce carbon emissions along the road; and

[24] Flintshire County Council Local Development Plan 2015-2030 (FINAL LDP Written Statement English), Adopted 24th January 2023, Last Accessed: June 2025

- Make more efficient use of the existing transport infrastructure.

3.2.2 Strategic Flooding Consequences Assessment (SFCA)

Flintshire County Council produced a Strategic Flooding Consequences Assessment (SFCA) in 2018 as part of the evidence base to inform the update to the LDP. This document was updated with regards to proposed PE1 Employment Allocations and PE2 Principal Employment Areas in July 2020, however only a draft version of the SFCA has been published on Flintshire County Council's website.

3.3 Consultation and guidance from NRW

3.3.1 Pre-application consultations

A number of pre-application consultations have been held with NRW to inform the FCA. A comprehensive list of NRW pre-application correspondence is provided in Chapter 7 (Water) of the ES.

3.3.2 NRW guidance

Flood modelling guidance previously contained in NRW Guidance Notes (GN028) Modelling for Flood Consequence Assessments and (GN43) Modelling Blockage and Breach Scenarios has now been replaced with the following web-based publications:

- "Developing hydraulic models for flood risk" provides guidance for all flood modelling projects, on areas like model scenario, topographic data, representing defended area etc.
- "Modelling for Flood Consequence Assessments" provides further detailed guidance on how to prepare and submit models in support of FCAs.

3.4 Consultation and guidance from the Lead Local Flood Authority

The Lead Local Flood Authority for the area is Flintshire County Council, which is also a key stakeholder on the Scheme and is represented on the Scheme's Project Board.

3.4.1 Preliminary Flood Risk Assessment (PFRA)

The EC Flood Directive has been transposed into UK law through the Flood Risk Regulations (2009) and the Flood and Water Management Act (FWMA) (2010). Under the Flood Risk Regulations (2009), Flintshire County Council prepared and undertook a Preliminary Flood Risk Assessment (PFRA) in 2011 to assess the harmful consequences of past and potential future floods, and to identify significant flood risk areas (called 'Flood Risk Areas'). Flood Risk Management Plans (FRMPs), setting out risk management objectives and strategies for each of the Flood Risk Areas, are identified in the PRFA.

The PFRA concluded that there were no potential Flood Risk Areas within the Flintshire County Council administrative area. The PFRA was reviewed in 2017 and found that there was no new information to change the understanding of future flood risk to the area.

3.4.2 Flintshire Local Flood Risk Management Strategy (LFRMS)

The Flintshire Local Flood Risk Management Strategy (LFRMS) is currently undergoing an update and consequently both the 2025 draft version for public consultation and the current 2013 publication have been consulted. The LFRMS identifies risks of flooding with a focus on local sources that the LLFA are responsible for. This includes surface water runoff, groundwater

and ordinary watercourses. Flood risk management policies for these sources in the Local Authority area are set out and explained in relation to the objectives, measures and legislation in Welsh Government's National Flood Risk Management Strategy.

3.4.3 SuDS approval board (SAB) function

Flintshire County Council are the SuDS Approving Body (SAB). However, as the project is a road for the Welsh Ministers as the highway authority, the Scheme is exempt from SAB Approval. Regardless, application of the statutory standards for SuDS is still recognised as best practice and opportunities for SuDS have been incorporated into the Scheme, where possible.

4 Initial assessment of flooding consequences

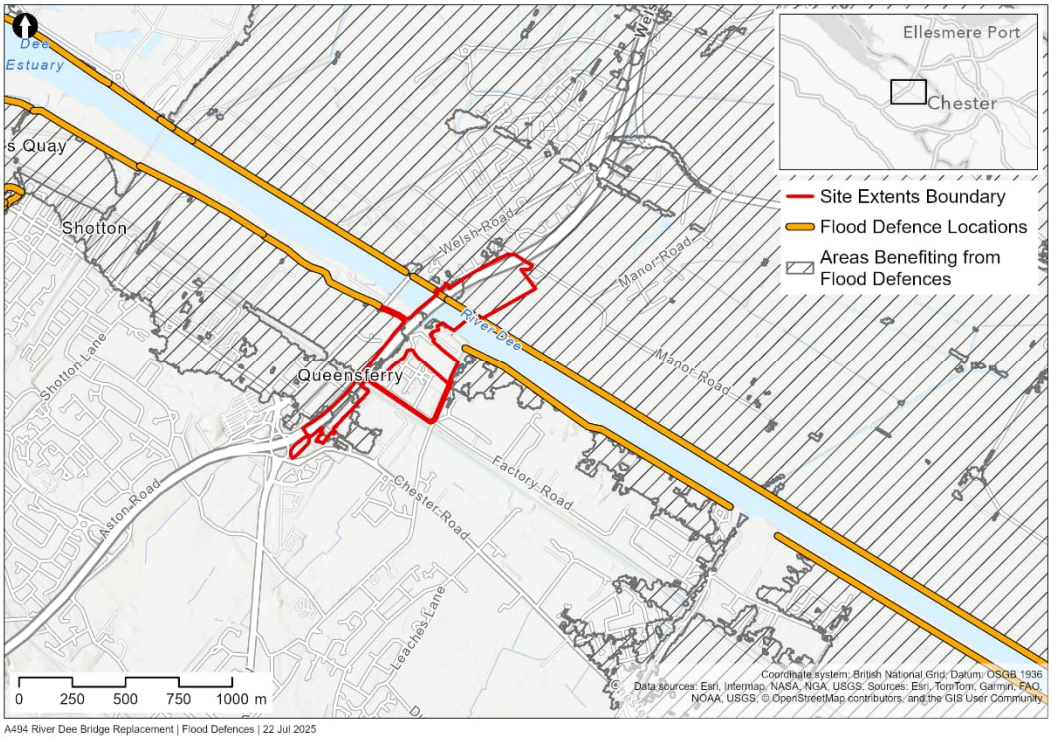
This Section provides an assessment of existing (pre-development) flooding consequences, in line with TAN15.

The assessment makes use of readily available online data and does not consider site or catchment specific modelling or information which is covered later in Section 5 of this report.

4.1 Existing flood defences

The banks of the River Dee currently benefit from extensive tidal flood defences, as shown in Figure 4.1. NRW maintain these defences, as indicated by the NRW flood defence structures dataset. The defences consist of embankments on either side of the river and protect a considerable area, particularly Sealand and Shotwick. The northern embankment had strengthening works completed in 2013 which included sheet piling to improve structural integrity. A minimum embankment level of 7.2mAOD is provided along the northern bank. NRW has confirmed that the current defences on both north and south sides offer a 1 in 200 year current-day standard of protection, with additional freeboard.

Figure 4.1: Flood Defence Locations



Source: Mott MacDonald (2026), Contains NRW data.

NRW has permissive powers (but not a duty) to carry out flood and coastal risk management work, including maintenance of flood defences. There are four published plans that indicate whether these flood defences will be maintained by NRW in the long term:

- River Dee Flood Risk Management Strategy.
- River Dee Catchment Flood Management Plan (CFMP).
- North West England and North Wales Shoreline Management Plan 2 (SMP2).
- North Wales Routine Maintenance Programme, where the assets are designated as 'high' consequence for flood risk management in the NRW.

These plans highlight the importance of these assets for wider flood protection on Deeside, and provide reassurance that NRW will continue to maintain these defences in the long term.

4.2 Initial assessment

Using readily available data, Table 4.1 below provides an initial assessment of flooding consequences. All mapping associated with the initial assessment is provided in Appendix C.

Table 4.1: Initial assessment of flooding consequences

Flood Risk Mechanism	Source	Flooding Risk	Description
Past flood events	Queensferry Drain	Yes - High	Figure C.1 displays the NRW Recorded Flood Extents. This indicates past flooding within the south-western extents of the Scheme, relating to two flood events occurring in 1976 and 2000. Given the extents are centred around the Queensferry Drain, it is assumed this flooding originated from this watercourse.
Fluvial	River Dee and Queensferry Drain	Yes - High	Figure C.2 displays the Flood Risk Assessment Wales (FRAW) – Rivers dataset. This indicates small areas at high risk of fluvial flooding (>3.3% AEP) which appear to be confined to the watercourses within the Scheme area. Within the southern extents of the Scheme, and in an area proposed for an access road in the north, there are small areas at low risk of flooding (0.1% - 1% AEP). The Flood Map for Planning (FMfP) – Rivers (Figure C.3) represents an undefended, 100-year climate change scenario. It is indicated that the Scheme is partially within Flood Zones 2 and 3. This is in areas adjacent to the northern bank of the River Dee and surrounding Queensferry Drain (Flood Zone 3) and within the southern extents of the Scheme (Flood Zone 2). Whilst a large proportion of the Scheme is at very low risk, overall, the Scheme is considered to be at high risk for fluvial flooding.
Tidal	Queensferry Drain	No	The downstream extent of the Queensferry Drain is controlled by a Pumping Station that discharges into the tidal River Dee. This is by gravity during periods of low water in the River Dee and is pumped during periods of high water. Therefore the Queensferry Drain is not a source of tidal flood risk.
Tidal	River Dee	Yes - High	Figure C.4, the FRAW – Seas, indicates that much of the Scheme is at low risk of tidal flooding (0.1% - 0.5% AEP).

			Figure C.5 displays the FMfP – Seas dataset which represents an undefended, 100-year climate change scenario. This indicates that the majority of the Scheme is located within Flood Zone 3 for tidal flooding. The FRAW suggests the Scheme is at much lower risk from tidal flooding than the FMfP. This is due to the FRAW taking into account areas benefiting from flood defences as well as the effects of climate change. Areas benefiting from defences are indicated in Figure 4.1. Whilst a proportion of the Scheme is at low risk, overall, the Scheme is considered to be at high risk for tidal flooding.
Surface Water	Surface water flows and accumulation	Yes - Medium	The FRAW – Surface Water and Small Watercourses dataset (Figure C.6) indicates only small areas of the Scheme are at risk of surface water flooding. These areas are located near the existing railway underpass and interchange with Chester Road in the south, both of which are shown as low (0.1%-1% AEP) or medium (1%-3.3% AEP) risk. The FMfP – Surface Water and Small Watercourses Figure C.7 represents an undefended, 100-year climate change scenario. Mirroring the picture provided FRAW, small areas of Flood Zone 2 and 3 are located at the existing railway underpass and interchange with Chester Road in the south. Both surface water flood maps show localised surface water issues and no large-scale pooling or overland flow paths indicative of small watercourses. Overall, the Scheme is considered to be at medium risk of surface water flooding.
Groundwater	Groundwater within bedrock and superficial layers.	Yes - Low	Historical groundwater flooding has not been documented in any information reviewed for this FCA. Groundwater monitoring was undertaken in four boreholes since October 2019 (see Railway Cofferdam Assessment 395318-TN63-V2, Mott MacDonald, 2021). Groundwater levels are generally consistent across the Scheme, with phreatic groundwater generally recorded at 4mAOD and the highest levels at 4.5mAOD. These levels are between 0.2m and 0.7m below existing ground levels at the lowest point of the Scheme (i.e. at the existing rail underpass). The data is inconclusive on whether the tide influences groundwater levels at the Scheme (Railway Cofferdam Assessment 395318-TN63-V2, Mott MacDonald, 2021). Overall, the Scheme is considered to be at low risk for groundwater flooding.

Sewer Exceedance	Portable water, foul and combined systems.	Yes - Low	Flintshire SFCA indicates that Dŵr Cymru Welsh Water have records of approximately 236 sewer flooding events in the Queensferry and Conah's Quay area between 1990 and 2016. Of these, approximately four cases are recorded near to the Scheme as indicated by Figure 5.1 of the SFCA however there are no recorded incidents within the Scheme area. Welsh Water records saw the presence of sewer within the scheme extent, and the Queensferry Sewerage Treatment Works lies immediately adjacent to the scheme. Overall, the Scheme is considered to be at low risk for sewer flooding.
Reservoirs and Large Waterbodies	Llyn Brenig	Yes - Low	The NRW Flood and Coastal Erosion Risk Map[25] 'Flood Risk from Reservoirs' indicates a small area of the Scheme north of the River Dee at risk of flooding from Llyn Brenig. The reservoir is more than 100km upstream of the Scheme. All large reservoirs must be inspected and supervised by reservoir panel engineers. The enforcement authority for the Reservoirs Act 1975 in Wales is NRW. They ensure that reservoirs are inspected regularly, and that essential safety work is carried out. Given the safety legislation in place, flood risk from reservoirs is considered to be low.
Canals and Manmade Waterways	n/a	No	There are no canals or manmade waterways in the vicinity of the Scheme.

Source: Various data sources, collated by Mott MacDonald, 2026

The above analysis indicates that the Scheme is at high risk of flooding from tidal (River Dee) and fluvial (River Dee and Queensferry Drain) source, and hence these are haven taken forward for further assessment in Section 5.

The above analysis indicates that the Scheme is also at medium risk of flooding from surface water sources. The proposed management of surface water risk ie further explored in Section 7.

[25] NRW Flood and Coastal Erosion Risk Maps (Flood and Coastal Erosion Risk Maps), Last Accessed by Mott MacDonald: June 2025

5 Detailed assessment of flooding consequences

This Section provides an assessment of the flooding consequences under existing and future conditions, for both the existing (pre-development) and proposed (post-development) Scheme, as required by TAN15.

The Section builds on the initial screening completed in Section 3, and contains information obtained from site-specific hydraulic modelling completed to inform the design and FCA for the Scheme. It will provide a full understanding of the potential risks and consequences of High Risk sources identified in Section 4 (namely River Dee fluvial, River Dee tidal and Queensferry Drian fluvial). The assessment also includes both exceedance (overtopping) and residual (breach / blockage) scenarios, as required by the TAN.

The assessments presented in this section will be used to determine whether the Scheme meets the acceptability criteria for flooding consequences (section 11 of TAN15) which is covered later in Section 6 of this report.

2025 has been adopted as the baseline and 'current day' on this basis that this aligns with time the draft Orders and associated Environmental Statement were published. It is also assumed this will also be used as the ongoing baseline for any subsequent stages of the project.

5.1 Existing (pre-development) scenario

5.1.1 River Dee

The following tables show the scenarios that have been modelled and will be assessed in this FCA.

5.1.1.1 Summary of modelled existing (pre-development) scenarios

Table 5.1: Current day (2025) modelled existing (pre-development) scenarios

Model Run	Hydrological event
Dee_Def_Q1000_2025_existing	0.1% AEP fluvial flood event
Dee_Def_T200_2025_existing	0.5% AEP tidal event in 2025
Dee_Def_T1000_2025_existing	0.1% AEP tidal event in 2025

Source: Mott MacDonald, 2026

Note: The 'Lower' climate change allowance (5%) has been adopted for the 0.1% 2100 Fluvial event instead of the recommended 'Central allowance (20%), as the additional flows in the latter scenario cause the model to become unstable upstream of the Scheme, at Chester, and result in the model failing.

Table 5.2: In the future (2100) modelled existing (pre-development) scenarios considering the lifetime of the development

Model Run	Hydrological event
Dee_Def_Q100cc20_2100_existing	1% AEP fluvial with Central (20%) climate change allowance until the 2080s (representing bridge design life to 2100)
Dee_Def_Q100cc45_2100_existing	1% AEP fluvial with Upper (45%) climate change allowance until the 2080s (representing bridge design life to 2100)
Dee_Def_Q1000-cc05_2100_existing	0.1% AEP fluvial with Lower (5%) climate change allowance until the 2080s (representing bridge design life to 2100)
Dee_Def_T200_2100_existing	0.5% AEP tidal event in 2100
Dee_Def_T1000_2100_existing	0.1% AEP tidal event in 2100

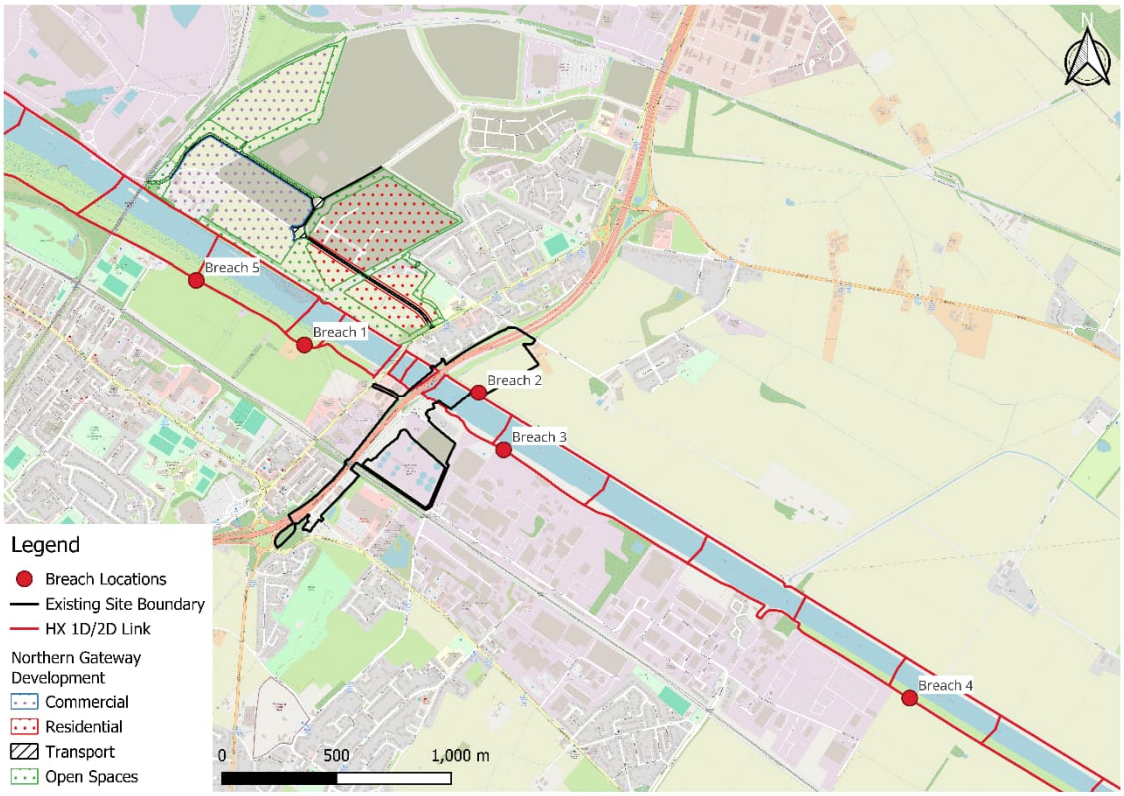
Model Run	Hydrological event
Tidal Flooding (Breach Scenarios)	
Dee_Def_T200_2100_existing_breach1	0.5% AEP tidal event in 2100 with existing breach at location 1
Dee_Def_T200_2100_existing_breach2	0.5% AEP tidal event in 2100 with existing breach at location 2
Dee_Def_T200_2100_existing_breach3	0.5% AEP tidal event in 2100 with existing breach at location 3
Dee_Def_T200_2100_existing_breach4	0.5% AEP tidal event in 2100 with existing breach at location 4
Dee_Def_T200_2100_existing_breach5	0.5% AEP tidal event in 2100 with existing breach at location 5
Dee_Def_T1000_2100_existing_breach1	0.1% AEP tidal event in 2100 with existing breach at location 1
Dee_Def_T1000_2100_existing_breach2	0.1% AEP tidal event in 2100 with existing breach at location 2
Dee_Def_T1000_2100_existing_breach3	0.1% AEP tidal event in 2100 with existing breach at location 3
Dee_Def_T1000_2100_existing_breach4	0.1% AEP tidal event in 2100 with existing breach at location 4
Dee_Def_T1000_2100_existing_breach5	0.1% AEP tidal event in 2100 with existing breach at location 5

Source: Mott MacDonald, 2026

As required by the TAN, breach scenarios have been assessed in the modelling. Five locations were selected for assessment as justified below (see Figure 5.1 overleaf for locations). These have been agreed with NRW in pre-application discussions. As recommended by NRW Guidance[14,15] for earth embankments, the breach width selected for all scenarios was 50m.

- Tidal Breach 1 – chosen due to known problems with badger burrowing along the riverbank coupled with a distinct lack of vegetation. Located immediately downstream of the Scheme where the riverbank is raised in front of the tidal defence. This location lacks a protective barrier which increases the frequency of hydraulic loading and hence the risk of breaching.
- Tidal Breach 2 – chosen due to its proximity to the Scheme on the right-hand bank of the River Dee with residential areas in Sealand and Garden at immediate risk of flooding from this location. There are no known problems on this northern embankment stretch to focus on for vulnerability.
- Tidal Breach 3 – chosen due to known low spots created in the embankment by illegal motorbike activity in the past. Located upstream of the Scheme on the left bank of the River Dee at Pentre.
- Tidal Breach 4 – chosen as there is a large area of embankment covered by hedge on the landward side leading to low grass and other vegetation cover and led to localised scouring in the region. This breach is located on the left bank further upstream along the River Dee at Sandycroft.
- Tidal Breach 5 – chosen due to known defects in the embankment because of badger sets and tunnelling. The area is also covered in dense vegetation which has led to a lack of grass cover on this embankment. Located further downstream of the Scheme at Shotton than Tidal Breach 1.

Figure 5.1: Tidal Breach Locations



Source: © OpenStreetMap contributors; Contains OS data © Crown copyright and database rights (2026)

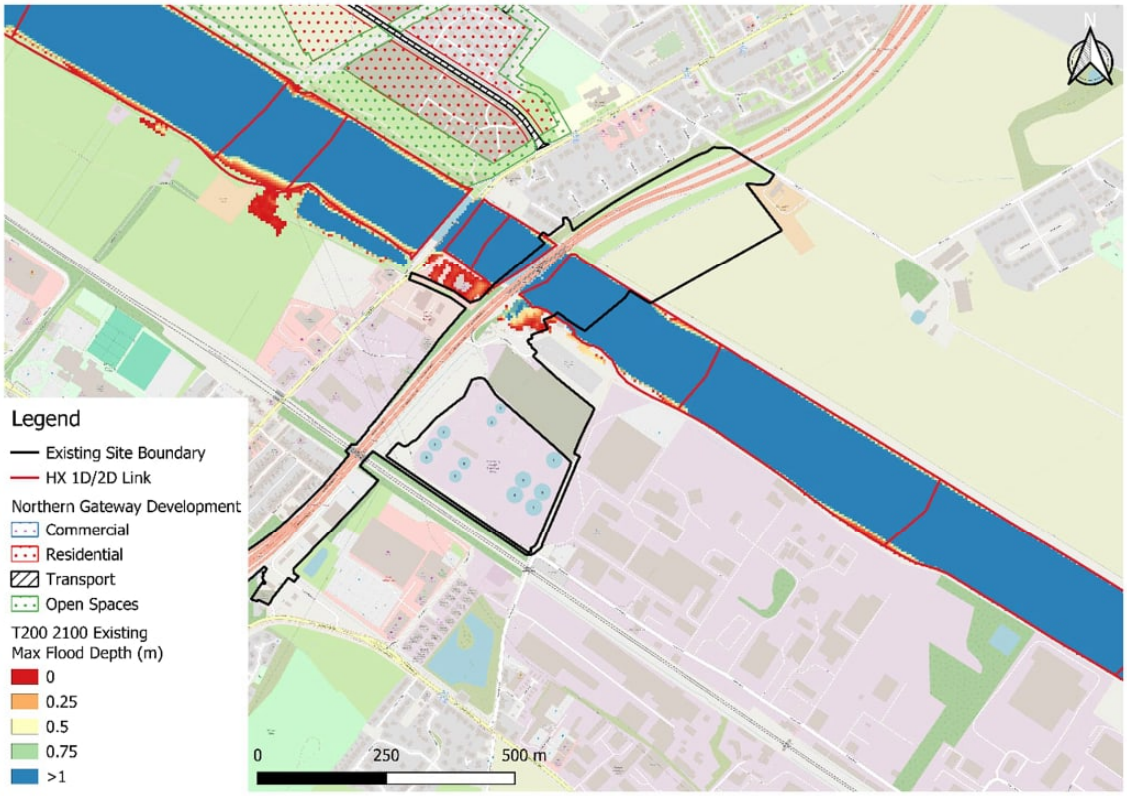
5.1.1.2 Existing (pre-development) fluvial flood risk

- For the 0.1% AEP and 1% plus climate change events, no flooding is predicted along the channelised section of the River Dee (adjacent to the Scheme), and the river is only predicted to go out of bank upstream of the Scheme, at Chester.
- Flooding extends north into Chester and depths exceed 1m for much of the area across Towergate.
- Appendix B1 in the River Dee modelling report provide maps showing the predicted extents of existing fluvial flood risk in Chester.

5.1.1.3 Existing (pre-development) tidal flood risk

- For the 0.5% and 0.1% AEP events, no flooding is predicted along the channelised section of the River Dee adjacent to, and within the Scheme extent. However, there is flooding further afield, within the model extent; downstream at Wepre Gutter and Connah's Quay, and upstream at Chester. Appendix B2 in the River Dee modelling report provides maps showing the predicted extents.
- For the 0.5% AEP event, incorporating allowances for climate change, the modelling indicates overtopping of flood defences at and adjacent to the Scheme extent. Overtopping is predicted to occur both within the Scheme boundary (on the left bank upstream of the existing bridge) and just outside the Scheme boundary (again on the left bank however this time downstream of the existing bridge), as Figure 5.2 below shows.

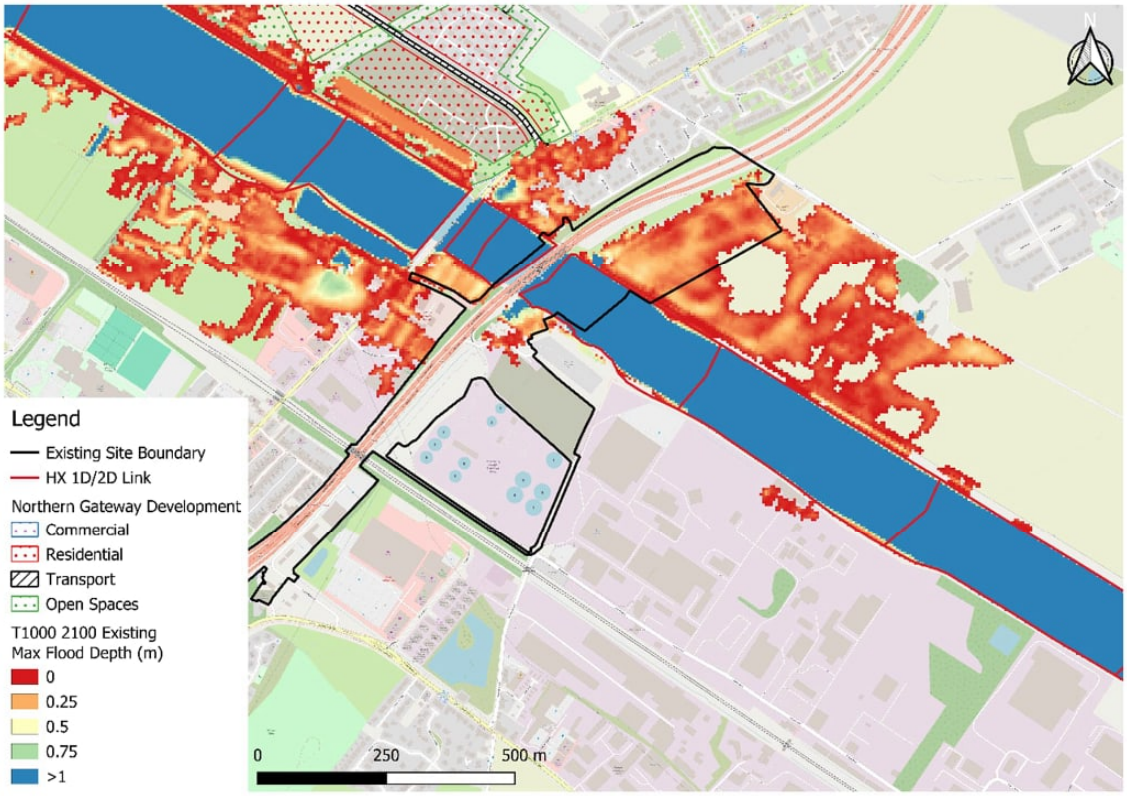
Figure 5.2: 0.5% AEP Tidal Existing Scenario Flood Depth at Existing Scheme in 2100



Source: © OpenStreetMap contributors; Contains OS data © Crown copyright and database rights (2026)

- For the 0.1% AEP event, incorporating allowances for climate change, out of bank flooding is expected to occur on both sides of the River Dee within the proposed Scheme extent, as shown in Figure 5.3.

Figure 5.3: 0.1% AEP Tidal 2100 Flood Depth at Existing Scheme



Source: © OpenStreetMap contributors; Contains OS data © Crown copyright and database rights (2026)

Section 5.5 of the River Dee modelling report provides maps showing the predicted extents of alternative existing tidal flood risk scenarios. These maps present the 97.5% confidence bound (C2) sensitivity test, representing an upper estimate of likely sea levels for the 0.5% and 0.1% AEP tidal events, as requested by NRW during pre-application discussions.

5.1.1.4 Existing (pre-development) tidal flood risk - breach scenarios

- All 5 scenarios show that a breach of the flood defences along the tidal River Dee would result in far greater flood extents when compared against the existing (pre-development) tidal flood risk where only overtopping occur. The modelling assessment reinforces the importance of the protection provided by the current tidal flood defences in the area.
- Of the five breach scenarios assessed, only a single scenario (Breach 4) does not result in flooding within the Scheme boundary.
- Appendix B3 in the River Dee modelling report provide maps showing the predicted extents of these breach scenarios.

5.1.2 Queensferry Drain

The following tables show the scenarios that have been modelled and will be assessed in this FCA.

5.1.2.1 Summary of modelled existing (pre-Scheme) scenarios

Table 5.3: Current day (2025) modelled existing (pre-development) scenarios

Model Run	Hydrological event
QFD_BAS_DES_SD_10_25_0100_005	1% AEP Fluvial
QFD_BAS_DES_SD_10_25_01000_005	0.1% AEP Fluvial

Source: Mott MacDonald, 2025

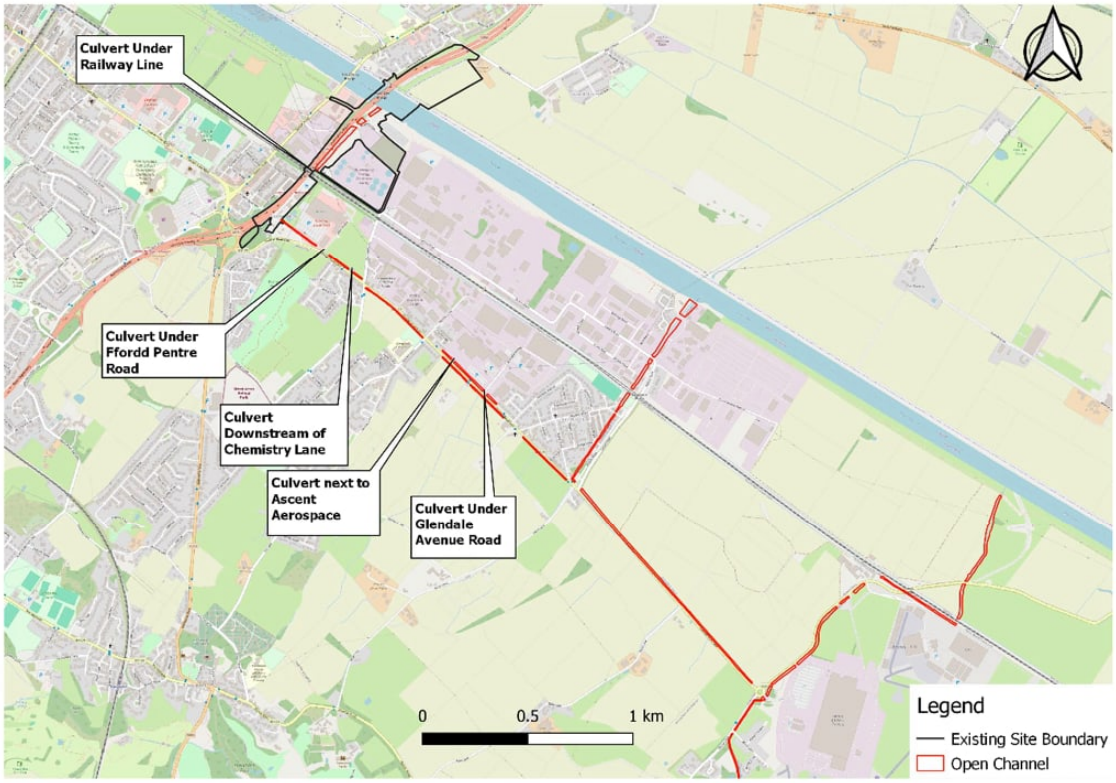
Table 5.4: In the future (2100) modelled existing (pre-development) scenarios considering the lifetime of the development

Model Run	Hydrological event
QFD_BAS_DES_SD_10_25_0100_20CC_005	1% AEP + 20 CC Fluvial
QFD_BAS_DES_SD_10_25_01000_20CC_005	0.1% AEP + 20 CC Fluvial
QFD_BAS_SEN_B67P_SD_10_25_0100_20CC_005	1% AEP + 20 CC Fluvial + 67% blockage
QFD_BAS_SEN_B67P_SD_10_25_01000_20CC_005	0.1% AEP + 20 CC Fluvial + 67% blockage

Source: Mott MacDonald, 2025

As required by the TAN, blockage scenarios have been assessed. The scenario has been agreed in pre-application discussions with NRW and assumes the blocking of five critical structures shown in Figure 5.4 by 67%.

Figure 5.4: Location of the five blocked structures assessed

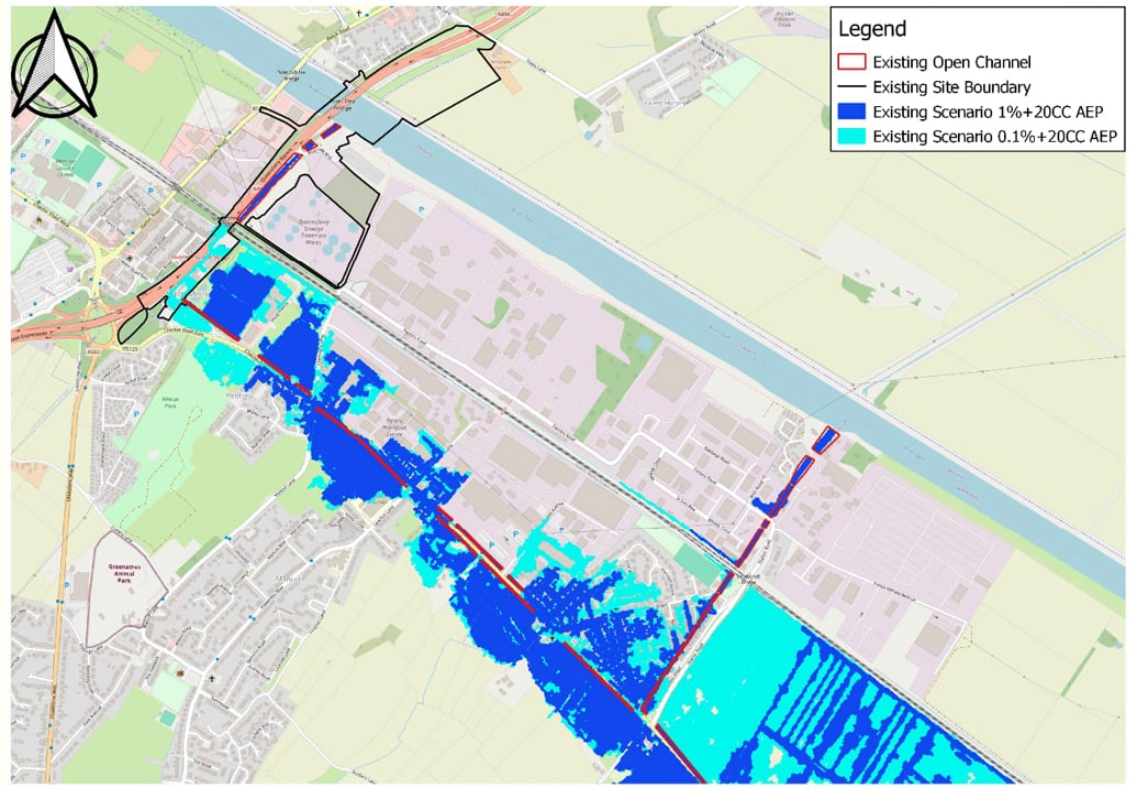


Source: © OpenStreetMap contributors; Contains OS data © Crown copyright and database rights (2026)

5.1.2.2 Existing (pre-development) fluvial flood risk

The Scheme is not at risk in the 1% and 0.1% AEP present day events, nor the 1% AEP 2100 event. It is predicted to be at risk in the extreme event (0.1% AEP 2100), as shown in Figure 5.5 below. In this event, flooding is expected to affect the southern half of the Scheme boundary, south of the railway line.

Figure 5.5: Map comparing the 1% and 0.1% AEP 2100 flood extents for the existing scenario Queensferry Drain free-flowing (without blockage)

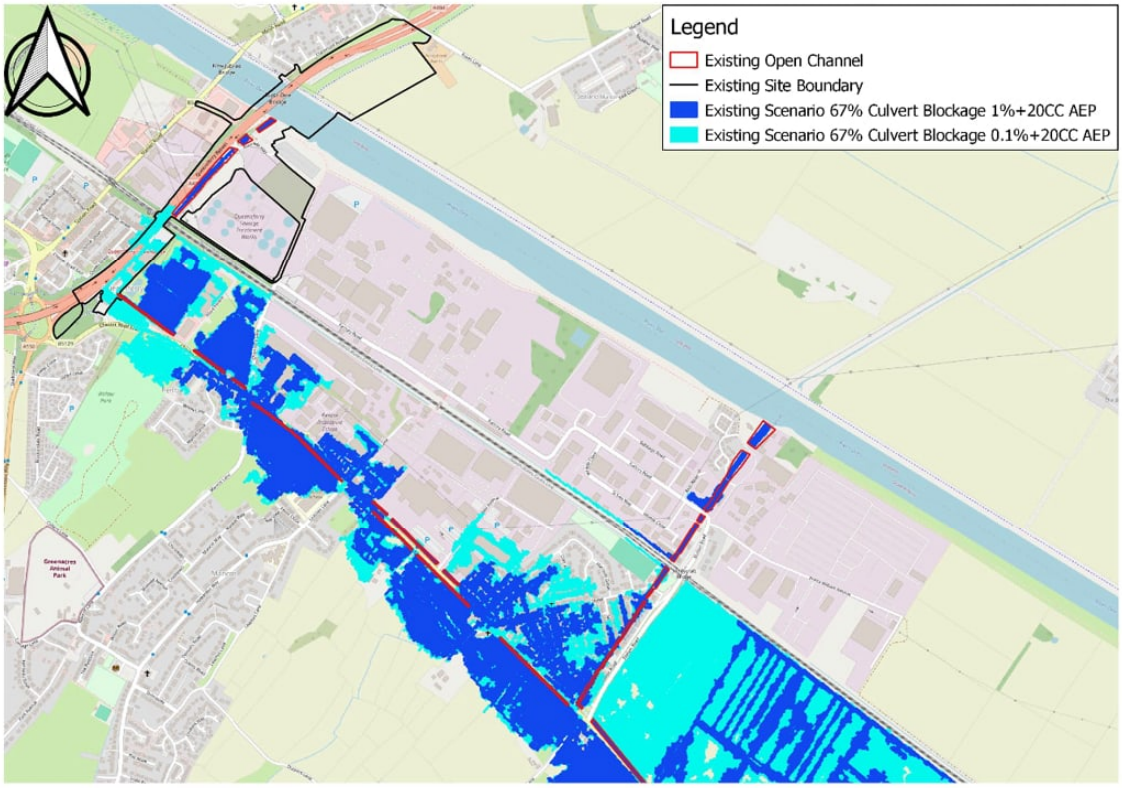


Source: © OpenStreetMap contributors; Contains OS data © Crown copyright and database rights (2026)

5.1.2.3 Existing (pre-development) fluvial flood risk – blockage scenarios

The blockage event shows a similar pattern to the free-flowing event, in that the Scheme is not at risk in the 1% and 0.1% AEP present day events, nor the 1% AEP 2100 event. It is predicted to be at risk in extreme event (0.1% AEP 2100), affecting the southern half of the Scheme, south of the railway line, see Figure 5.6 below.

Figure 5.6: Map comparing the 1% and 0.1% AEP 2100 flood extents for the existing scenario Queensferry Drain with blockage



Source: © OpenStreetMap contributors; Contains OS data © Crown copyright and database rights (2026)

5.2 Proposed (post-development) scenario

5.2.1 River Dee

The following tables show the scenarios that have been modelled and will be assessed in this FCA.

5.2.1.1 Summary of modelled proposed (post-development) scenarios

Table 5.5: Current day (2025) modelled proposed (post-development) scenarios

Model Run	Hydrological event
Dee_Def_Q1000_2025_proposed	0.1% AEP fluvial flood event
Dee_Def_T200_2025_ proposed	0.5% AEP tidal event in 2025
Dee_Def_T1000_2025_ proposed	0.1% AEP tidal event in 2025

Source: Mott MacDonald, 2026

Table 5.6: In the future (2100) modelled proposed (post-development) scenarios considering the lifetime of the development

Model Run	Hydrological event
Dee_Def_Q100cc20_2100_proposed	1% AEP fluvial with Central (20%) climate change allowance until the 2080s (representing bridge design life to 2100)
Dee_Def_Q100cc45_2100_proposed	1% AEP fluvial with Upper (45%) climate change allowance until the 2080s (representing bridge design life to 2100)

Model Run	Hydrological event
Dee_Def_Q1000-cc05_2100_proposed	0.1% AEP fluvial with Lower (5%) climate change allowance until the 2080s (representing bridge design life to 2100)
Dee_Def_T200_2100_proposed	0.5% AEP tidal event in 2100
Dee_Def_T1000_2100_proposed	0.1% AEP tidal event in 2100 with lower (30%
Tidal Flooding (Breach Scenarios)	
Dee_Def_T200_2100_ proposed_breach1	0.5% AEP tidal event in 2100 with existing breach at location 1
Dee_Def_T200_2100_ proposed_breach2	0.5% AEP tidal event in 2100 with existing breach at location 2
Dee_Def_T200_2100_ proposed_breach3	0.5% AEP tidal event in 2100 with existing breach at location 3
Dee_Def_T200_2100_ proposed_breach4	0.5% AEP tidal event in 2100 with existing breach at location 4
Dee_Def_T200_2100_ proposed_breach5	0.5% AEP tidal event in 2100 with existing breach at location 5
Dee_Def_T1000_2100_ proposed_breach1	0.1% AEP tidal event in 2100 with existing breach at location 1
Dee_Def_T1000_2100_ proposed_breach2	0.1% AEP tidal event in 2100 with existing breach at location 2
Dee_Def_T1000_2100_ proposed_breach3	0.1% AEP tidal event in 2100 with existing breach at location 3
Dee_Def_T1000_2100_ proposed_breach4	0.1% AEP tidal event in 2100 with existing breach at location 4
Dee_Def_T1000_2100_ proposed_breach5	0.1% AEP tidal event in 2100 with existing breach at location 5

Source: Mott MacDonald, 2026

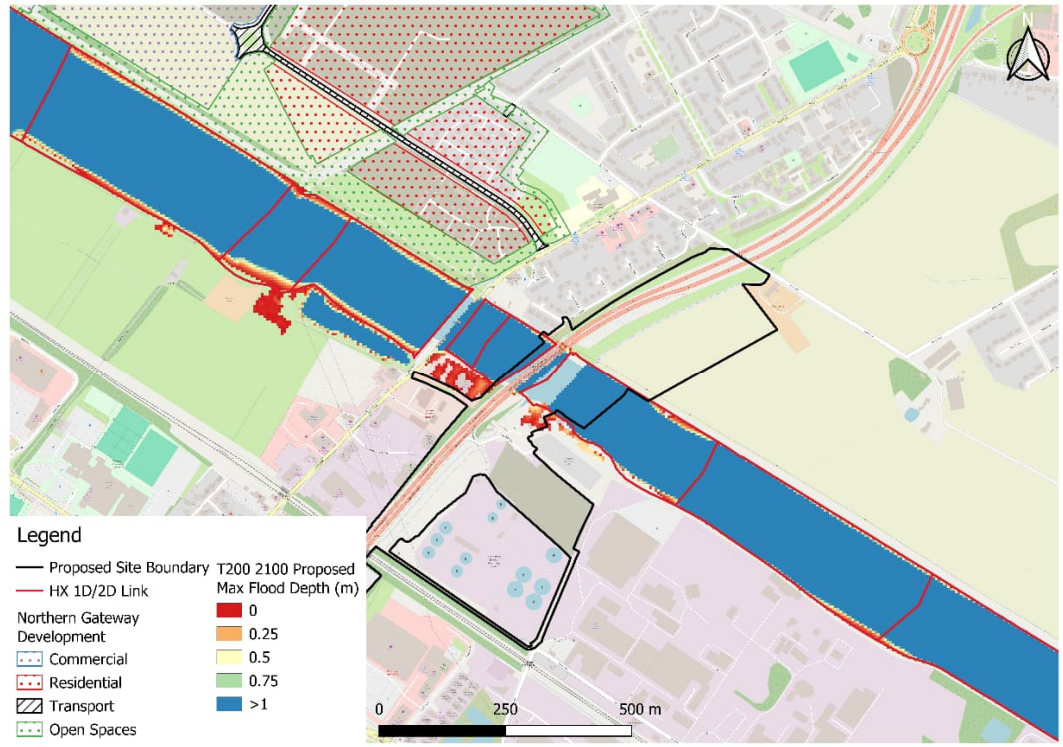
5.2.1.2 Proposed (post-development) fluvial flood risk

Similar to the existing scenario, the river is only predicted to go out of bank upstream of the Scheme, at Chester. No flooding is predicted within the Scheme boundary, and it remains flood free for the 1% AEP and 0.1% AEP 2100 events.

5.2.1.3 Proposed (post-development) tidal flood risk

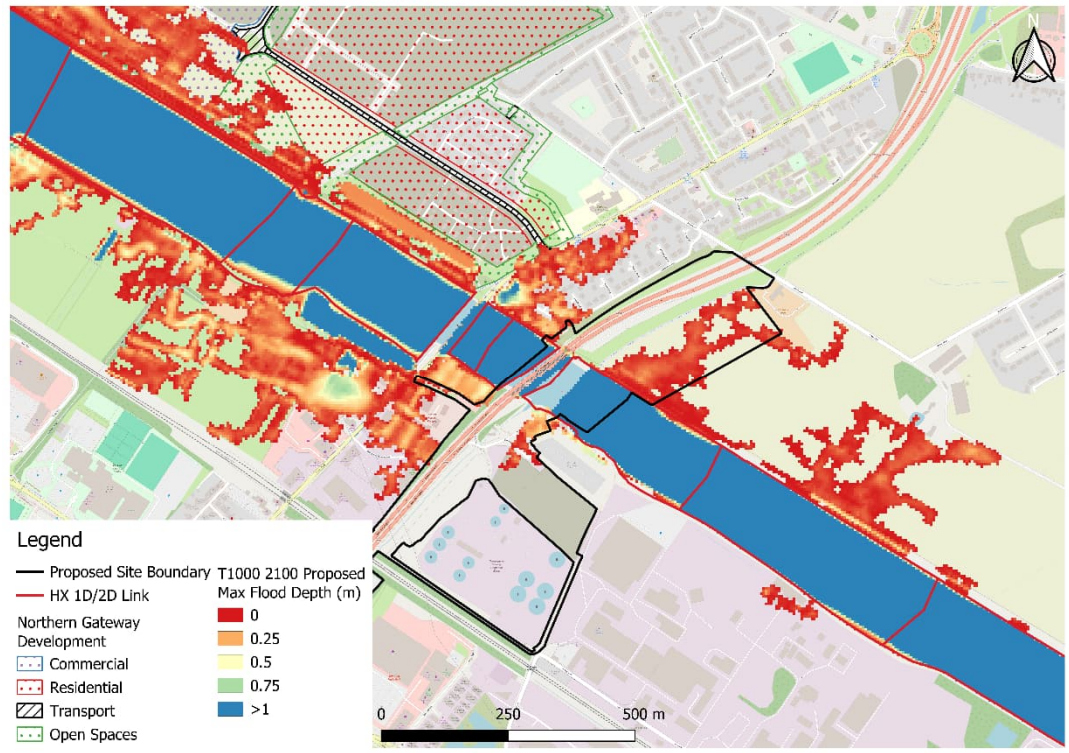
- The proposed scenario produces the same flood extents compared to the existing scenario for the 0.5% and 0.1% AEP present day tidal overtopping events.
- The proposed scenario produces very similar flood extents compared to the existing scenario for the 0.5% AEP 2100 event and the Scheme is only at risk of flooding flood around the area of the new Queensferry Drian Pumping Station. (see Figure 5.7 overleaf).
- The proposed scenario produces very similar flood extents compared to the existing scenario for the 0.1% AEP 2100 event. In this event, out of bank flooding is expected to occur on both sides of the River Dee within the Scheme extent, as shown in Figure 5.8 overleaf.

Figure 5.7: 0.5% AEP 2100 Tidal Proposed Scenario Flood Depth



Source: © OpenStreetMap contributors; Contains OS data © Crown copyright and database rights (2026)

Figure 5.8: 0.1% AEP 2100 Tidal Proposed Scenario Flood Depth



Source: © OpenStreetMap contributors; Contains OS data © Crown copyright and database rights (2026)

5.2.1.4 Proposed (post-development) tidal flood risk - breach scenarios

- Like in the existing scenario, for the five breach scenarios assessed, only a single scenario (Breach 4) does not result in flooding within the Scheme boundary.
- All 5 breach scenarios show that a breach of the flood defences along the tidal River Dee would result in greater flood extents when compared against tidal flood risk where only overtopping occurs.
- Appendix B3 in the River Dee modelling report provides maps showing the predicted extents and velocities of these breach conditions.

5.2.2 Queensferry Drain

5.2.2.1 Summary of modelled proposed (post-development) scenarios

The following tables show the scenarios that have been modelled and will be assessed in this FCA.

Table 5.7: Current day (2025) modelled proposed (post-development) scenarios

Model Run	Hydrological event
QFD_SCH_DES_SD_10_25_0100_008	1% AEP Fluvial
QFD_SCH_DES_SD_10_25_01000_008	0.1% AEP Fluvial

Source: Mott MacDonald, 2025

Table 5.8: In the future (2100) modelled proposed (post-development) scenarios considering the lifetime of the development

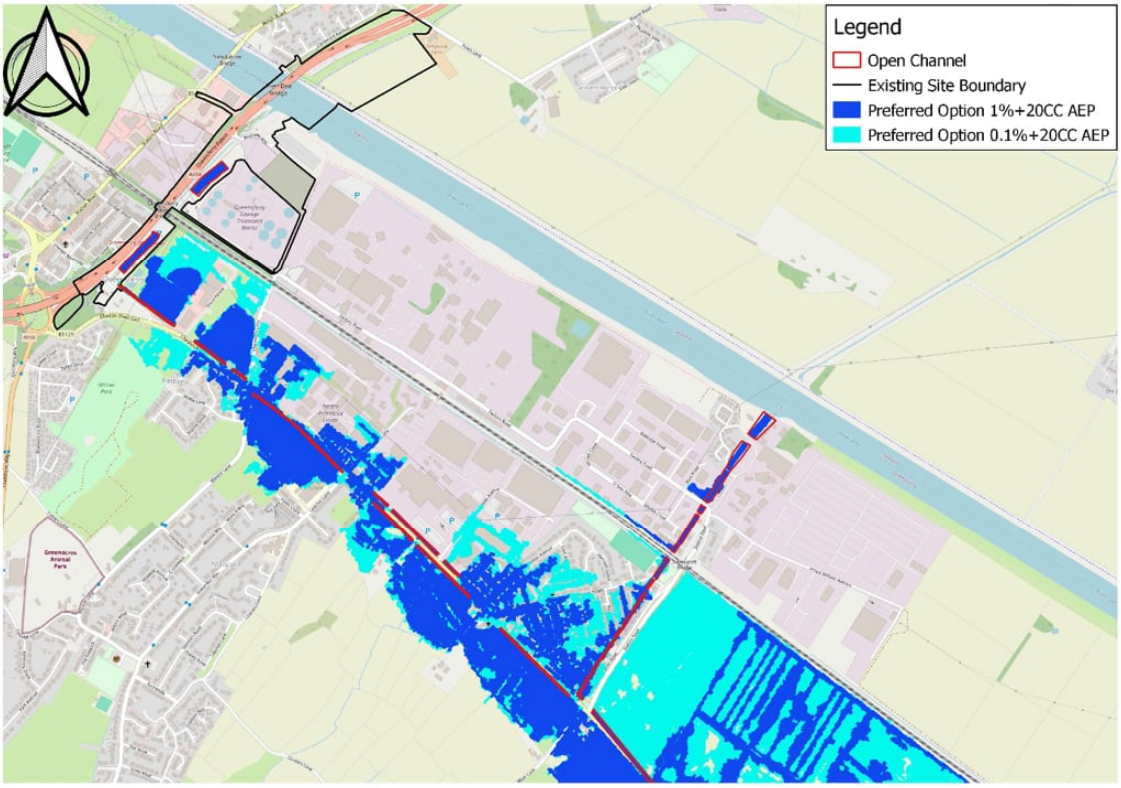
Model Run	Hydrological event
QFD_SCH_DES_SD_10_25_0100_20CC_008	1% AEP + 20 CC Fluvial
QFD_SCH_DES_SD_10_25_01000_20CC_008	0.1% AEP + 20 CC Fluvial
QFD_SCH_SEN_B67P_SD_10_25_0100_20CC_008	1% AEP + 20 CC Fluvial + 67% blockage
QFD_SCH_SEN_B67P_SD_10_25_01000_20CC_008	0.1% AEP + 20 CC Fluvial + 67% blockage

Source: Mott MacDonald, 2025

5.2.2.2 Proposed (post-development) fluvial flood risk

Flood water would be wholly contained within the proposed new open channel section of the Queensferry Drain within the Scheme. As a result, flood risk within the Scheme area is expected to improve as a result of the development, and be flood-free in all events up to and including the 0.1% AEP 2100 event. See Figure 5.9 below. Like the existing scenario, in the proposed scenario, there is expected to be extensive flooding south-east of the Scheme.

Figure 5.9: Map comparing the 1% and 0.1% AEP 2100 flooding extents in the proposed scenario for Queensferry Drain fee-flowing (without blockage)

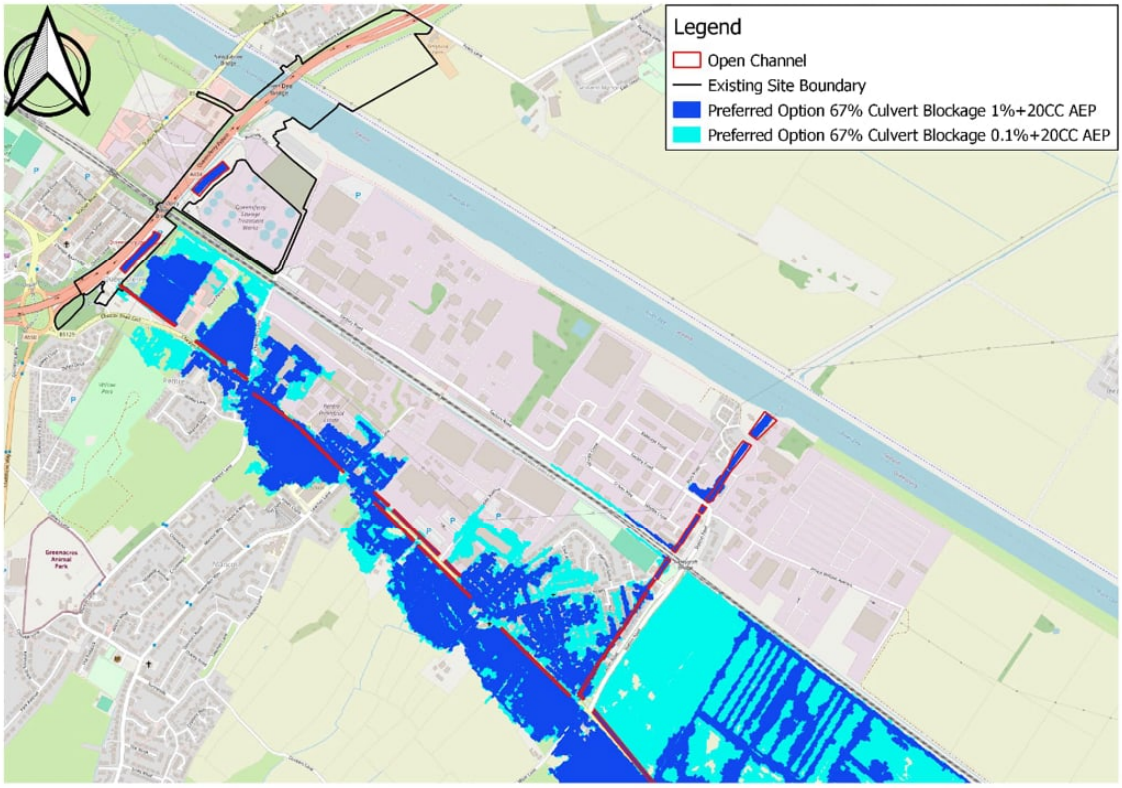


Source: © OpenStreetMap contributors; Contains OS data © Crown copyright and database rights (2026)

5.2.2.3 Proposed (post-Scheme) fluvial flood risk – blockage scenarios

As with the free flowing event, the Scheme is expected to be flood-free in all events up to and including the 0.1% AEP 2100 event, with flood water wholly contained within the proposed new open channel section of the Queensferry Drain within the Scheme, see Figure 5.10 below. Like the existing scenario, in the proposed scenario, there is expected to be extensive flooding south-east of the Scheme.

Figure 5.10: Map comparing the 1% and 0.1% AEP 2100 flooding extents in the proposed scenario for Queensferry Drain with blockage



Source: © OpenStreetMap contributors; Contains OS data © Crown copyright and database rights (2026)

5.3 Summary

The detailed assessment of flooding consequences has shown:

- In either the existing or proposed scenarios, the Scheme is not at risk of:
  - fluvial flooding from the River Dee in events up to and including the 0.1% AEP 2100 event.
  - tidal flooding from the River Dee in the 0.5% and 0.1% AEP present day events.
- In the existing scenario, the Scheme is at risk of flooding from Queensferry Ditch, in events up to and including the 0.1% AEP 2100 event including in a 67% blockage scenario. However, in the proposed scenario, due to the diversion and improvement work proposed for Queensferry Ditch, the Scheme is not shown to be at risk in these events.
- In either the existing or proposed scenarios, parts of the Scheme are considered to be at risk from:
  - tidal flooding from the River Dee in the 0.5% and 0.1% AEP 2100 events
  - tidal flooding from the River Dee in a breach scenario.

6 Assessment against acceptability criteria

As described in Section 11.3 of the TAN, the decision on whether a development should proceed or not will depend upon whether the consequences of flooding can be safely managed, including its effects on flood risk elsewhere.

This section will determine whether this redevelopment is consistent with the acceptability criteria for flooding consequences, using the information that has been provided in Sections 4 and 5 of this report.

The following assessments covers the 3 predominant flood sources - River Dee fluvial, River Dee tidal and Queensferry Drain fluvial - in both exceedance (overtopping) and residual (River Dee tidal breach / Queensferry Drain fluvial blockage) scenarios, as required by the TAN.

6.1 Design event

The assessment of how flood risk elsewhere may change as a result of the Scheme covers the 3 flood sources (River Dee fluvial, River Dee tidal and Queensferry Drain fluvial) in both exceedance (overtopping) and residual (River Dee tidal breach / Queensferry Drain fluvial blockage) scenarios, as required by the TAN.

- River Dee - the likelihood of a breach occurring in the tidal defences is significantly influenced by defence type, location, condition, ownership and predicted loading. Additionally, once a defence experiences overtopping during a flood event greater than its design standard, unless that defence has been specifically designed to withstand overtopping, the chance of breach markedly increases. Given the high Standard of Protection provided by the River Dee defences in the vicinity of the Scheme, in that they are:

  Not expected to overtop in the 0.5% AEP with climate change in 2100 event;
  – The defences are considered by NRW to be in good and serviceable condition; and,
  – As identified Great Ormes Head to Solway of Firth Shoreline Management Plan, these defences are strategically important for Deeside, as evidenced by the ‘Hold the Line’ policy assigned for all epoch up to 2105, and are therefore likely to be maintained in perpetuity by NRW.

  It is concluded that the residual probability of flooding from a breach event is considered to very low, and the exceedance (overtopping) scenario should be adopted as the appropriate design event for the River Dee flood.

- Queensferry Drain - The likelihood of a blockage is significantly influenced by local factors such as the proximity and availability of debris, the size and configuration of a structure, and maintenance regime. Within the Scheme boundary, the proposed works to Queensferry Drain (including new sections of open channel, new river pumping station and drainage outfall, and two trash screens), will reduce the probability of blockage occurring in this location. The Scheme will not affect the probability of blockage at any of the existing structures, as these lie outside and upstream of the Scheme area and will continue to operate under their existing conditions.

  Therefore, the probability of a blockage occurring at or adjacent to the Scheme is considered to be very low, and the free-flowing (no-blockage) scenario has been adopted as the appropriate design event for Queensferry Drain.

6.2 Acceptable consequences for type of use

6.2.1 Development to be flood free (Section 11.7-11.8 of TAN15)

Figure 5 of the TAN summaries the frequency thresholds for different types of development. For less vulnerable development or water compatible' development (see Section 3.1.4) development should be flood free in the 1% AEP event plus an allowance for climate change (Rivers) and 0.5% AEP event plus an allowance for climate change (Sea).

As demonstrated in Section 4 and 5, in the proposed scenario, and for overtopping (exceedance) cases:

- River Dee (fluvial) – the Scheme is predicted to be flood-free in the 1% AEP 2100 event
- River Dee (tidal) – the majority of the Scheme is predicted to be flood-free in the 0.5% AEP 2100 event, with the exception of a small area coinciding with the proposed new Queensferry Drain Pumping Station.
- Queensferry Drain (fluvial) -- the Scheme is predicted to be flood-free in the 1% AEP 2100 event, and flood water will be wholly contained within the proposed new open channel section of the Queensferry Drain.

For residual risk scenarios:

- River Dee (tidal) breach – the Scheme is predicted to be flooded in 4 of the 5 scenarios assessed.
- Queensferry Drain (fluvial) blockage - the Scheme is predicted to be flood-free in the 1% AEP 2100 event, and flood water will be wholly contained within the proposed new open channel section of the Queensferry Drain within the Scheme.

The criteria set in Figure 5 of the TAN are not met for River Dee Tidal flooding, in either overtopping (exceedance) or residual risk (breach) scenarios. However, the TAN does go on to permit that '*thresholds may be applied with more flexibility for redevelopment, changes of use, conversions and extensions, where the ability to substantially redesign a development is limited*'. The proposed development is redevelopment, so applying this flexibility:

- In the existing (pre-development) scenario, incorporating the existing road and bridge, does not meet the requirements of Section 11.7-11.8. The proposed Scheme will not make this worse. Indeed, the Scheme will result in a small decrease in flood risk within the Scheme area in certain cases (see Section 6.3.2.2 and Figure 6.2).
- The proposed levels of all built infrastructure are maximised as far as reasonably practicable within the constraints of the Scheme, i.e. considering the need to tie in with existing infrastructure.
- The new Highway construction is generally more resilient to floodwater compared to other types of infrastructure. In addition, any new Highway construction will be modernised compared with existing.
- The residual risks outlined here are acceptable to the owner and maintainer of the Scheme (NMWTRA).

6.2.2 Manageable consequences in an extreme flood (Section 11.9-11.11 of TAN15)

The TAN recognises that it may not be possible to keep all development flood-free in extreme floods. Under these circumstances, the TAN asks that FCAs demonstrate that conditions within the development during an extreme event will be tolerable.

Figure 6 of the TAN summaries the tolerable conditions for different types of development. For 'less vulnerable' or 'water compatible' development (see Section 3.1.4) the maximum depth of

flooding in extreme conditions should not exceed 600mm and velocity of flood waters should not exceed 0.15 m/s.

In the case of exceedance (overtopping) scenarios:

- River Dee (fluvial) – the Scheme is predicted to be flood-free in the 0.1% AEP 2100 event.
- River Dee (tidal) – for the 0.1% AEP 2100 event, out of bank flooding is predicted to occur on both sides of the River Dee within the Scheme extent (section 5.2.1.3).
  - For the right bank: worse case flood depths are 0.23m, and velocities 0.87m/s. These values exceed the tolerable conditions provided in the TAN and applying Figure 7 of the TAN (flood hazard matrix) the hazard to people classification is predicted to be *'Danger for some'* under this scenario. However, flood depth, velocities and hazards on the right bank will be reduced as a result of the Scheme, and therefore it is considered that the Scheme provided improvement (betterment) when compared to the existing situation. It should also be noted that this part of the Scheme will be used solely for temporary construction-phase activities (see Appendix A) and will be demobilised and reinstated to its pre-development condition within approximately four years, long before 2100.
  - For the left bank: worse case flood depths are 0.62m and velocities 0.30m/s. These values are in line with the tolerable conditions provided in the TAN. This relates to an area of the Scheme that has been earmarked for the proposed new location of the Queensferry Drain open water course and outfall.
- Queensferry Drain (fluvial) – the Scheme is predicted to be to be flood-free in the 0.1% AEP 2100 event, and flood water will be wholly contained within the proposed new open channel section of the Queensferry Drain within the Scheme.

For residual risk scenarios, the following conditions are expected;

- River Dee (tidal) breach:
  - For Breach 4, the Scheme is predicted to be flood-free in the 0.1% AEP 2100 event.
  - For Breaches 1-3 and 5, flood depths at the Scheme could be greater than 1m deep and velocities 0.9 m/s or greater (see Section C3 of the River Dee Modelling Report). These values exceed the tolerable conditions provided in the TAN. Applying Figure 7 of the TAN (flood hazard matrix) the hazard to people classification would be 'Danger for all' under this scenario at the Scheme boundary.
- Queensferry Drain (fluvial) blockage scenario: the Scheme is predicted to be flood-free in the 1% AEP 2100 event, and flood water would be wholly contained within the proposed new open channel section of the Queensferry Drain within the Scheme.

Exceedance of the tolerable conditions under extreme event flood conditions is only expected at the Scheme (for less vulnerable development) in:

- discrete, water-compatible areas e.g. the larea of the proposed new Queensferry Ditch Pumping Station; and,
- for residual flood risk scenarios – specifically where the Scheme is affected by a breach in the River Dee defences.

When using the above to assess whether the Scheme can be considered to provide a safe environment during an extreme flood event, the TAN recognises that each site should be considered individually, and a judgement be taken in the context of the circumstances which could prevail at the Scheme. So, to apply this flexibility, decision makers should also consider:

- The proposed levels of the new carriageway are already maximised at this location, and it would not be practicable to increase them as it is necessary for the Scheme to tie in with the levels of the existing A494.

- It is expected that with an updated Local Contingency Plan (see Section 6.6), flood risk to the Scheme for these extreme future climate change events can be adequately managed.
- The residual risks outlined here are acceptable to the owner and maintainer of the Scheme (NMWTRA).

6.3 No increase in flooding elsewhere

The Scheme may occupy space that would otherwise be available for the storage or conveyance of floodwaters, and any FCA should therefore assess whether this results in any increase in flood risk elsewhere.

6.3.1 Assessment approach

The reporting of flood risk change is in line with NRW Guidance[15] e.g. model data rounded to the nearest 0.005m. Depth difference data (calculated from modelling data) is reported to three decimal places (aka. nearest mm). Velocities and hazard values to two decimal places. The following sections also provide a series of mapping outputs from the River Dee and Queensferry Drain modelling. These show both changes in flood extent (through 'was wet now dry' and 'was dry now wet' layers), and flood depths (depth difference). Depth difference is presented as Proposed minus Existing, so negative values represent predicted reductions in depth as a result of the Scheme, whilst positive values represent expected increases in depths as a result of the Scheme. The presentation of this data, including the depth change categorisations, was agreed in pre-application discussions with NRW.

The reporting focuses on flood risk changes outside of any river channels, in line with NRW Guidance[15].

It should be noted that a separate assessment of the flood storage volume that would be lost and/or displaced from the Scheme boundary has not been undertaken, as the extent of the proposed development is fully represented in both the River Dee and Queensferry Drain models, and the model results therefore account for any potential effect of any changes in flood storage volume.

6.3.2 River Dee

With respect to assessment of flood risk elsewhere, the FCA has assessed the following scenarios for the River Dee.

- Fluvial exceedance (overtopping);
- Tidal exceedance (overtopping); and,
- Residual risk (tidal breach).

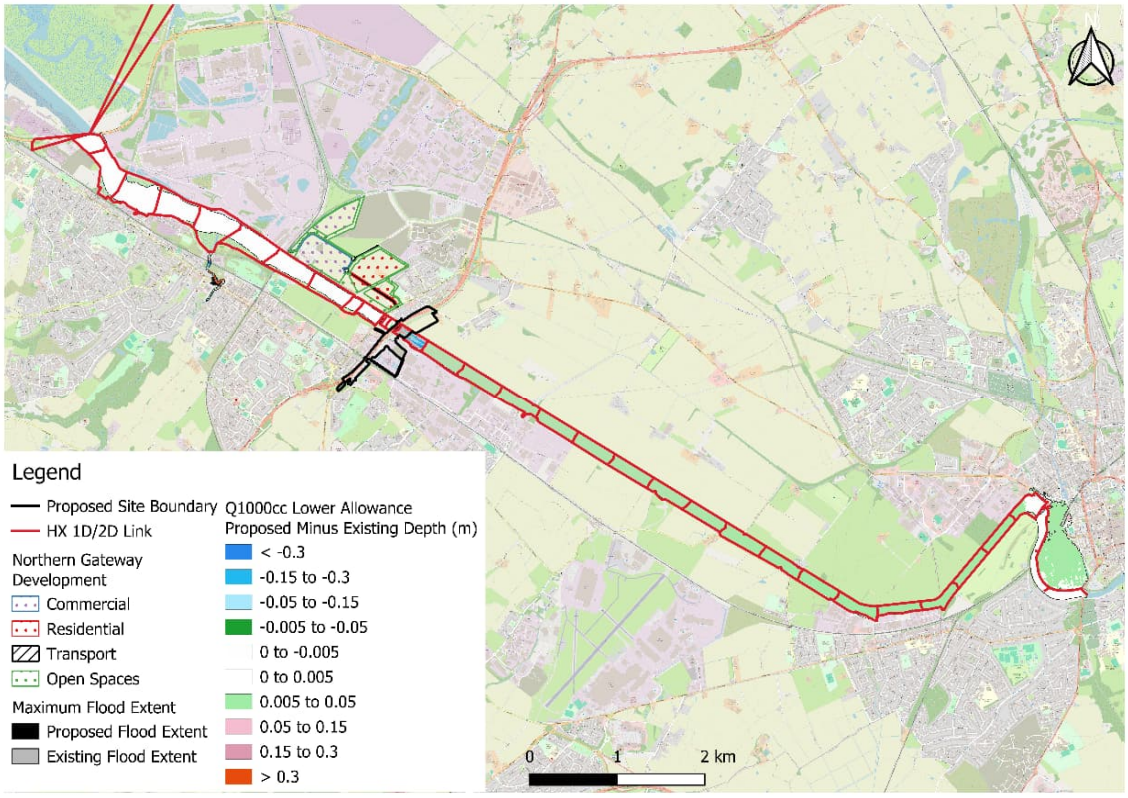
6.3.2.1 Fluvial exceedance (overtopping)

The modelling indicates that there are three areas away from the Scheme where flood risk impacts could change as a result of the Scheme. These are shown for the 0.1% AEP 2100 event in Figure 6.1 and described below.

- Inside the River Dee channel immediately upstream of the Scheme, where the current bridge is removed, and the proposed bridge is added. This is expected to have a localised impact and will change water levels inside the channel only.
- Inside the River Dee channel upstream of the proposed development, towards Chester, as shown in light green on Figure 6.1 below. This increase in water levels is limited to inside the River Dee channel only.

- The maps show signals of change in areas around Chester Racecourse and Wepre Drain areas (see Figure 6.1). However, due to the distance of these areas from the Scheme and known limitations in model's representation of flooding mechanism in these locations (see River Dee Hydraulic Modelling Report Section 6) there is low confidence in the model results for these areas. A more robust assessment of flood risk in these distant areas would require further updates to the modelling, and it is recommended that this is undertaken at the next stages of design development.

Figure 6.1: Change in flood depth and extent for the 0.1% AEP 2100 fluvial events

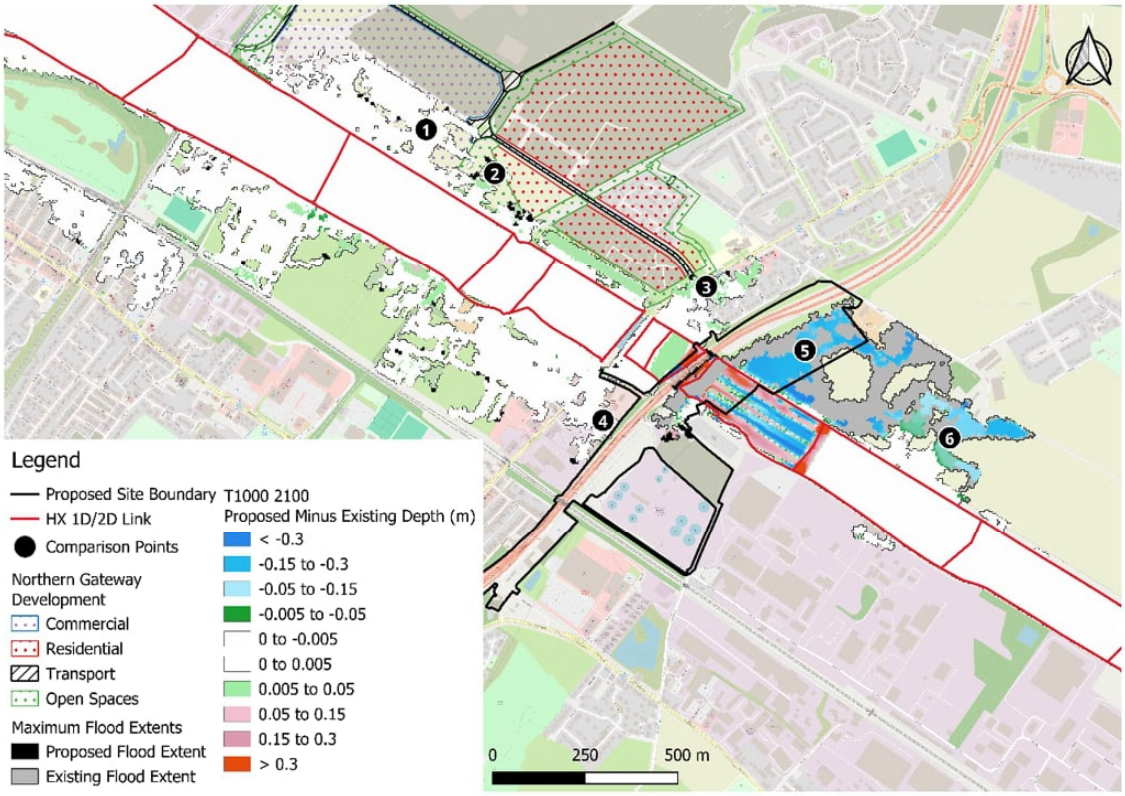


Map source: © OpenStreetMap contributors; Contains OS data © Crown copyright and database rights (2026)

6.3.2.2 Tidal exceedance (overtopping)

Figure 6.2 shows the predicted flood risk change in the immediate surrounds of the Scheme and the locations of six comparison points considered to be representative of nearby residential, commercial and open space receptors and used to produce tabulated data (Table 6.1) of anticipated flood depth changes.

Figure 6.2: Change in flood depth and extent for the 0.1% AEP 2100 tidal event – immediate surrounds



Source: © OpenStreetMap contributors; Contains OS data © Crown copyright and database rights (2026)

Table 6.1: Comparison of Existing and Preferred flood levels for 0.1% AEP 2100 tidal event – immediate surrounds

Comparison Point	Existing Model water depths (m)	Proposed Model water depths (m)	Change in water depths (m)
1 (commercial)*	0.117	0.119	+0.002
2 (open space)*	0.023	0.033	+0.010
3 (residential)	0.268	0.274	+0.006
4 (commercial)	0.149	0.151	+0.002
5 (open space)	0.262	0.117	-0.145
6 (open space)	0.189	0.114	-0.075

*in the Northern Gateway Development, the land use stated in this table corresponds to the proposed use[20] not the current use.

Source: Mott MacDonald, 2026

In areas adjacent to the Scheme, there are large areas that are expected to be flood-free as a result of the redevelopment (see light grey areas on Figure 6.2). In addition, there are notable areas on the right bank where flood depths are also expected to reduce as a result of the Scheme, as shown by blue areas on Figure 6.2. Table 6.1 shows that flood depths could reduce by up to 0.14m in these areas (Comparison Point 5).

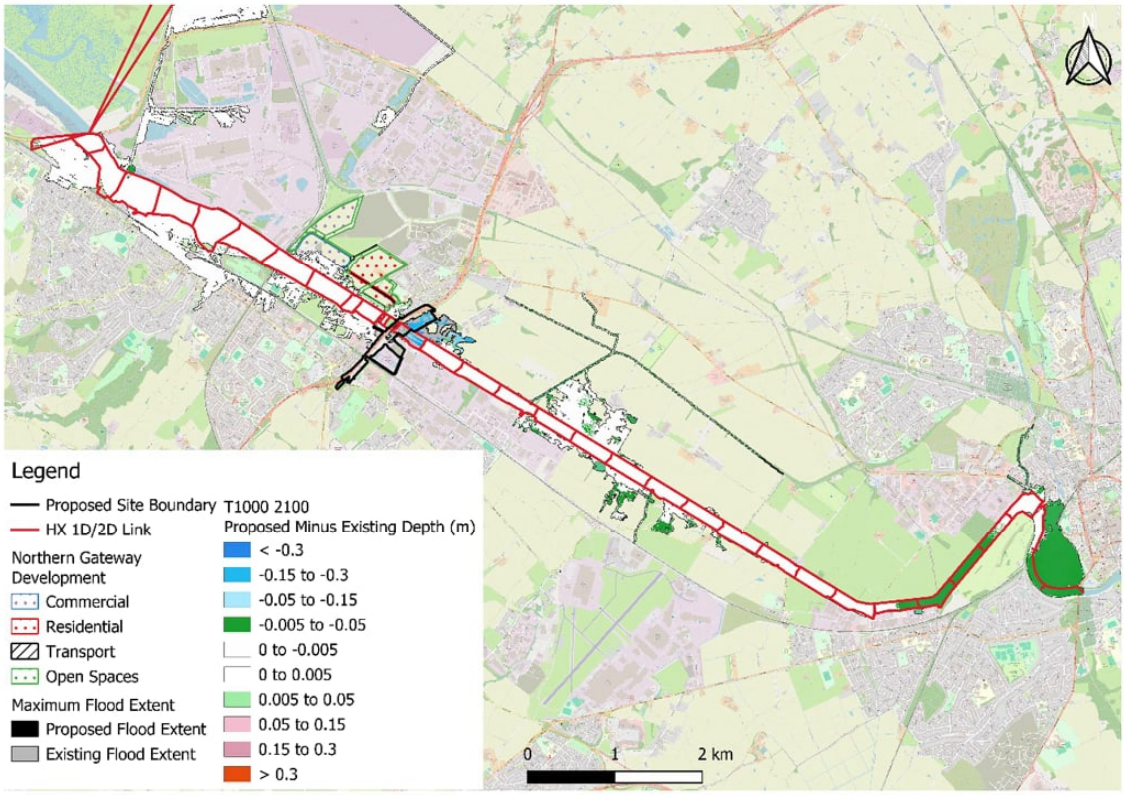
However, and relating to this extreme scenario (0.1% AEP in 2100) only, there are some marginal areas where both flood depths (see light green areas on Figure 6.2) and flood extents (see black areas on Figure 6.2) may increase.

- On the right bank, in residential areas in Garden City and commercial and open spaces area within the Northern Gateway Development. Table 6.1 shows that flood depths could increase by up to 0.006m (6mm) in residential areas of Garden City (Comparison Point 3), up to 0.010m (10mm) in water compatible (ditches/swales) open space areas of Northern Gateway Development (Comparison Point 2) and up to 0.002m (2mm) in proposed commercial areas of Northern Gateway Development (Comparison Point 1).
- On the left bank in commercial and open space areas in Queensferry. Table 6.1 shows that flood depths could increase by up to 0.002m (2mm) in this area (Comparison Points 4).

The construction of the proposed new bridge piers within the River Dee is expected to impact water levels within the river, however any backwater effect is predicted to be limited to a 400m reach upstream of the Scheme.

Further away from the Scheme, in all events up to and including the 0.1% AEP 2100, much of the area shows no discernible change between pre- and post- development flood extents or depths (see white areas, Figure 6.3). However, in some locations, flood depths are predicted to be reduced by up to 0.05m (dark green, Figure 6.3). These changes apply to in-channel, open space and the Chester Racecourse areas.

Figure 6.3: Change in flood depth and extent for the 0.1% AEP 2100 tidal event – wider area



Source: © OpenStreetMap contributors; Contains OS data © Crown copyright and database rights (2026)

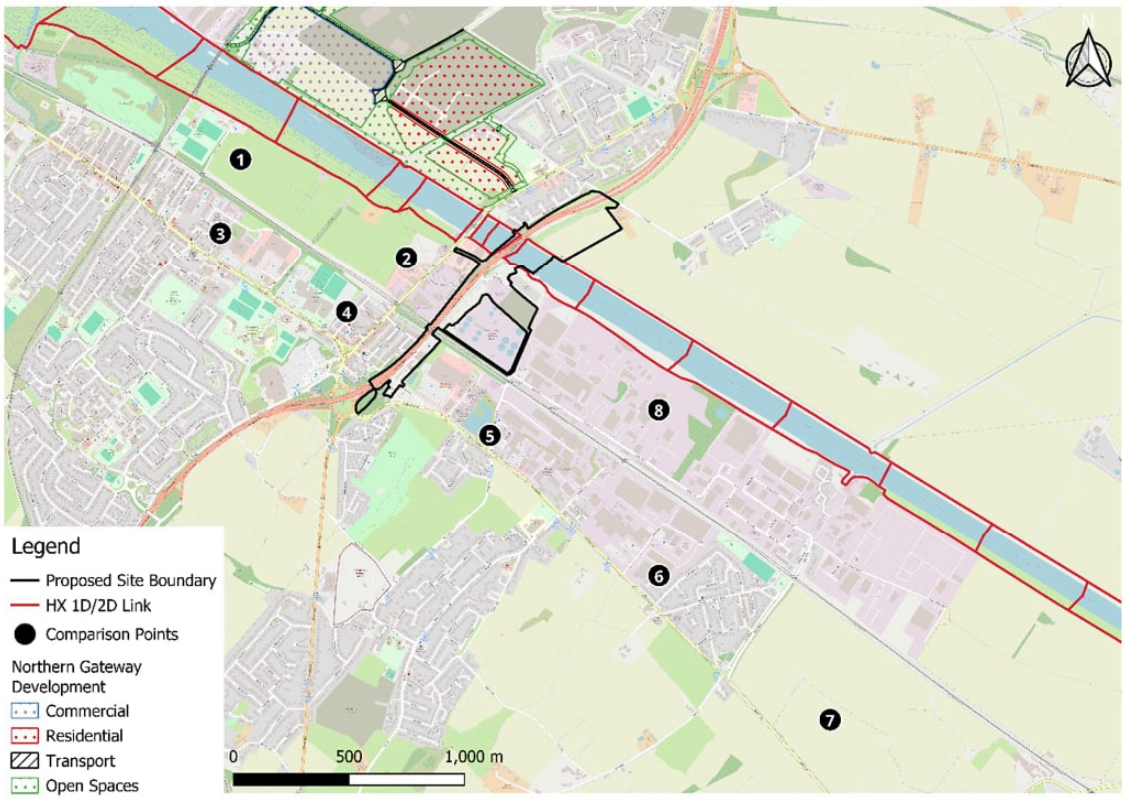
6.3.2.3 Residual risk (tidal breach) analysis

Appendix C4 of the River Dee Modelling Report provides the full details of the breach modelling results; however to summarise:

- Breach Scenarios 2 and 4 (all on the right bank of the River Dee) show the Scheme could bring a widespread improvement (flood risk benefit) elsewhere.
- Breach Scenarios 1, 3 and 5 (all on the left bank of the River Dee) show the greatest positive or negative changes in flood-risk impacts; therefore, subsequent sections of this FCA further explore the potential changes the Scheme could bring for these three breach scenarios.

Figure 6.4 gives the location of eight points, representing nearby residential, commercial and open space receptors, that have been selected for producing tabulated flood depths change data for Breach Scenarios 1, 3 and 5. Points 1-4 to the west of the bridge are located around the Shotton area and Point 5-8 to the east of the bridge are located around the Sandycroft area.

Figure 6.4: Comparison Points selected for reporting the impacts of the Scheme in breach scenarios



Source: © OpenStreetMap contributors; Contains OS data © Crown copyright and database rights (2026)

Breach 1

As summarised and reported in Table 6.2, Figure 6.5 and Figure 6.6, generally in this scenario there is an increase in flood depths across Sandycroft and a decrease around Shotton.

In the 0.1% AEP 2100 event, flood depths may increase by up to 0.173m (173mm) in Sandycroft. By comparison, flood levels are expected to decrease by up to 0.049 (49mm) in Shotton.

The change in flood risk can be attributed to the proposed ground levels of the Scheme, which are generally lower and allow a larger exchange of flood water and overland flows between the Shotton and Sandycroft areas.

Table 6.2: Impact of the Scheme on Flood Depth (m) for Tidal Breach 1

0.5% AEP 2100 Flood Event				
Location	Comparison Site No	Existing	Post-development	Depth Difference (m) to 2 dp,
Shotton	1 (open space)	1.319	1.302	-0.017
	2 (commercial)	1.504	1.489	-0.015
	3 (residential)	0.823	0.769	-0.054
	4 (residential)	0.997	0.942	-0.055
Sandycroft	5 (commercial)	0.413	0.570	+0.157
	6 (residential)	0.177	0.329	+0.152
	7 (open space)	0.842	0.962	+0.120
	8 (commercial)	No Data	No Data	No Data
0.1% AEP 2100 Flood Event				
Location	Comparison Site No	Existing	Post-development	Depth Difference (m)
Shotton	1 (open space)	1.440	1.424	-0.016
	2 (commercial)	1.616	1.599	-0.017
	3 (residential)	0.970	0.924	-0.046
	4 (residential)	1.146	1.097	-0.049
Sandycroft	5 (commercial)	0.490	0.637	+0.147
	6 (residential)	0.224	0.397	+0.173
	7 (open space)	0.892	1.016	+0.124
	8 (commercial)	No Data	No Data	No Data

Source: Mott MacDonald, 2026

Figure 6.5: 0.5% AEP Tidal 2100 Breach One Flood Depth Difference

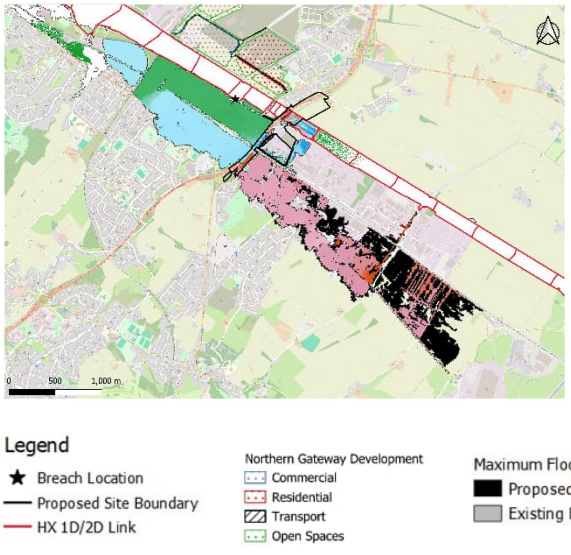
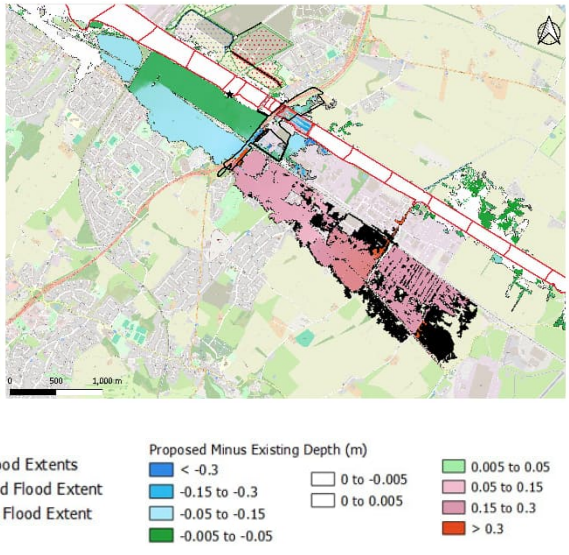
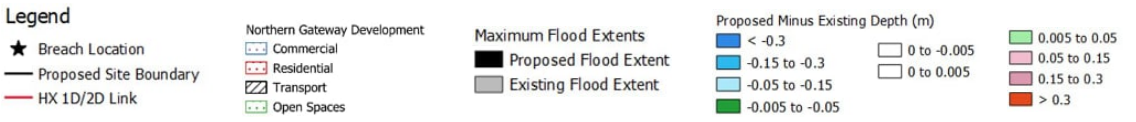


Figure 6.6: 0.1% AEP Tidal 2100 Breach One Flood Depth Difference





Source: © OpenStreetMap contributors; Contains OS data © Crown copyright and database rights (2026)

Breach 3

Unlike Breach 1 and 5, Breach 3 is located upstream of the Scheme. However, the spatial pattern of impacts and change broadly mirrors Breach Scenario 1; with increases in Shotton and decreases in Sandycroft, albeit the magnitude of change is less.

For Breach 3, flood depths increase in areas around Shotton, whilst decreasing in areas around Sandycroft (see Figure 6.7 and 6.8).

For the reporting locations and event (Table 6.3), predicted changes in Shotton range from a slight increase of 0.043m (43mm) at an open space receptor to reductions of up to 0.017m (17mm) at residential locations. In Sandycroft, all assessed locations show decreases in flood depth, ranging between 0.003m (3mm) and 0.020m (20mm).

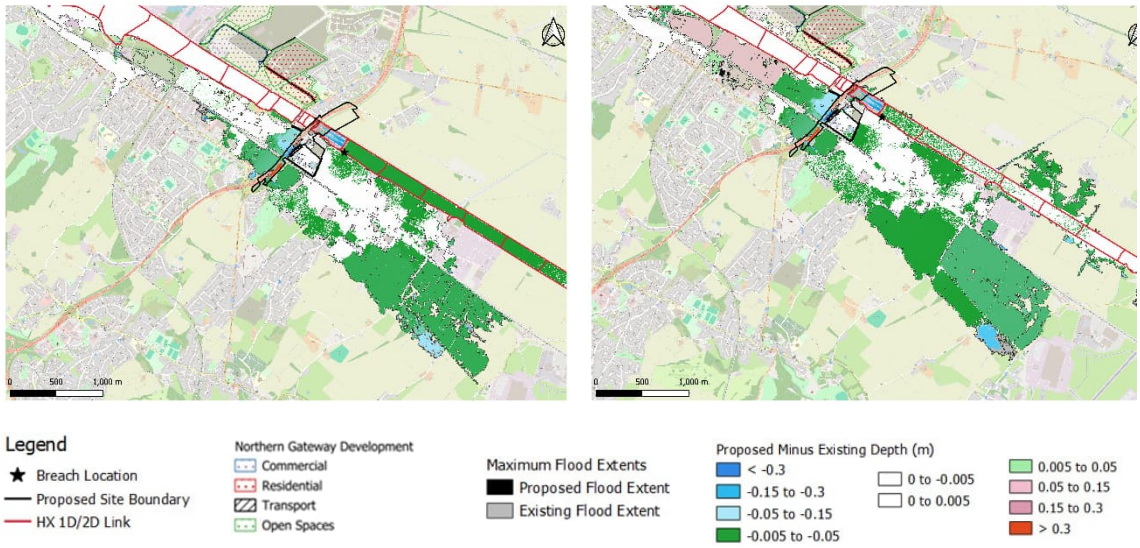
Table 6.3: Impact of the Scheme on Flood Depth (m) for Tidal Breach 3

0.5% AEP 2100 Flood Event				
Location	Comparison Site No	Existing	Post-development	Depth Difference (m) 2 dp.
Shotton	1 (open space)	0.119	0.124	+0.005
	2 (commercial)	0.457	0.457	No change
	3 (residential)	No Data	No Data	No data
	4 (residential)	0.290	0.273	-0.017
Sandycroft	5 (commercial)	0.571	0.558	-0.013
	6 (residential)	0.421	0.408	-0.013
	7 (open space)	0.960	0.955	-0.005
	8 (commercial)	0.393	0.390	-0.003
0.1% AEP 2100 Flood Event				
Location	Comparison Site No	Existing	Post-development	Depth Difference (m) 2 dp.
Shotton	1 (open space)	0.191	0.234	+0.043
	2 (commercial)	0.522	0.510	-0.012
	3 (residential)	No Data	No Data	No data
	4 (residential)	0.318	0.304	-0.014
Sandycroft	5 (commercial)	0.711	0.691	-0.020
	6 (residential)	0.609	0.602	-0.007
	7 (open space)	1.067	1.062	-0.005
	8 (commercial)	0.470	0.467	-0.003

Source: Mott MacDonald, 2026

Figure 6.7: 0.5% AEP 2100 Breach 3 Depth Difference

Figure 6.8: 0.1% AEP 2100 Breach 3 Depth Difference



Source: © OpenStreetMap contributors; Contains OS data © Crown copyright and database rights (2026)

Breach 5

For the 0.1% AEP 2100 tidal Breach 5 scenario, the modelling indicates a consistent pattern of reductions in flood depths across the Shotton area and corresponding increases in the Sandycroft area.

Across Shotton, flood depths are predicted to decrease by between approximately 0.007m (7mm) and 0.042m (42mm), reflecting a modest overall benefit in this part of the floodplain. In contrast, in Sandycroft, increases in flood depths are expected, with the modelling indicating rises of up to around 0.162m (162mm) in residential, up to 0.148m (148mm) in commercial or up to 0.115m (115mm) in open-space areas.

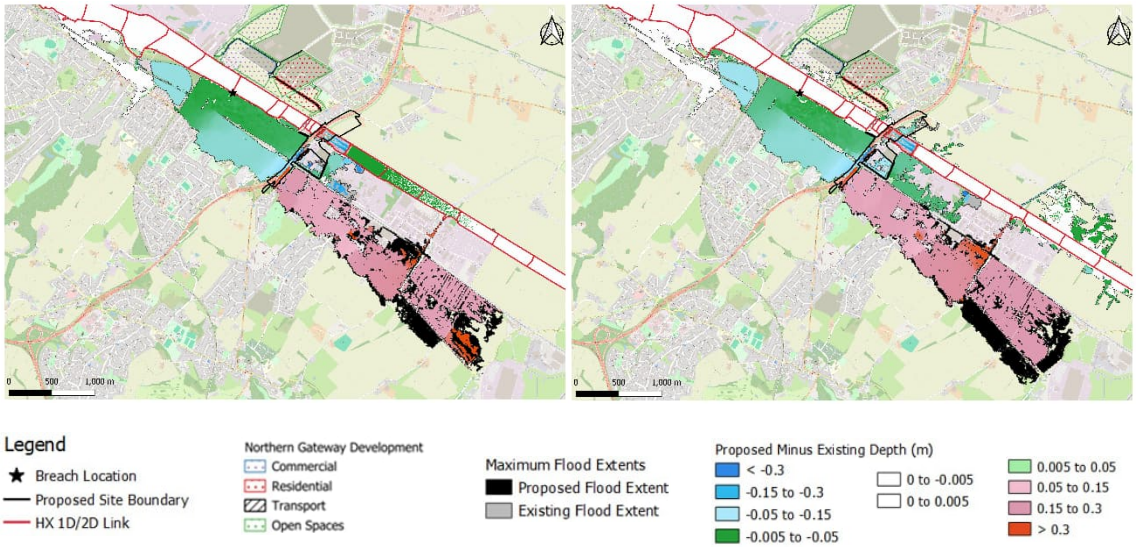
Table 6.4: Impact of the Scheme on Flood Depth (m) for Tidal Breach 5

0.5% AEP Flood Event				
Location	Comparison Site No	Existing	Post-development	Depth Difference (m)
Shotton	1 (open space)	1.610	1.603	-0.007
	2 (commercial)	1.757	1.742	-0.015
	3 (residential)	1.097	1.064	-0.033
	4 (residential)	1.282	1.242	-0.040
Sandycroft	5 (commercial)	0.512	0.641	+0.129
	6 (residential)	0.253	0.414	+0.161
	7 (open space)	0.918	1.022	+0.104
	8 (commercial)	No Data	No Data	No Data
0.1% AEP Flood Event				
Location	Comparison Site No	Existing	Post-development	Depth Difference (m)
Shotton	1 (open space)	1.761	1.741	-0.020
	2 (commercial)	1.906	1.889	-0.017
	3 (residential)	1.303	1.266	-0.037
	4 (residential)	1.481	1.439	-0.042

Sandycroft	5 (commercial)	0.574	0.722	+0.148
	6 (residential)	0.335	0.497	+0.162
	7 (open space)	1.043	1.158	+0.115
	8 (commercial)	No Data	No Data	No Data

Figure 6.9: 0.5% AEP Tidal 2100 Breach Five Depth Difference

Figure 6.10: 0.1% AEP Tidal 2100 Breach Five Depth Difference



Source: © OpenStreetMap contributors; Contains OS data © Crown copyright and database rights (2026)

6.3.2.4 Residual risk (tidal breach) summary

- For Breaches 2, 3 and 4, the overall effect of the Scheme on flood risk elsewhere is neutral or negative (i.e., a flood-risk benefit).
- Breaches 1 and 5, both located downstream of the Scheme, appears to be the most sensitive to the proposed Scheme.
- In the worst-case breach scenarios (Breach 1 or 5), the Scheme may result in flood-depth changes ranging between +0.161m (161mm) and –0.055m (55mm) in the 0.5% AEP 2100 event.
- For the same worst-case breach scenarios in the 0.1% AEP 2100 event, predicted changes are of a similar magnitude, ranging from +0.173m (173mm) to –0.049m (49mm).
- Overall, across the eight comparison points reported and the five breach scenarios assessed, negative changes (reductions in flood depth) occur more frequently than positive changes (increases in flood depths). In addition, the magnitude, spatial and temporal scale of the increases reported are not considered to pose an unmanageable risk to receptors.

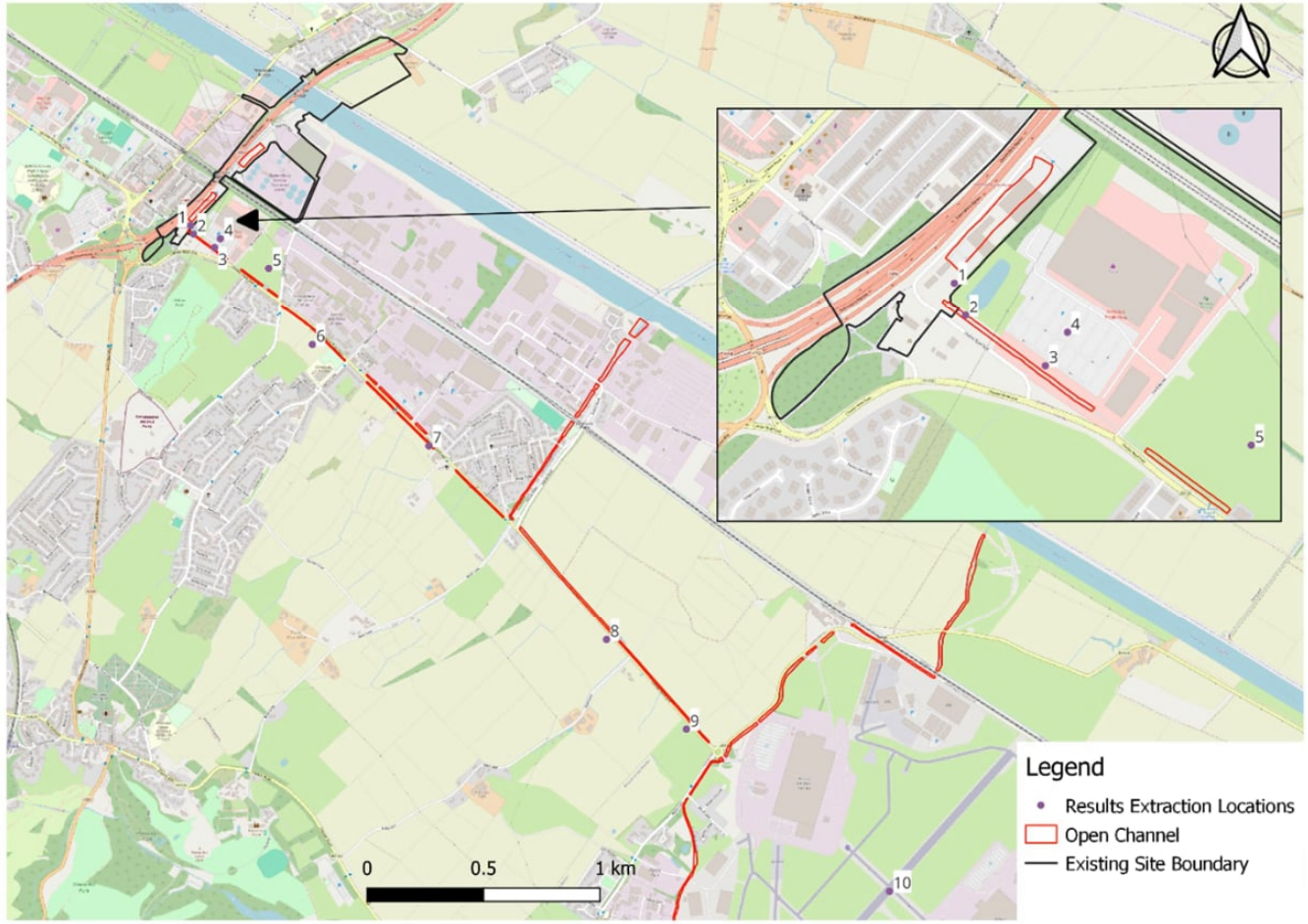
It is important to note that these conditions are only expected under the specific, theoretical residual-risk scenarios assessed—namely, where the tidal defences are assumed to breach to a width of 50 m at locations 1, 3 or 5, 75 years into the future and with climate-change allowances applied. These results are not representative of any other potential combination of breach location, breach size, timing or flood event on the River Dee, all of which could produce different outcomes.

6.3.3 Queensferry Drain

Figure 6.11 details the location of ten comparison points representing nearby residential, commercial and open space receptors, have been selected for producing tabulated data of the

changes to flood depths. These the entire catchment, up to and including the Airbus facility at Hawarden (Comparison Point 10).

Figure 6.11: Comparison Points selected for reporting the impacts of the Scheme (Queensferry Drain)

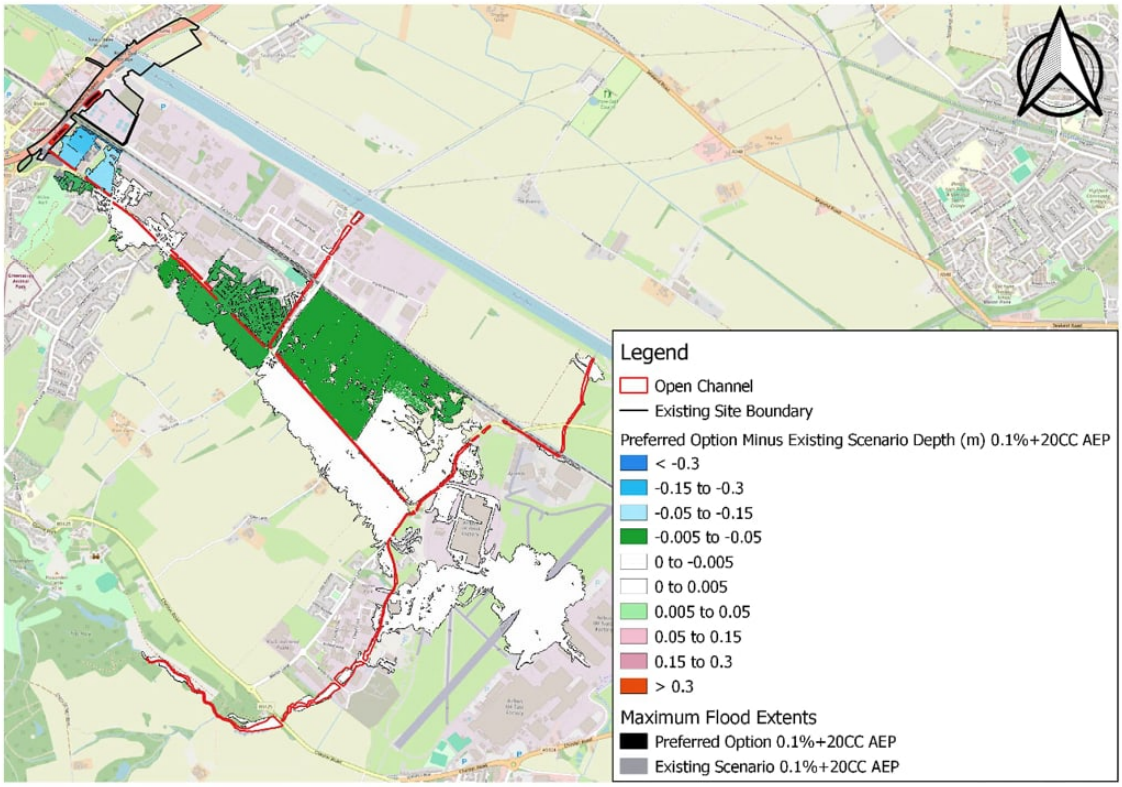


Source: © OpenStreetMap contributors; Contains OS data © Crown copyright and database rights (2026)

6.3.3.1 Free flowing scenario

Results for the 0.1% AEP 2100 event are provided in Figure 6.12 and Table 6.5 below and are representative of other return periods, data for which is contained within the Queensferry Modelling Report.

Figure 6.12: Map showing depth difference in the 0.1% AEP 2100 event



Source: © OpenStreetMap contributors; Contains OS data © Crown copyright and database rights (2026)

The expected overall trend is for flood depths to reduce across the catchment as a result of the development. The greatest decreases are expected to be immediately adjacent to the Scheme boundary, where a reduction of up to around 0.092m (92mm) could occur (see Comparison Point 2). This trend reduces as you move upstream towards no change. At a mid-point in the catchment, Comparison Point 7 (residential), the modelling indicates a reduction in water levels of up to 0.01m.

Table 6.5: Comparison of Existing and Preferred Scenario flood levels for 0.1% AEP 2100 event

Comparison Point	Ground Level	Existing Model	Preferred Option Model	Change in depth (m)
1 (commercial)	5.380	5.475	no flooding	-0.092
2 (commercial)	4.230	5.486	5.394	-0.092
3 (commercial)	4.960	5.495	5.407	-0.088
4 (commercial)	4.930	5.495	5.406	-0.089
5 (open space)	4.800	5.509	5.440	-0.069

6 (open space)	5.280	5.636	5.635	-0.001
7 (residential)	4.850	5.255	5.245	-0.010
8 (open space)	4.810	5.472	5.472	0.000
9 (open space)	5.095	5.505	5.505	0.000
10 (commercial)	4.255	4.437	4.437	0.000

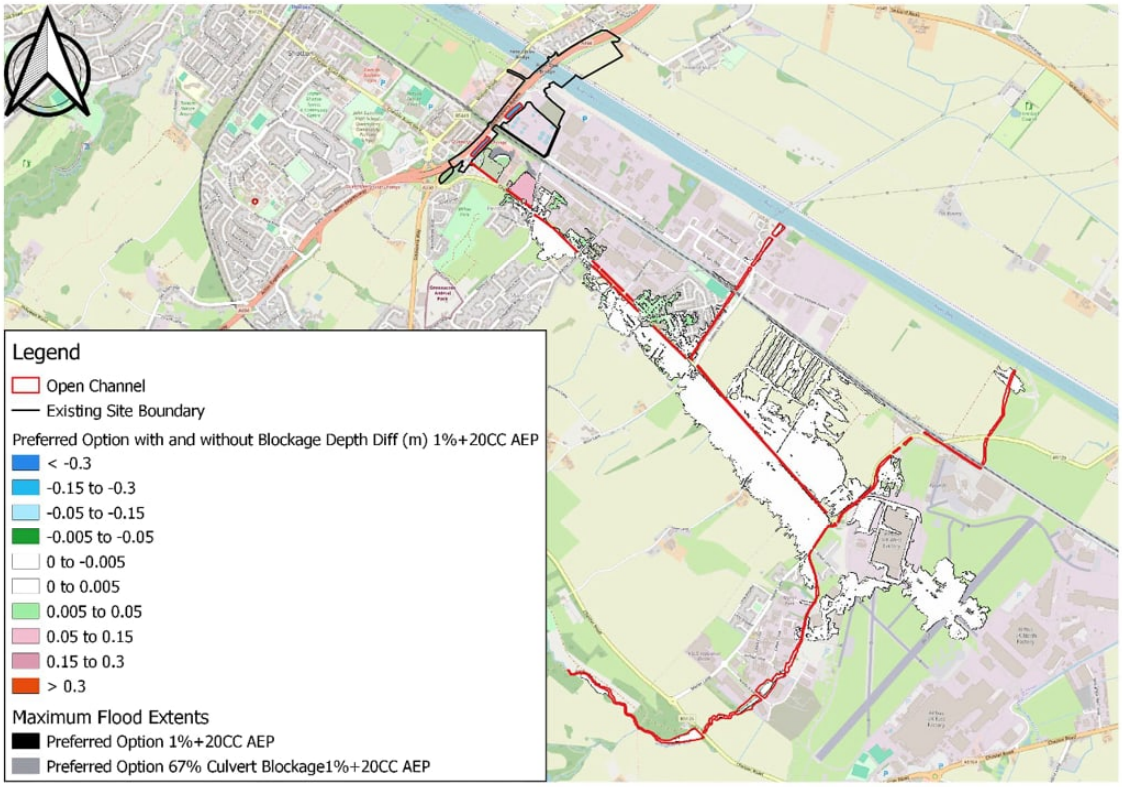
Source: Mott MacDonald, 2026

6.3.3.2 Blockage scenario

Comparing the free flow and blockage scenarios, large areas of the catchment indicate no change in flood depths or extents. However, the modelling does indicate there will be some changes in flood depths close to the Scheme.

Of the locations assessed, Comparison Point 5 (also see pink Figure 6.13), relating to Open Space in Sandycroft, indicates an increase in water level of up to 0.07m for the 1% AEP 2100 event. For Comparison Points 2, 3 and 4, relating to commercial areas in Sandycroft, water levels could increase by up to 0.03m in the 1% AEP 2100 event. However, across the majority of the scheme area, there is no change to flood risk (see white area, Figure 6.13).

Figure 6.13: Map showing depth difference in the 1% AEP 2100 free flowing and 67% blockage events



Source: © OpenStreetMap contributors; Contains OS data © Crown copyright and database rights (2026)

Table 6.6: Comparison of water levels, with and without 67% blockage, for the post-development 1% AEP 2100 flood event

Comparison Point	Sample Point	Ground Level	Existing Model	Preferred Option Model	Change in depth (m)
1 (commercial)	1	5.380	no flooding	no flooding	N/A

2 (commercial)	2	4.230	5.175	5.201	0.026
3 (commercial)	3	4.960	5.185	5.212	0.027
4 (commercial)	4	4.930	5.185	5.212	0.027
5 (open space)	5	4.800	5.190	5.258	0.068
6 (open space)	6	5.280	5.599	5.601	0.002
7 (residential)	7	4.850	5.152	5.155	0.003
8 (open space)	8	4.810	5.447	5.447	0.000
9 (open space)	9	5.095	5.470	5.470	0.000
10 (commercial)	10	4.255	4.288	4.288	0.000

Source: Mott MacDonald, 2026

The above highlights how the consequences of flooding may change in the area due to blockage. In terms of the probability of these structures' blockage, the assessment concludes:

- The proposed diversion of Queensferry Drain, which includes new sections of open channel, new river pumping station and drainage outfall, and two trash screens, will reduce the probability of blockages within the Scheme boundary.
- The Scheme will not affect the chances of existing structures blocking as they are all located upstream of the Scheme extent. They will have the same probability of blocking whether the Scheme proceed or not.

6.3.4 Conclusions

To summarise, the FCA demonstrates that potential increase in flood risk elsewhere on the following grounds:

- River Dee fluvial - the Scheme's impact is expected to be limited to the River Dee channel only. The modelling shows flood risk change (depth difference and/or flood extent) in areas around Chester Racecourse and Wepre Drain. However, there is low confidence in these areas that are distant from the Scheme, and a more robust assessment of flood risk would require further updates to the modelling, which is recommended at the next stages of design development.
- River Dee tidal - the modelling shows that flood extents may very marginally increase in the extreme 0.1% AEP 2100 event. Correspondingly, flood depths may increase in the same event by up a maximum of 0.010m (10mm) in residential areas of Garden City, up to 0.006m (6mm in water compatible open space areas of Northern Gateway Development (n.b. only 0.002m (2mm) in proposed commercial areas) and by up to 0.002m (2mm) in commercial and open space areas in Queensferry. The magnitude, spatial and temporal scale of the increases reported are not considered to pose an unmanageable risk to receptors and no further mitigation is therefore proposed.
- Queensferry fluvial - no increase in flood risk elsewhere. The expected overall trend is for flood depths to reduce across the catchment as a result of the development. Immediately adjacent to the Scheme boundary, a maximum reduction of up to around 0.15m is expected.

The assessment shows that in the majority of cases, the Scheme is not expected to cause nor increase the frequency of flood risk elsewhere. Therefore, the impacts of this redevelopment are considered to be consistent with the acceptability considerations in section 11 of TAN15. The assessment has identified a potential increase in flood risk for one source (River Dee tidal) in one event (0.1% AEP 2100). For flood risk sensitive receptors, the expected increase in flood depths this scenario is 0.010m (10mm) of less. Flood models are only representation of predicted conditions, and there are industry-accepted inherent uncertainties associated with flood estimation which should be taken into account when considering flood risk change, especially when the change is small. Notwithstanding this, the magnitude, spatial and temporal

scale of the increases reported are not considered to pose an unmanageable risk to receptors elsewhere. Therefore, no further mitigations to manage this impact are proposed.

6.4 Occupiers aware of flood risk

As a highway infrastructure project, there are no 'occupiers' of the Scheme.

NMWTRA is a member of the North Wales Local Resilience Forum (LRF), other members include the regional emergency services and local principal councils. As a member, NMWTRA is included within the Regional Flood Advisory Service response structure and receives timely and detailed information on likely flooding conditions. This enables NMWTRA and the other members of the North Wales LRF to manage the consequences of flooding incidents collectively. NMWTRA also receives other products from the Flood Forecasting Centre and the Met Office for this area.

The NRW online maps indicate that the Scheme is located within the 'Hawarden Embankment' (River Dee left/south bank) and "Northern Embankment" (north/right bank) Flood Warning Areas and the 'North Wales Coast' Flood Alert Area. It should be noted that these flood warnings cover only tidal and fluvial flooding from the River Dee and there are no flood warnings in place for fluvial flooding from the Queensferry Drain. NMWTRA receives flood warnings and alerts from NRW.

6.5 Escape/evacuation routes present

The modelling has indicated that, up to and including the 0.1% AEP 2100 event, the new road and bridge will not be affected in an exceedance (overtopping) event. Flood water is only expected on the new road and bridge as a residual risk (breach event). In a breach event near the Scheme (i.e. Breach Scenario 1, flood depths could exceed 1m and velocities be greater than 1 m/s. In these conditions, hazard to people classification would be 'Danger for all' under this scenario at the Scheme, which indicates that parts of the road will be unsafe for even Emergency Services.

Procedures, roles and responsibilities, and triggers for evacuating the Scheme, will be clearly set out in the local contingency plan, as flooding is included as part of the over-arching contingency plan for highway incidents. NWMTRA would, where possible, prevent vehicles approaching the affected area through closures and diversions; clear signage of a diverted route would minimise risk to motorists. If required, any evacuation would be undertaken under the management and guidance of the highway authority or emergency services as appropriate. The emergency services will be able to gain access/egress to stranded vehicles via unflooded section of the hard shoulder. Road users would be directed to turn around within the carriageway and evacuate away from the flooded section of carriageway from the same direction that they approached the area via sections of the A494 outside of the flood extents.

A Vehicle Management System (VMS) is being considered, which could advise motorists that the A494 is closed and divert vehicles onto alternative routes which would reduce the number of vehicles approaching the section of carriageway which could be at risk of flooding.

6.6 Flood emergency plans and procedures agreed and in place

Whilst there is no dedicated Flood Emergency Plan in place, there is a local contingency plan, which outlines procedures for westbound, eastbound, and full closures in both directions. This will be reviewed and updated once the Scheme is operational in consultation with the LLFA, Highways England and local stakeholders.

NMWTRA receives flood warnings and alerts from NRW. These alerts are issued for the general area and are not specific to the A494. In the event of a credible risk of flooding affecting the A494, a multi-agency Tactical / Strategic Coordination Group meeting would likely be convened to assess and respond to the situation.

6.7 Flood resistant and resilient design

TAN15 guidance encourages the incorporation of flood resilient construction measures within new developments to mitigate against flooding. Flood resilient infrastructure is designed and constructed to reduce the impact of floodwater so that no permanent damage is caused, and the infrastructure can be returned to normal use as quickly as possible following a flood event.

The proposed levels of the new carriageway are maximised within the constraints of the site topography and the need to tie-in with the existing carriageway levels. As a result, flood water is only expected on the Scheme as a residual risk (breach event).

Highway construction is relatively resilient to floodwater compared to other types of infrastructure; however it can be damaged by floodwaters. Given the criticality of the road, after a flood event, the road will need to be inspected, repaired where necessary, cleaned and returned to use quickly after a flooding event.

With respect to the new Queensferry Drain pumping station, this will be designed with electrics and control kiosks located above floodwater levels to ensure that they remain operational and maintainable during times of flooding.

6.8 Summary

The development has been assessed against the Acceptability Criteria as outlined in Section 11 of TAN15, and summary is presented in Table 6.7. As required by the TAN, any redevelopment proposals should be consistent with the acceptability considerations in section 11.

Table 6.7: Assessment of Acceptability Criteria

TAN-15 Acceptability Criteria	Consistent / met criteria	Comments
No increase in flooding elsewhere	Consistent	For: ● River Dee fluvial - The Scheme's impact is expected to be limited to the River Dee channel only. While the modelling indicates signals of change in areas around Chester Racecourse and Wepre Drain, these locations are distant from the Scheme and subject to known modelling limitations. ● River Dee tidal - in the extreme 0.1% AEP 2100 event, flood extents may increase marginally, as well as peak flood levels; 0.010 m (10mm) in Garden City, 0.006 m (6mm) in Northern Gateway and 0.002m (2mm) in Queensferry. ● Queensferry Drain - expected overall trend is for flood extent and depths to reduce across the catchment as a result of the Scheme. As required by the TAN, the FCA also assesses residual risk (breach and blockage). ● River Dee tidal breach, the modelling indicates the Scheme would affect the exchange of flood water flow between the Shotton and Sandycroft areas. For 3 of the 5 Breaches

TAN-15 Acceptability Criteria	Consistent / met criteria	Comments
		assessed, the overall effect of the Scheme on flood risk elsewhere is neutral or negative (i.e., a flood-risk benefit). However, two of the scenarios assessed indicate more sensitivity, and the proposed development may result in flood-depth changes of between from +0.173m (173mm) to –0.049m (49mm) in the 0.1% AEP 2100 event. Overall, negative changes (reductions in flood depth) occur more frequently than positive changes (increases in flood depths). ● Queensferry Drain blockage - the consequence of flooding would vary between free-flowing and 67% blockage scenarios. Across most of the catchment flood risk change is considered to be nil or negligible. However, in Open Space in Sandycroft, there could be a 0.07m increase in flood levels in the 0.1% AEP 2100 event.
Occupiers aware of flood risk	Met	As a highways infrastructure project, there are no ‘occupiers’ on the Scheme. NMWTRA is a member of the North Wales LRF and receives flood warnings and alerts from NRW.
Escape / evacuation routes present	Met	Flood water is only expected on the new road and bridge as a residual risk (breach event) and in this scenario the hazard to people classification would be ‘Danger for all’ which indicates that parts of the Scheme would be unsafe for even Emergency Services. NWMTRA would, where possible, prevent vehicles approaching the affected area through closures and diversions. If required, any evacuation would be undertaken under the management and guidance of the highway authority or emergency services as appropriate A Vehicle Management System (VMS) is being considered, which could advise motorists that the A494 is closed and divert vehicles onto alternative routes which would reduce the number of vehicles approaching the section of carriageway which could be at risk of flooding.
Flood emergency plans and procedures are agreed and in place	Met	Flooding is included as part of the over-arching contingency plan for highway incidents. This sets out flood emergency plans and procedures. This will be reviewed and updated once the Scheme is operational in consultation with the LLFA, Highways England and local stakeholders.
Flood-resistant and resilient design	Met	Highway construction is relatively resilient to floodwater compared to other types of infrastructure however after a flood event, the road will need to be inspected, repaired where necessary, cleaned and returned to use quickly after a flooding event. With respect to the new Queensferry Drain pump station, this will be designed with electrics and control kiosks located above floodwater levels to ensure that they remain operational and maintainable during times of flooding.
Acceptable consequences for the type of use - Section 11.7-11.8	Consistent	The desired standard for less vulnerable development is to be flood free during the 1% AEP fluvial and the 0.5% AEP tidal event, incorporating an allowance for climate change over the lifetime of development. This is met for River Dee fluvial and Queensferry Drain fluvial, but not River Dee tidal flooding.

TAN-15 Acceptability Criteria	Consistent / met criteria	Comments
		As permitted by the TAN, the above criteria can be more flexibly applied for redevelopment**.** The development proposals provide betterment when compared with existing and the proposed levels of all built infrastructure are maximised as far as reasonably practicable within the constraints of the Scheme.
Acceptable consequences for the type of use - Section 11.9-11.11	Consistent	For less vulnerable development, the maximum depth of flooding on site in extreme conditions should not exceed 600mm and velocity of flood waters should not exceed 0.3m/s. Exceedance of tolerable conditions in extreme flood events is only anticipated in discrete water-compatible areas (such as the area around the proposed Queensferry Ditch Pumping Station) and in residual-risk scenarios where the River Dee defences breach during an extreme tidal event. The TAN recognises that each site should be considered individually, and a judgement taken in the context of the circumstances which could prevail at the Scheme. The assessment concludes that proposed levels of the new carriageway are already maximised at this location and via implementation of an updated Local Contingency Plan, flood risk for these extreme future climate change events can be adequately managed and the residual risk is acceptable to the owner and maintainer of the Scheme (NMWTRA).

Source: Mott MacDonald, 2026

The evidence and assessments contained within this FCA confirm that the redevelopment meets, or is consistent with, the acceptability considerations in section 11 of TAN15.

7 Drainage Statement

The Highway Drainage Developed Design Strategy Report, ref. 395318-MMD-00-XX-RP-D-0007, details the existing area, the current drainage arrangements and proposed drainage design. The Scheme lies on Previously Developed (brownfield) and the drainage strategy identifies existing hardstanding of approximately 23,480m² will be redeveloped into new permeable areas totalling approximately 24,690m² (and net increase of approximately 1,210 m^2).

The drainage design will include the following SuDS drainage features:

- Vegetated open channel (approx. 158 metres)
- Vegetated open channel (approx. 130 metres)
- Swale (approx. 250 metres)

As well as the following regular drainage features:

- New lengths of Daisy Bank Farm and Queensferry Drain culverts
- No.13 inlet headwalls into the swale
- No.10 headwalls for watercourse and swale extents
- Carrier pipes, manholes, gullies, combined kerb drainage units
- Trash screen in the culvert inlet upstream of the pumping station
- Penstock control chambers
- Vortex separator chamber

The proposed surface water drainage strategy has been developed into an appropriate detailed SuDS drainage design, based upon the constraints of the Scheme, and the proposed design does not increase flood risk elsewhere. Section 7 of TAN15 has therefore been satisfied.

8 Conclusions and recommendations

8.1 Conclusions

The predominant sources of flood risk for the Scheme are from tidal and fluvial sources; namely the River Dee (tidal and fluvial), and Queensferry Drain (fluvial). The Scheme benefits from substantial flood defences alongside the River Dee, that offer a good standard of protection and are strategically important in the area, so likely to be maintained in perpetuity by NRW.

This redevelopment secures this critical link between north Wales and England and is identified in the LDP. The Scheme is therefore considered justifiable in accordance with the principles set out in section 8 of TAN15.

The evidence and assessments contained within this FCA confirm that the redevelopment has predominantly met, or is consistent with, the acceptability considerations in section 11 of TAN15, as summarised below:

- For the Scheme to met the required design standard for less vulnerable development it should be flood free during the 1% AEP fluvial and the 0.5% AEP tidal events, incorporating an allowance for climate change over the lifetime of development. This condition is not met for River Dee Tidal flooding however, as permitted by the TAN, these criteria can be more flexibly applied for redevelopment. The FCA concludes that the Scheme would provide betterment when compared with existing, and the proposed levels of all built infrastructure are maximised as far as reasonably practicable.
- For the Scheme, which is classed as less vulnerable development**,** under extreme event flood conditions the maximum depth of flooding should not exceed 600mm and velocity of flood waters should not exceed 0.3m/s. Exceedance of these conditions across the Scheme extent is only expected in discrete, water-compatible areas e.g. the area around the proposed new Queensferry Ditch Pumping Station, and in residual flood risk scenarios – i.e. where the defences have breached. TAN 15 allows for judgement taken in the context of the circumstances which could prevail at the Scheme. The assessment concludes that the proposed levels of the new carriageway are already maximised at this location
- The residual risk will also be managed via implementation of an updated Local Contingency Plan, to be prepared by the owner and maintainer of the Scheme (NMWTRA).
- The Scheme will be resilient to flooding for the duration of its lifetime, and can be inspected, repaired, cleaned and returned to use quickly after a flooding event, minimising disruption to people living and working in the area. The new Queensferry Drain Pumping Station will be designed with electrics and control kiosks located above floodwater levels so that they remain operational and maintainable during times of flooding.
- In the majority of flood events and cases, the Scheme is not expected to cause nor increase the frequency of flood risk elsewhere. Furthermore, with respect to Queensferry Drain flood risk, the expected overall trend is for flood depths to reduce across the catchment. However, in relation to River Dee tidal sources, in the extreme 0.1% AEP 2100 event only, the hydraulic modelling completed for the Scheme predicts flood extents and depths may marginally increase in the order of 0.006 m (6mm) for residential areas of Garden City, 0.010 m (10mm) for open spaces in Northern Gateway and 0.002m (2mm) in commercial areas of Queensferry. The magnitude, spatial and temporal scale of the increases reported are not considered to pose an unmanageable risk and therefore no further mitigations to manage these impacts are proposed.
- The proposed surface water drainage strategy has been developed into an appropriate detailed SuDS drainage design, based upon the constraints of the Scheme, and the

proposed design does not increase flood risk elsewhere. Section 7 of TAN15 has therefore been satisfied.

The FCA provides a full understanding of the potential risks and consequences, and sufficient information to consider flooding implications and to balance them against other considerations. The Scheme design delivers a development that is considered safe and there is minimal risk to life or disruption to people living and working in the area. The FCA demonstrates that flood risk can be managed within acceptable limits, and there is no reason from a flood risk standpoint not to proceed.

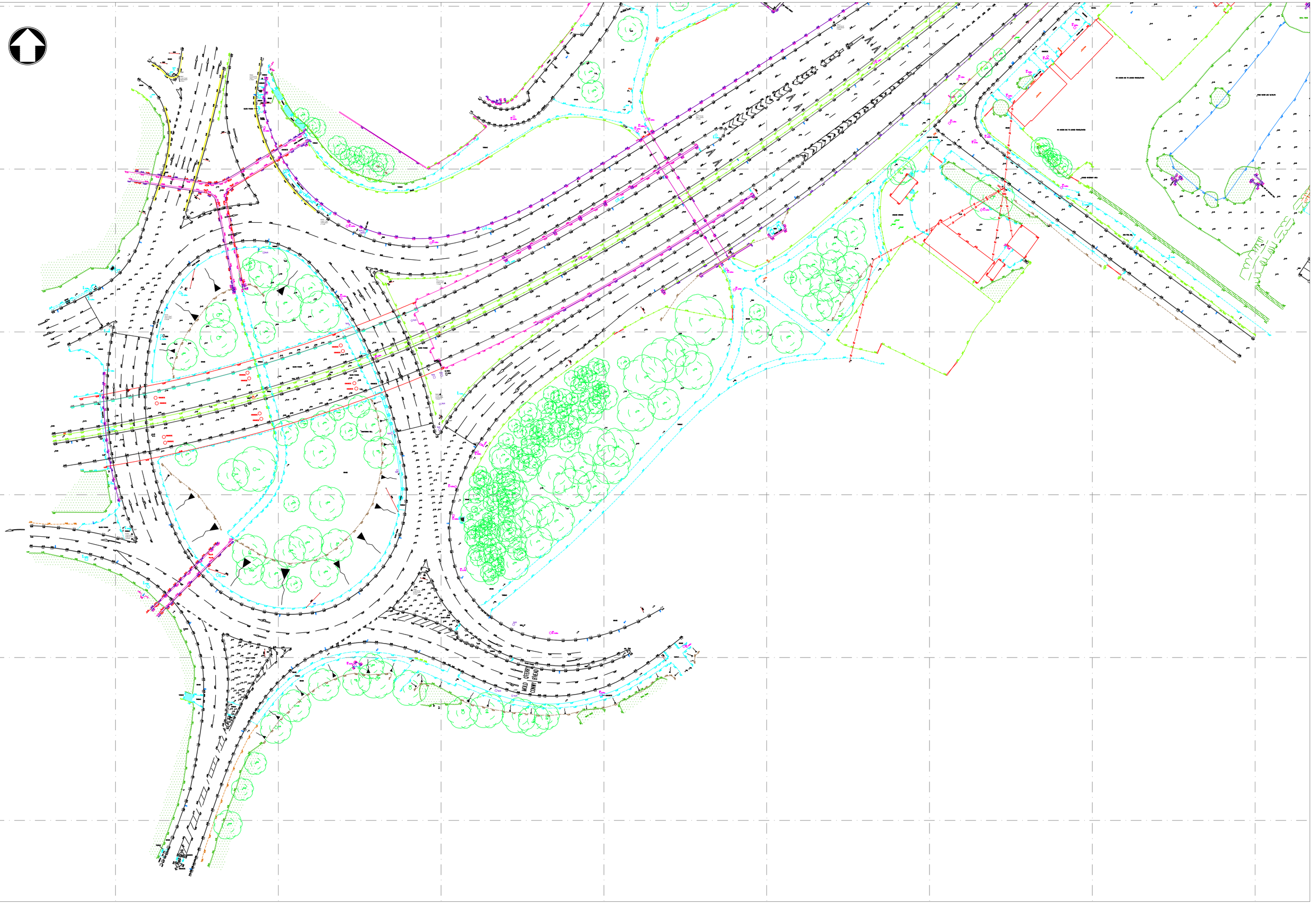
8.2 Recommendations

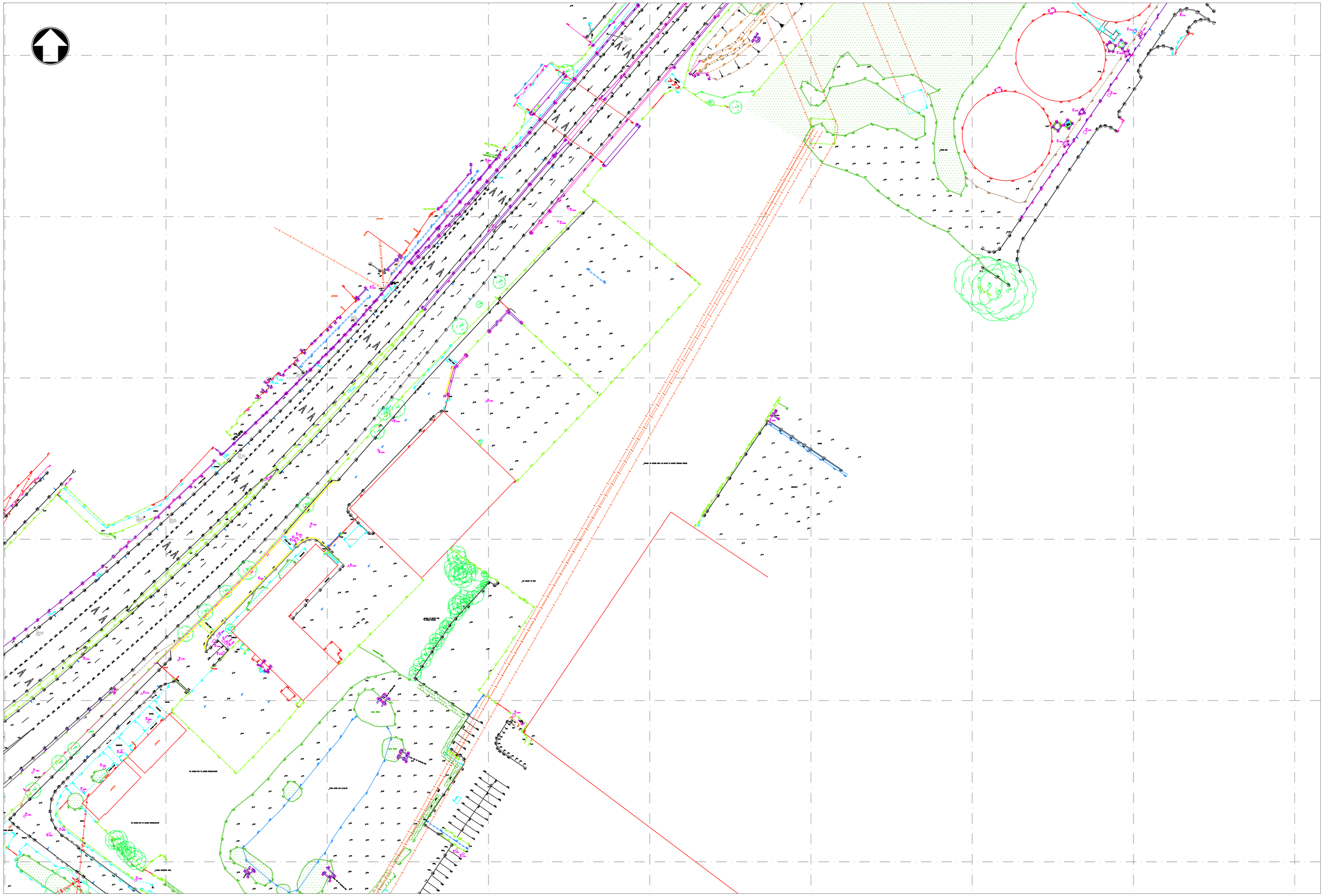
The assessment has identified the following activities, or further works will be required in relation to flood risk matters:

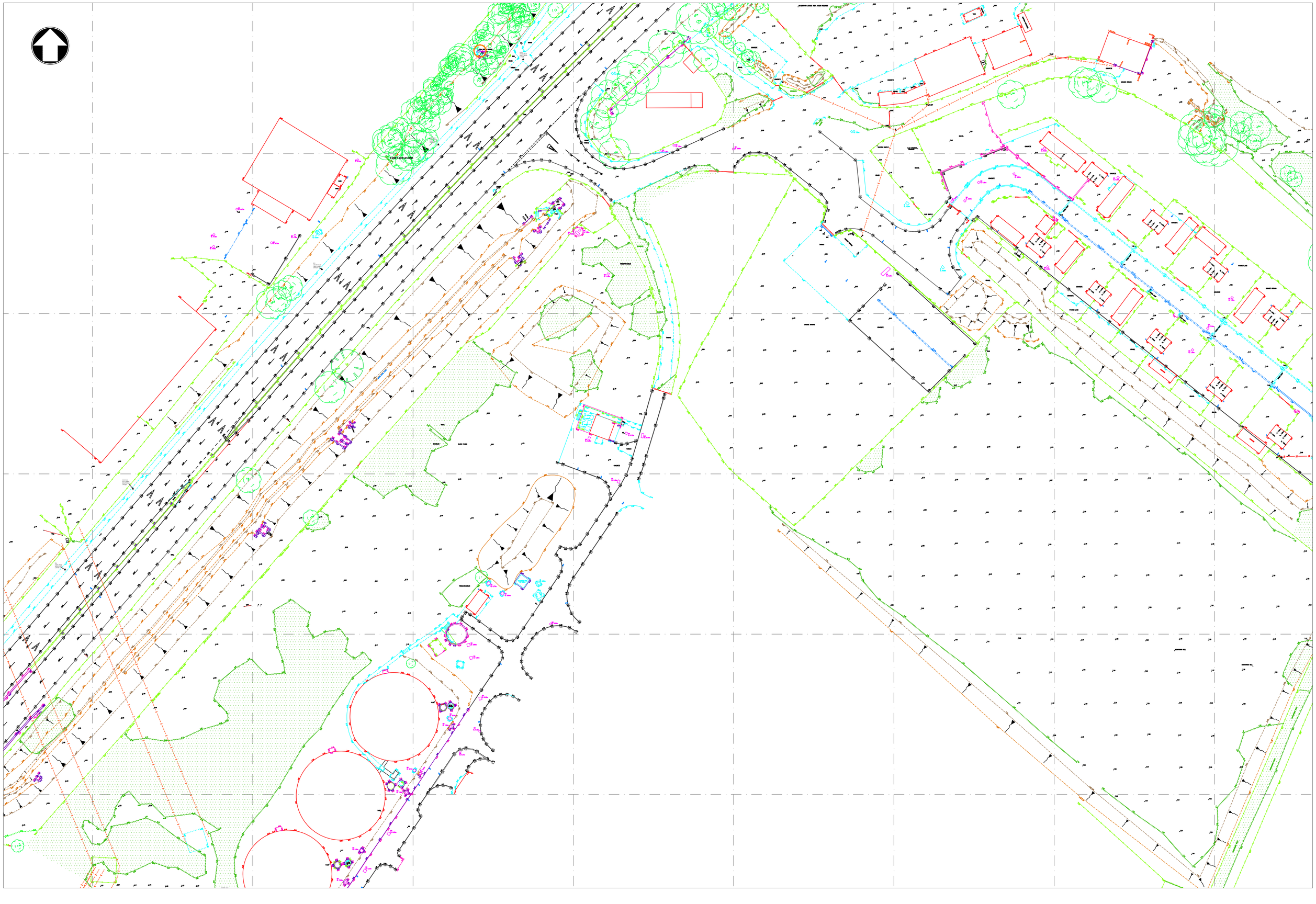
- During any subsequent design development, it is recommended that further work is undertaken to the River Dee model in the Wepre and Chester Racecourse areas, to address known limitations in areas is those areas, and improve confidence in the model results.
- Prior to the Scheme being operational, the local contingency plan should be updated with flood risk procedures, roles, responsibilities, and triggers for evacuating
- The Environmental Permitting (England and Wales) Regulations 2016 require a Flood Risk Activity Permit (FRAP) is obtained for any works in, over, under or adjacent to Main Rivers.

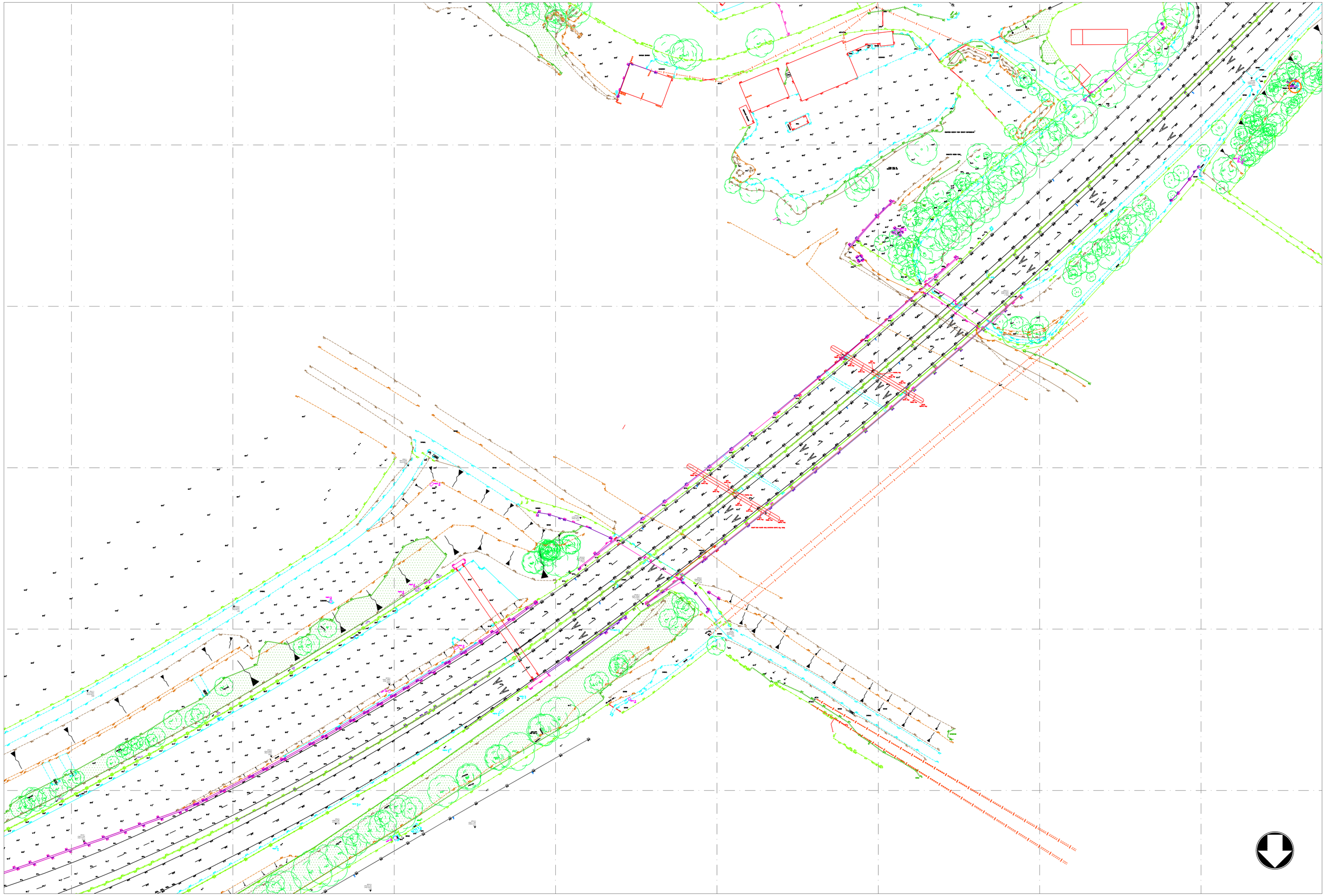
Appendices

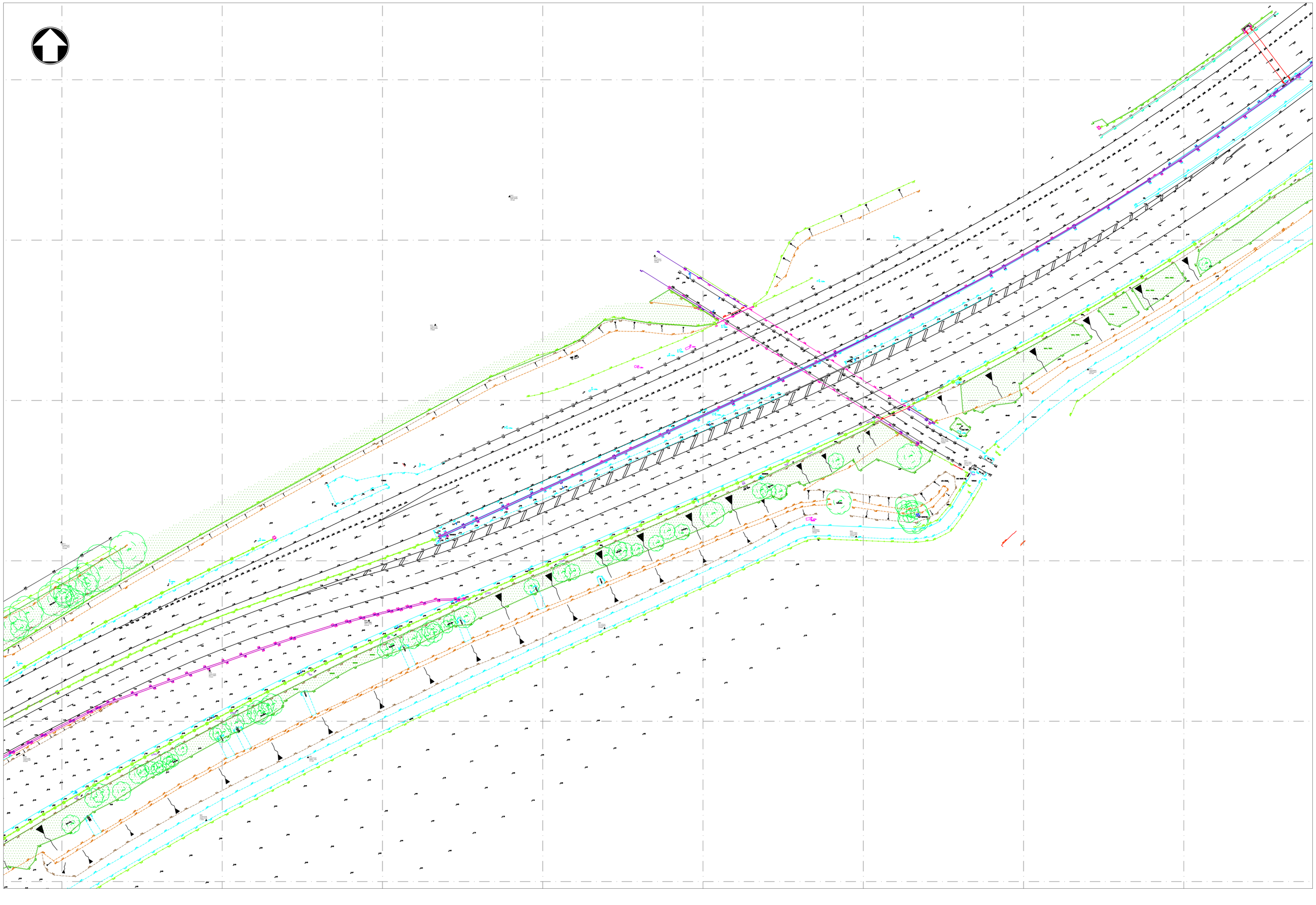
A. Topographic survey


WILD OTTER CRANK BRIDGE



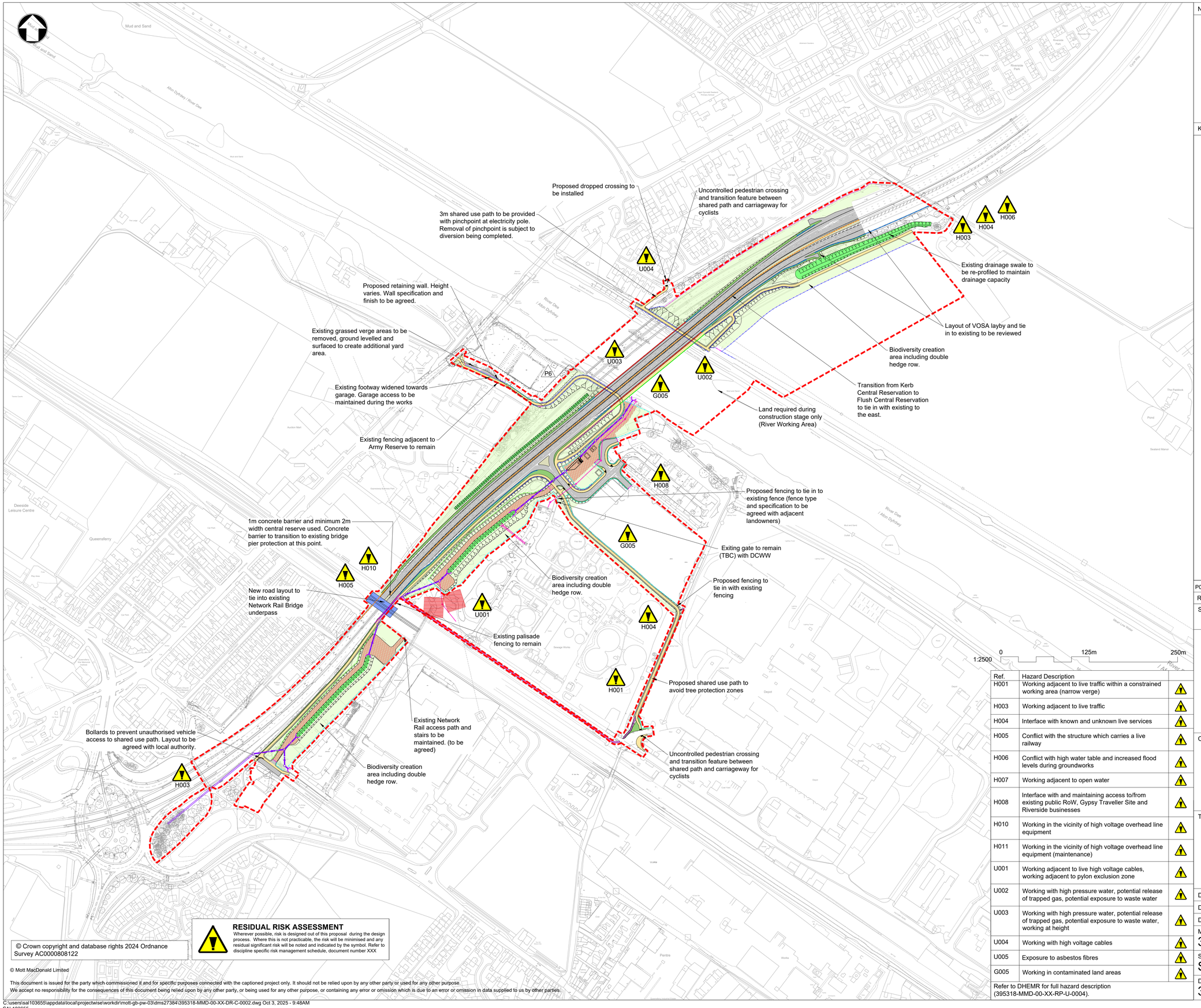






B. General arrangement of proposed development

Drawing number 395318-MMD-00-XX-DR-C-0002-A1 2



1:2500 0 125m 250m

Notes

1. This drawing details the current Developed Design at Key Stage 3 of Welsh Government's Linear Stage Approval Process and is subject to further detail design development.
2. This drawing is to be read in conjunction with all other related Mott MacDonald and RML drawings and specifications.
3. Unless otherwise stated all dimensions are in metres and all levels are in metres Above Ordnance Datum (AOD).
4. Information on this drawing is based on topographical data received from PM Surveys 2018 for the site area and OS mapping data for all other areas.
5. Proposed embankments shown are 1:2 slope for fill and 1:3 slope for cut (subject to confirmation in the Geotechnical Design Report). Extents of embankments shown are subject to further rationalisation and development.

Key to symbols

- Proposed Site Boundary
- Proposed Shared use cycle track (for use by cyclists and pedestrians)
- Proposed carriageway
- Central Reservation
- Soft Estate (Refer to Environmental Master Plans for details)
- Soft Verge
- Proposed footpath
- Rail Bridge Deck
- Proposed drainage swale/open channel
- Proposed maintenance access road / compound area
- Proposed Gate
- Proposed 400x400mm Buff Tactile Paving
- Proposed Palisade Fence
- Proposed Paladin Fencing
- Proposed Railing Fence
- Proposed Post and Rail Fence
- Proposed Noise Barrier - Subject to EIA
- Proposed H2W1 Concrete VRS
- Proposed H4bW2 Concrete VRS with railing (min 1400mm high)
- Proposed N2W2 Steel VRS
- Proposed N2W3 Bridge Parapet
- Proposed Class 3C Pedestrian Parapet
- Proposed Culvert
- Existing Retained Culvert
- Proposed Drainage Headwall including retaining feature at connection to ditch
- 10m Construction Exclusion Zone to Face of Pylons
- Proposed Retaining Wall
- Proposed Bollard
- Proposed diverted Welsh Water outfall pipe - details TBC by Welsh Water

Ref.	Hazard Description	
H001	Working adjacent to live traffic within a constrained working area (narrow verge)	
H003	Working adjacent to live traffic	
H004	Interface with known and unknown live services	
H005	Conflict with the structure which carries a live railway	
H006	Conflict with high water table and increased flood levels during groundworks	
H007	Working adjacent to open water	
H008	Interface with and maintaining access to/from existing public RoW, Gypsy Traveller Site and Riverside businesses	
H010	Working in the vicinity of high voltage overhead line equipment	
H011	Working in the vicinity of high voltage overhead line equipment (maintenance)	
U001	Working adjacent to live high voltage cables, working adjacent to pylon exclusion zone	
U002	Working with high pressure water, potential release of trapped gas, potential exposure to waste water	
U003	Working with high pressure water, potential release of trapped gas, potential exposure to waste water, working at height	
U004	Working with high voltage cables	
U005	Exposure to asbestos fibres	
G005	Working in contaminated land areas	

Refer to DHEMR for full hazard description (395318-MMD-00-XX-RP-U-0004).

RESIDUAL RISK ASSESSMENT
Wherever possible, risk is designed out of this proposal during the design process. Where this is not practicable, the risk will be minimised and any residual significant risk will be noted and indicated by the symbol. Refer to discipline specific risk management schedule, document number XXX

Rev	Date	Drawn	Description	Ch'k'd	App'd
P06	02/10/25	FS	Updated Boundary	SH	GM

Status Stamp
NOT FOR CONSTRUCTION

MOTT MACDONALD
RML
1st Floor Bryn Eirias
Abergele Road
Colwyn Bay
LL29 8BY
United Kingdom
T
F
W www.mottmac.com

Client
Asiant Cefnffyrdd Gogledd a Chanolbarth Cymru
North & Mid Wales Trunk Road Agent
Yn gweithio ar ran Llywodraeth Cymru
Working on behalf of the Welsh Government

Title
A494 River Dee Bridge Replacement Scheme
Developed Design
Highways General Arrangement

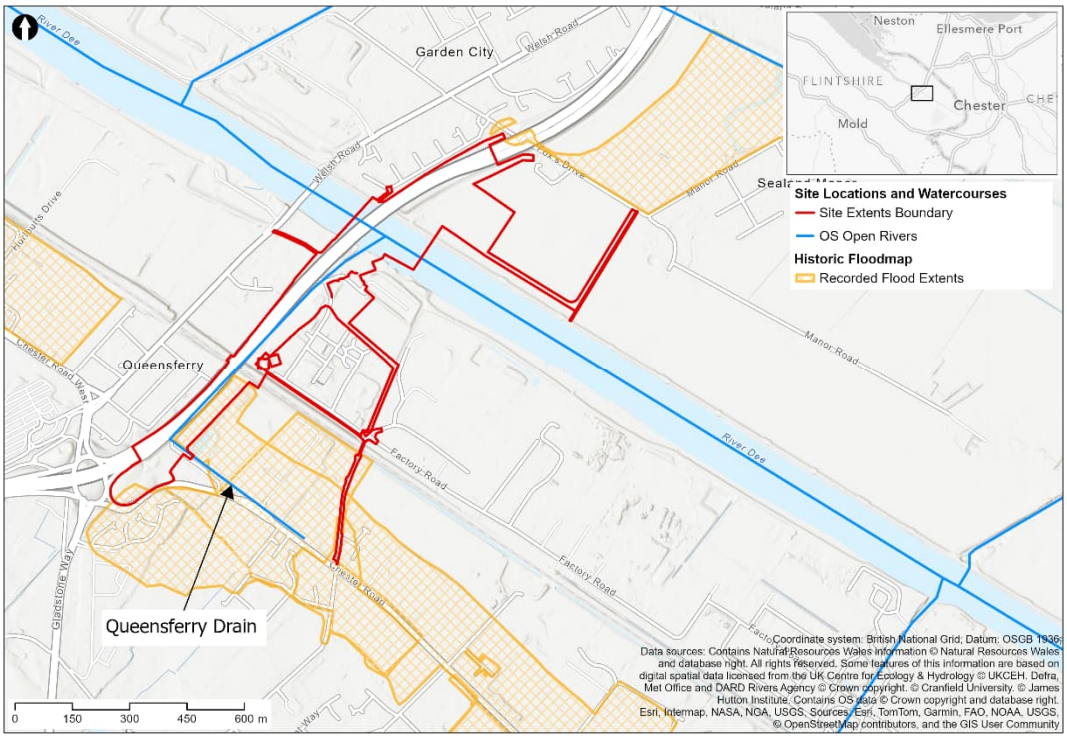
Designed	B.Bowers	BB	Eng check	S.HORSFALL	SH
Drawn	F.SALEH	FS	Coordination	G.MORGAN	GM
Dwg check	S.HORSFALL	SH	Approved	G.MORGAN	GM

MMD Project Number 395318	Scale at A1 1:2500	Security Rstd
Suitability Description Suitable for Information		Suit. Code S2
Drawing Number 395318-MMD-00-XX-DR-C-0002		Revision P06

C:\users\sal103655\appdata\local\projectwise\workdir\mott-gb-pw-03\dms27384\395318-MMD-00-XX-DR-C-0002.dwg Oct 3, 2025 - 9:48AM
SAL103655

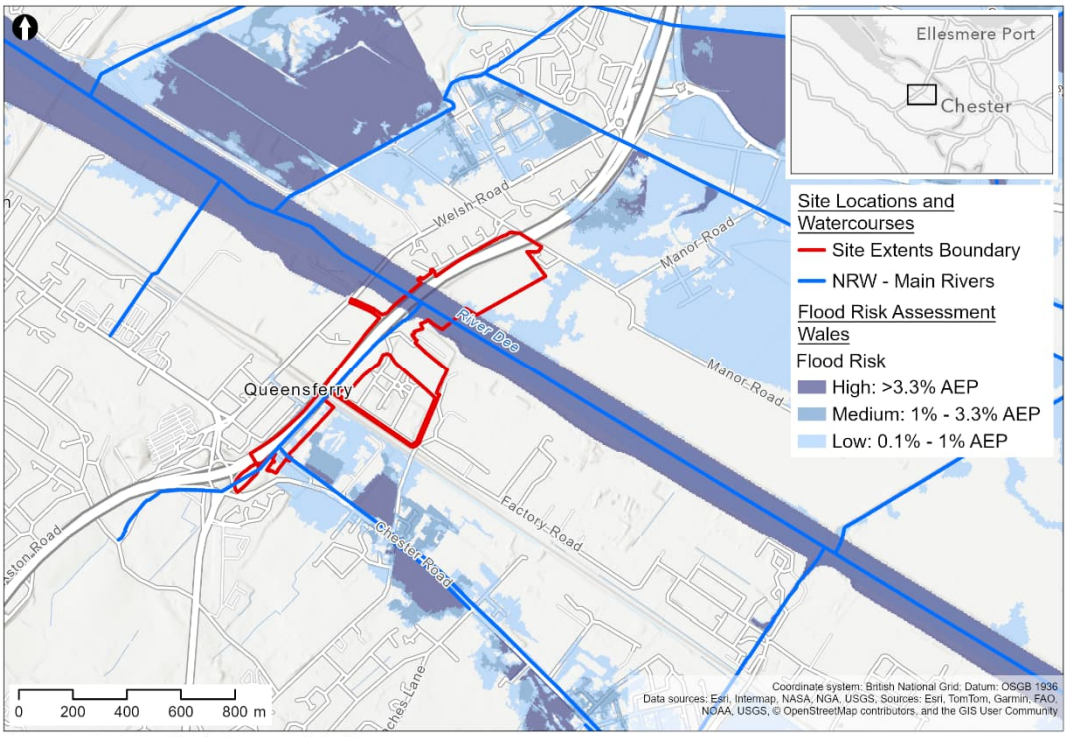
C. Initial assessment – mapping

C.1 Recorded flood extents



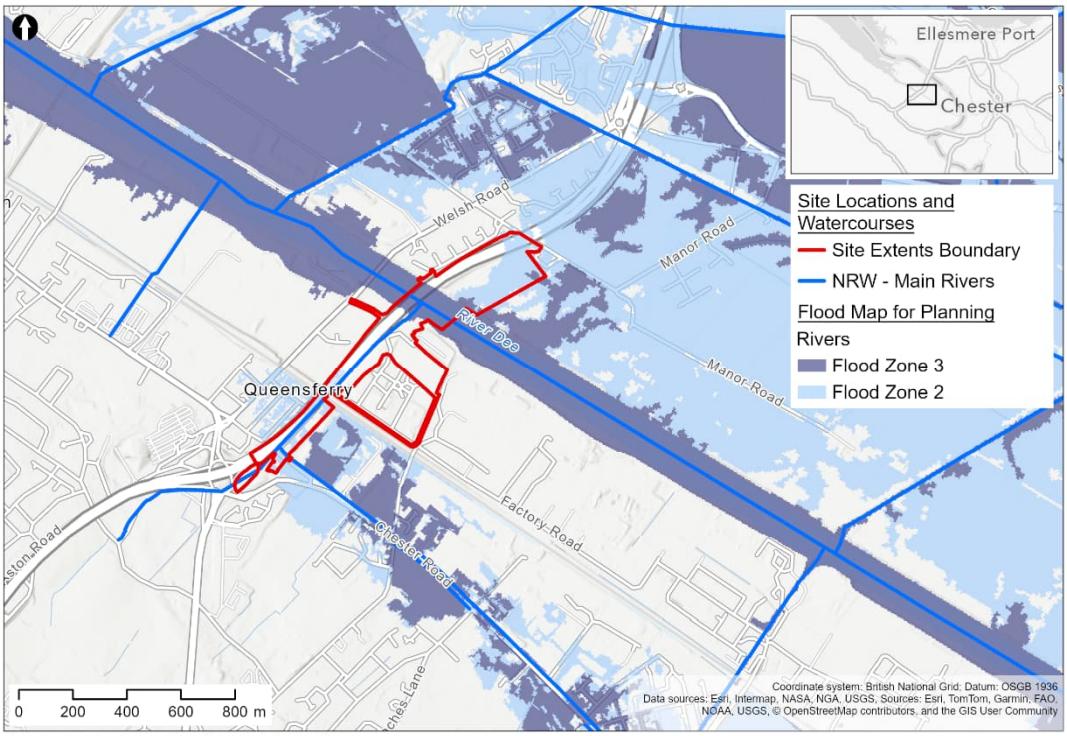
A494 River Dee Bridge Replacement | Recorded Flood Extents | 17 Jun 2025

C.2 Flood Risk Assessment Wales (FRAW) – Rivers



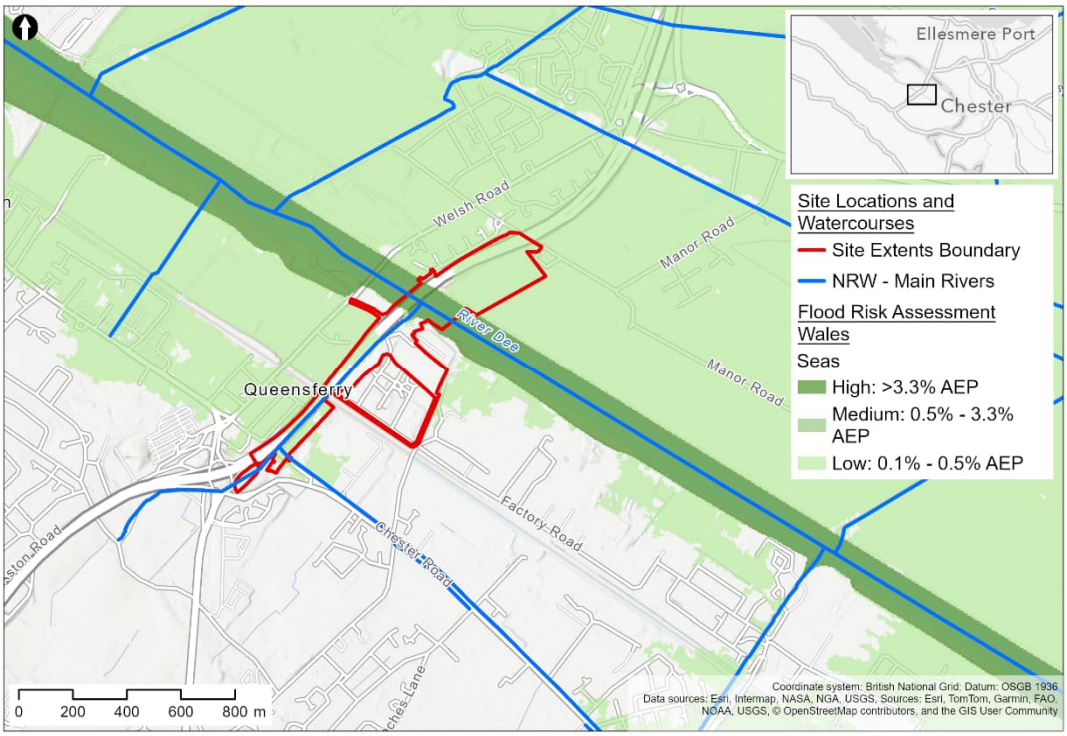
A494 River Dee Bridge Replacement | Flood Risk Assessment Wales | 22 Jul 2025

C.3 Flood Map for Planning (FMfP) – Rivers



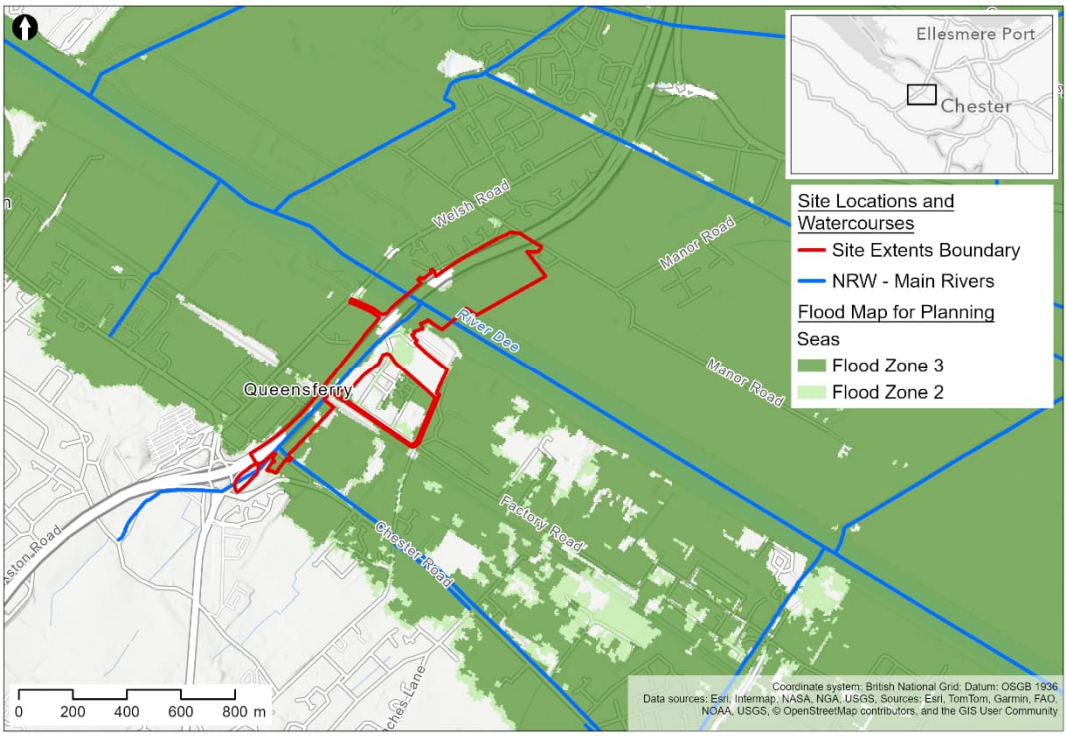
A494 River Dee Bridge Replacement | Flood Map for Planning | 22 Jul 2025

C.4 Flood Risk Assessment Wales (FRAW) – Seas



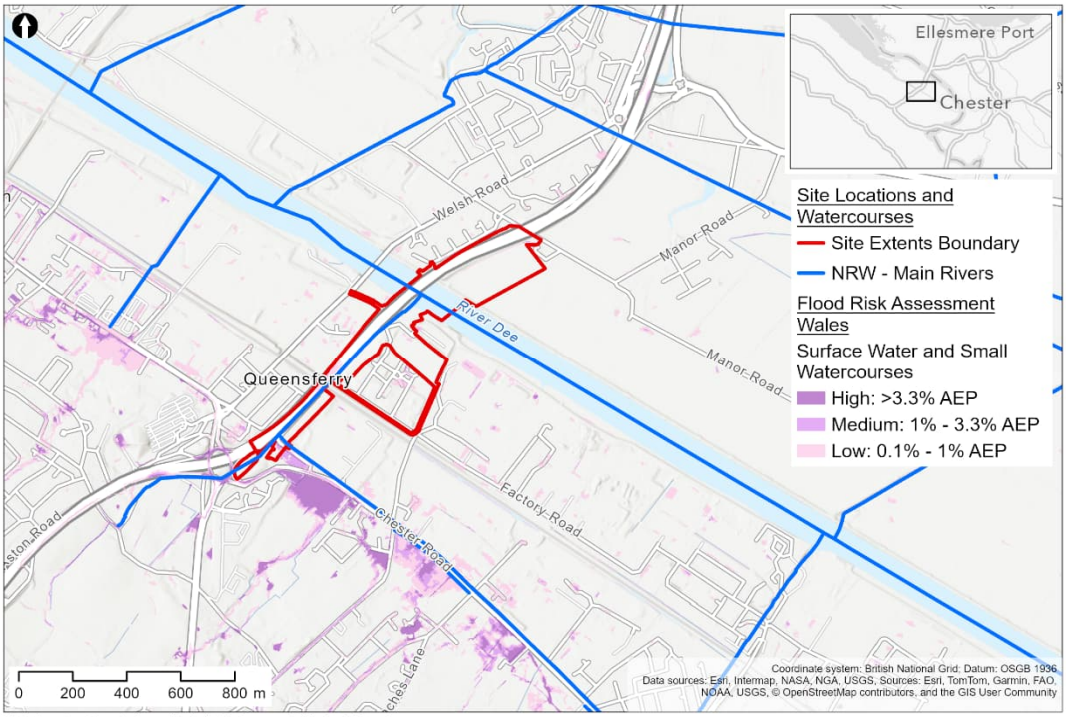
A494 River Dee Bridge Replacement | Flood Risk Assessment Wales | 22 Jul 2025

C.5 Flood Map for Planning (FMfP) – Seas



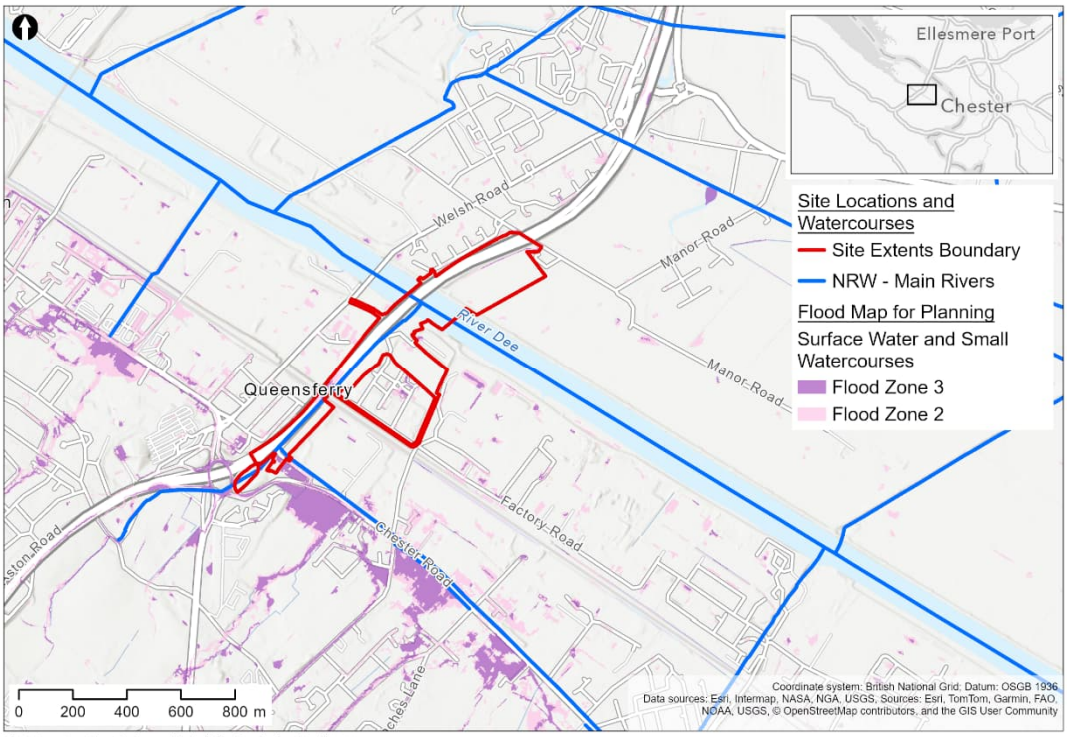
A494 River Dee Bridge Replacement | Flood Map for Planning | 22 Jul 2025

C.6 Flood Risk Assessment Wales (FRAW) – Surface Water and Small Watercourses



A494 River Dee Bridge Replacement | Flood Risk Assessment Wales | 22 Jul 2025

C.7 Flood Map for Planning (FMfP) – Surface Water and Small Watercourses



A494 River Dee Bridge Replacement | Flood Map for Planning | 22 Jul 2025