

TOBIN

Meath County Council

**Newtownmoyaghy Road
Planning and Environmental
Considerations Report**



comhairle chontae na mí
meath county council

BUILT ON KNOWLEDGE

Newtownmoyaghy Road

Planning and Environmental Considerations Report

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Appendices

- Appendix A Regional Site Location Map
Appendix B Planning Issue Drawings



1.0 INTRODUCTION

This Planning and Environmental Considerations Report has been prepared to accompany a planning application from Meath County Council to An Coimisiún Pleanála under Section 177AE of the Planning and Development Act, 2000 (as amended) to obtain development consent for road upgrade works (hereafter referred to as “the proposed development”) on the Newtownmoyaghy Road situated to the northeast of Kilcock within the Meath County Council Local Authority

The Newtownmoyaghy Road is also known locally as the Moyglare Road. For the purposes of this report, it will be referred to as the Newtownmoyaghy Road throughout. The Newtownmoyaghy Stream also known locally as the Jenkingstown Stream runs adjacent to the Newtownmoyaghy Road. For the purposes of this report, it will be referred to as the Newtownmoyaghy Stream throughout.

TOBIN Consulting Engineers have been appointed by Meath County Council as lead consultants for this project.

1.1 SUMMARY OF THE PROPOSED DEVELOPMENT

The Newtownmoyaghy Road is situated approx. 1km from the town centre of Kilcock Co. Meath. The road, located to the Northeast of the town serves as a busy link road between Kilcock and Maynooth especially at peak traffic commuter times enabling vehicles to avoid the busy R148.

The existing road edge and verge of Newtownmoyaghy Road has in discrete sections collapsed into the adjacent Newtownmoyaghy Stream due to erosion from stream flood events compounded by vehicles passing close to the road/stream interface. The length of road affected is 550m, which is subjected to flooding in extreme flood events. The present narrow road width increases the risk of vehicles travelling on and, on occasion, over the edge. Temporary non-retaining/non-structural edge barriers are currently in place to help prevent this, acting more as a warning system.

This development proposes the provision of a two stage open channel diversion to the east of and away from the existing road. The route of the diversion will pass-through privately-owned lands which will require a land acquisition. The existing roadside stream channel will be backfilled with suitable material including recovered material subject to meeting suitable grading requirements from the new channel excavation. The infilled area will provide the additional width required for a Type 3 Single (6.0m) Carriageway and widened grass verge which will also include a filter drain system with a 400mm drainage pipe to facilitate road runoff drainage and local land drainage to the west of the carriageway..

An estimated 15m long box culvert will be required at where the proposed diversion will pass from the East side of the road to the West side before re-connecting into the existing stream.

A full description of the proposed development is provided in Section 2.2 of this report.

1.2 SITE LOCATION AND DESCRIPTION

Newtownmoyaghy Road is a local secondary road situated to the northeast of Kilcock within the Meath County Council Local Authority Area (Figure 1-1). While it is a local secondary route, Newtownmoyaghy Road is used as a 'bypass' or 'rat run' for vehicles avoiding traffic congestion

in Kilcock and Maynooth. Meath County Council has provided an estimated and Annual Average Daily Traffic (AADT) figure of approximately 2500.

The Newtownmoyaghy Road is rural in nature and location and would be classified as a local road based on the existing cross section which varies between 4-6m. The narrow existing cross section requires passing vehicles to operate, at points, in a give way approach in the localised wider road section areas, with Newtownmoyaghy Stream a tributary of the River Rye running parallel to the carriageway.

The existing road edge and verge of Newtownmoyaghy Road has in discrete sections collapsed into the adjacent stream due to erosion from stream flood events compounded by vehicles passing close to the road/stream interface. The present narrow road width increases the risk of vehicles travelling on and on occasion over the edge. Temporary non-retaining/non-structural edge barriers are currently in place to help prevent this acting more as a warning system.

There is a line of mature trees comprising primarily beech and horse chestnut along the eastern boundary side of the existing road, which has limited the ability to widen the road in this direction and away from the stream on the western side of the road.



*Figure 1-1: Proposed Road Section Area impacted within Study Area-Newtownmoyaghy Road.
Google Map imagery © 2021*

1.3 THE APPLICANT

Meath County Council (Comhairle Contae na Mí) is a local government body responsible for the provision and administration of a wide range of services in County Meath in the Northeast of Ireland.

The completion of the proposed development will allow Meath County Council to provide improved road safety for all road users including cyclists and pedestrians.

1.4 NEED FOR THE PROPOSED DEVELOPMENT

The Newtownmoyaghy Road has been under review by Meath County Council given the safety concerns which have arisen in the area. This has been made even more priority given the expansion of Kilcock to the Northeast and a resulting increase in traffic within the area. The proposed development seeks to address a number of existing road safety issues

The study area is located within a flood risk area as identified on the Kilcock Environs Land Zoning Map and associated CFRAMs maps available from Floodinfo.ie

1.4.1 Safety

Specific issues associated with this stretch of road include:

- The existing carriageway of the Newtownmoyaghy Road is narrow with several pinch points. The width varies to as low as 4m in some sections which is substandard.
- This narrow cross-section renders the route unsafe for vulnerable road users and a risk of fall into the adjacent stream along a rural road link.
- Areas of the carriageway edge which drop directly into the Newtownmoyaghy Stream have also been noted to show signs of subsidence, further highlighting the risk.

The existing road has been identified by Meath County Council as a location for improvement given the current sub-standard alignment, cross-section and pavement condition.

1.5 ENVIRONMENTAL IMPACT ASSESSMENT SCREENING

An Environmental Impact Assessment (EIA) Screening has been undertaken to assess the proposed development against criteria set out in Annex I, II and III of the EU Directive 2011/92/EU, as amended by Directive 2014/52/EU (EIA Directive).

The outcome of this review has determined that the EIA Directive is not applicable to the proposed development and therefore no Environmental Impact Assessment report is required. Furthermore, the review has concluded that the proposed development will not result in significant effects on the environment.

The EIA Screening report is provided in support of this planning application.

1.6 APPROPRIATE ASSESSMENT

An AA Screening Report was prepared by TOBIN Consulting Engineers on behalf of Meath County Council, to provide information to enable the competent authority to perform its statutory function to undertake a screening for AA in respect of the proposed development.

The AA Screening Report has concluded that in light of best scientific knowledge, in view of the conservation objectives for the relevant European sites and on the basis of objective information, that the proposed development, either individually or in combination with other plans or projects, will have the potential for indirect effect on European sites.

Accordingly, a Natura Impact Statement (NIS) has been prepared, in accordance with relevant legislation, to provide information to enable the competent authority to perform its statutory function.

The conclusion of the NIS has determined that, following the application of the detailed mitigation measures, potentially significant adverse effects arising from the proposed development will be avoided or reduced.

The Stage One AA and NIS reports are submitted in support of this planning application.

2.0 DESCRIPTION OF THE EXISTING ENVIRONMENT AND PROPOSED DEVELOPMENT

2.1 DESCRIPTION OF THE EXISTING ENVIRONMENT

The proposed development is situated to the northeast of Kilcock within the Meath County Council Local Authority Area Newtownmoyaghy along and adjacent to the Newtownmoyaghy Road local secondary road. The road located to the northeast of the town serves as a busy link road between Kilcock and Maynooth, especially at peak traffic commuter times enabling vehicles to avoid the busy R148.

The Newtownmoyaghy Road is classified as a local secondary route however, it is used as a 'bypass' or 'rat run' for vehicles avoiding traffic congestion in Kilcock and Maynooth and has an estimated AADT of 2500. The need for the Newtownmoyaghy Road Project has been identified in the following documents:

- Meath County Development Plan 2021-2027 – Kilcock Environs Written Statement
- Kilcock Local Area Plan 2015-2021

At the development location, the existing Newtownmoyaghy Road is a local road with no defined or standardised geometric design. It's width varies between 4.0m and 6.0m which is also substandard. This narrow cross-section renders the route unsafe for vulnerable road users. The road is bounded on the west side by the Newtownmoyaghy Stream with a boundary hedgerow on the west and a boundary wall and mature trees to the east of the road.

The Newtownmoyaghy Stream (WFD code for Rye_Water_020: IE_EA_09R010300) will be diverted as part of the proposed development. This stream was assigned 'Good' water quality status for the WFD 2016-2021 period. The Newtownmoyaghy Stream flows in an easterly direction, ultimately discharging into Dublin Bay, approximately 37km downstream of the proposed development site.

Surrounding lands comprise of agricultural land and one-off rural housing to the east of the carriageway with a rural dwelling to the west of the carriageway and more urban development within the Kilcock settlement area inside the Kildare County Council jurisdiction.

2.2 DESCRIPTION OF THE PROPOSED DEVELOPMENT

The location and layout of the proposed works can be viewed in Figures 1-1 and 2-2.

The lands are within the administrative boundary of Meath County Council. The proposed development site is 2.5 hectares.

The need for the scheme has been highlighted in the Meath County Development Plan 2021-2027 -Kilcock Environs written Statement – To examine the feasibility of a new road which will connect the lands at Newtownmoyaghy with the L6219/L2211.

The Newtownmoyaghy Road has also been under review by Meath County Council given the safety concerns which have arisen in the area. The existing road edge and verge has collapsed into the adjacent stream at various locations due to be what is considered to be erosion from flood events. The study area is also located within a flood risk area as identified on the Kilcock Environs Land Zoning Map and associated CFRAMs maps available from Floodinfo.ie.

it is proposed to upgrade and widen the existing Newtownmoyaghy Road which will result in the diversion of the Newtownmoyaghy Stream to the northeast of the existing channel, adjacent to an existing treeline, within an area of agricultural grassland. The new channel will then travel south to reconnect to the existing Newtownmoyaghy Stream channel via a box culvert, under the existing road, connecting the stream from east to west. The existing mature trees along the east side of the road will for the most part be retained, with a minimum amount of tree removal (five trees in total) occurring along the path of the realigned stream i.e. where road culvert crossing points are necessitated. A local land crossing will also be installed with the private lands to avoid severance of the agricultural lands.

A description of the proposed upgrade works is provided hereunder and in Figure 2-1.

The route of the diversion will pass-through privately-owned lands which will require a land acquisition. The existing mature trees along the East side of the road will be retained for the most part. It is envisaged that a minimum amount of tree removal will occur at the culvert road crossing point and if required it is expected this would be between Ch. 0+010m and Ch. 0+525m along the path of the realigned stream.

The existing roadside stream channel will be backfilled with suitable material including recovered material subject to meeting acceptable grading requirements from the new channel excavation. This will provide the additional width required for a Type 3 Single (6.0m) Carriageway and widened grass verge, which has sufficient space for shared cycle and pedestrian facilities at a future date, if required, as shown in Figure 2-2 below. A standard filter drain will be installed with a 400mm slotted pipe along the new roadside edge.

The required road width will be in accordance with TII Publication DN-GEO-03031 Rural Link Design Table 6.1 for route with an AADT of up to 5000 a Type 3 Single Carriageway shall be provided (Table 2-1). This is composed of a 6m wide carriageway and 0.5m hard strips.

Table 2-1 Recommended Rural Link Layouts – extract from Table 6.1 DN-GEO-03031

Type of Road 1.	Capacity ² (AADT) for Level of Service D	Edge Treatment	Access Treatment	Junction Treatment at Minor Road	Junction Treatment at Major Road
Type 3 Single (6.0m) Carriageway (National Secondary Roads Only)	5,000	0.5m hard strip. Cycle Facilities Footways	Minimise number of accesses to avoid standing vehicles and concentrate turning movements.	Simple Priority Junctions ⁵	Priority junctions, with ghost islands where necessary ⁵ or roundabouts.

An estimated 15m long box culvert will be required at Ch. 0+525m where the proposed diversion will pass from the East side of the road to the West side before connecting into the existing stream. Two trees will be removed to accommodate the new box culvert.

In summary the proposed development involves the:

- Diversion of a waterbody – Newtownmoyaghy Stream which is a tributary of the River Rye from its current course to a new course approximately 50 metres east of the current line. This will require the development of a new two stage channel.
- Widening and realignment of the Newtownmoyaghy Road, L-6219.
- Infilling of existing roadside Newtownmoyaghy Stream, including a conventional filter drain system with a 400mm slotted pipe to collect surface water road runoff and localised land drainage on the west side of the road.
- Petrol Interceptor to treat road runoff which doesn't enter the filter drain.

- e) Bridging point / culverting of road.
- f) All associated site works including replacement landscaping.
- g) Accommodation works.

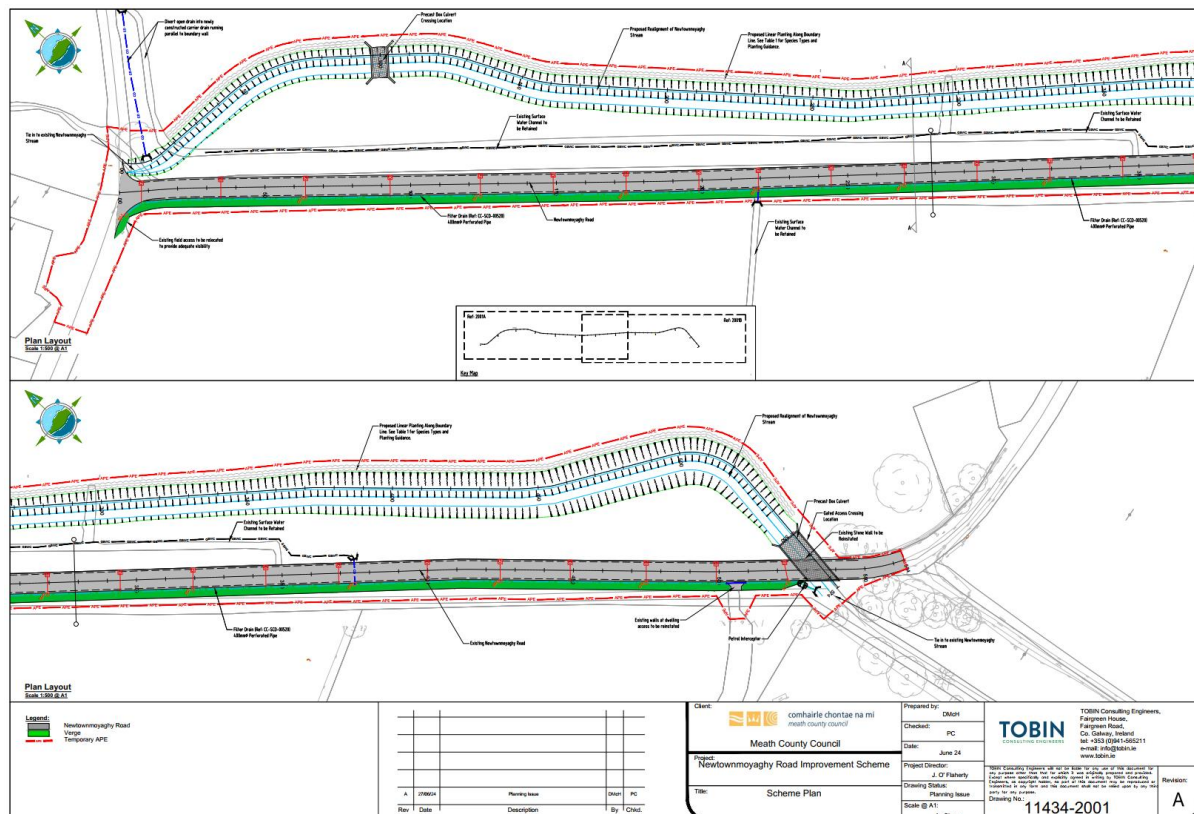


Figure 2-1: Plan of Proposed Upgrade Works

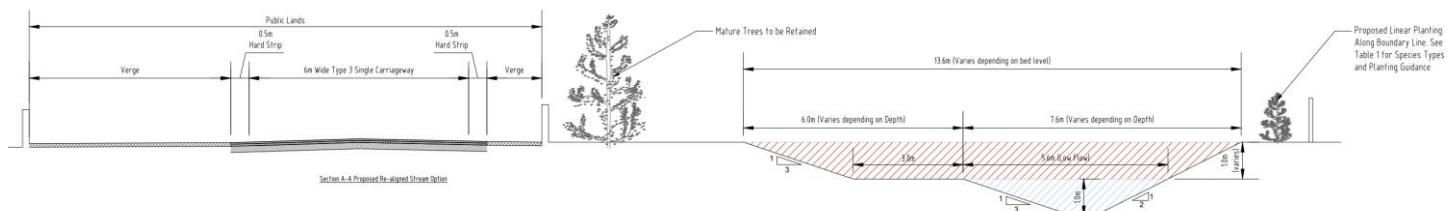


Figure 2-2 Option 4 Open Channel Diversion (East side of the Road)

2.2.1 Proposed Construction Phase Activities

Subject to statutory approval, the following is the sequence of activities that will be undertaken during the Construction Phase of the proposed development:

- It is anticipated construction will begin in late Q2 of 2026 (during low flow periods) and will continue for a duration of six months, during which time there will be six personnel on site.
- Traffic will be maintained along the existing carriageway while the bypass stream is under construction. The existing carriageway will be unimpeded but may have to operate under with a stop-and-go system while the existing stream is being infilled during the last two to three months of the Construction Phase.

- Normal working hours during the Construction Phase are expected to be Monday to Friday 08:00 to 17:00 hours.
- Five trees will be removed to facilitate the channel diversion (as shown in Drawing Ref:11434-2006 Site Clearance).
- Prior to backfilling of the existing stream and bringing into operation the new channel a survey will be undertaken and where deemed necessary a fish salvage will be undertaken along the old channel (under licence using electrofishing techniques by certified personnel) and translocation of any fish present will take place to the watercourse directly downstream of the proposed development.
- The stream will then be diverted into the newly formed channel during low flow conditions, outside the 1 in 10-year flood event extents.
- The existing roadside channel will be backfilled with material, including material subject to meeting grading requirements, which had previously been removed from the new channel excavation.
- The road level will be raised in areas where the flood waters are modelled to be in excess of 175mm, by 150-175mm in order to ensure the safety of road users during future flood events. Where the road is raised, an equivalent volumetric of storage to the raised section will be provided by the newly formed bypass channel material.
- A Type 3 Single (6.0m) carriageway and widened grass verge will then be constructed.
- A standard filter drain will be installed with a 400mm slotted pipe along the new roadside edge of the Newtownmoyaghy Road. This will cater for road surface run-off and localised land drainage to the west of the existing road. This water will be directed back to the stream via an outlet head wall (Figure 2-1).

The construction compound and welfare facilities will be located adjacent to the road within the site application boundary.

2.2.2 Operational Phase

During the operational phase the proposed development site will continue to function as a road. As mentioned above, all surface water run-off from the new carriageway as part of the proposed development will flow through a standard filter drain containing a 400mm diameter slotted pipe which will then enter the Newtownmoyaghy Stream at the downstream end of the scheme.

The new open channel section will operate as a two stage channel, to facilitate a depth of water in a tighter cross-sectional area in the channel at low flow, with inclusion of washed gravel in the bed of the channel which will help to enhance the properties of the channel for aquatic life.

3.0 POLICY, PLANNING AND LEGISLATIVE CONTEXT

This chapter provides a description of the plans and policies in support of the proposed development.

3.1 NATIONAL POLICY CONTEXT

3.1.1 *Project Ireland 2040*

The National Planning Framework and the National Development Plan together make up Project Ireland 2040.

The National Planning Framework is a framework to guide Ireland's development and investment in the coming years. It is the Government's high-level strategic plan to shape Ireland's development out until the year 2040. It contains a set of national objectives and key principles from which more detailed and refined plans will follow. The NPF sets out key goals and objectives for the State, and central to this is sustainability with more environmentally friendly development. In particular, the NPF lists the following national planning objectives:

- **NPO22:** Facilitate the development of a National Greenways, Blueways & Peatways Strategy which prioritises projects achieving maximum impact & connectivity at national & regional level.
- **NPO27:** Ensure the integration of safe & convenient alternatives to the car into the design of our communities, by prioritising walking & cycling accessibility to both existing & proposed developments & integrating physical activity facilities for all ages.
- **NPO64:** Improve air quality & help prevent people being exposed to unacceptable levels of pollution in our urban & rural areas through integrated land use & spatial planning that supports public transport, walking & cycling as more favourable modes of transport to the private car, the promotion of energy efficient buildings & homes, heating systems with zero local emissions, green infrastructure planning & innovative design solutions

The revised National Development Plan (NDP) 2021 – 2030 is aligned with the delivery of the objectives of the National Planning Framework. It sets out the significant level of investment, almost €165 billion, which will underpin the successful implementation of the National Planning Framework and drive it forward over the next 10 years. The proposed development supports the following National Strategic Outcomes:

- **NSO 3** Strengthened Rural Economies and Communities
- **NSO 4** Sustainability Mobility
- **NSO 8** Transition to a Low Carbon and Climate Resilient Society

The NDP seeks to promote sustainable mobility, by linking people and places in a sustainable way. Government policy on Sustainable Mobility seeks to facilitate "Safe and Green Mobility" with a focus on people and the integration of green transport options. Under the revised NDP, significant new investments are planned to increase sustainable mobility through "Active Travel" by facilitating an increase in cycling and walking.

The NDP outlines several key rural initiatives to revitalise rural areas and to enhance economic growth. As part of the above plan, the Rural Recreation Infrastructure Scheme supports the development and necessary maintenance, enhancement or promotion of recreational infrastructure, which covers a broad spectrum and range of walking trails.

3.1.2 National Investment Framework for Transport in Ireland (Dec 2021)

The Department of Transport has prepared the National Investment Framework for Transport in Ireland (NIFTI), which is the Department of Transport's high-level strategic framework to support the consideration and prioritisation of future investment in land transport. It represents the Department's contribution to Project Ireland 2040, Government's long-term, overarching strategy to make Ireland a better country for all and to build a more sustainable future.

NIFTI sets out the following investments priorities relevant to this project:

Investment Priority: Decarbonisation – “Decarbonisation and protection of our natural environment will mean investing in sustainable modes so that transport users have safe, accessible, reliable and efficient alternatives to the private car.”

Investment Priority: Protection and Renewal – “Protecting and renewing the existing land transport network is a key priority for transport investment.” “Necessary improvements to ensure safety or increase accessibility are considered a form of asset protection and renewal.”

Investment Priority: Enhanced Regional and Rural Connectivity: - “The types of measures that might be supported under this Investment Priority are diverse and will depend on specific transport needs and local contexts but could include the introduction of a regional bus service in an area poorly served by public transport or the realignment of a road to improve safety, journey speeds and reliability.”

3.1.3 Climate Action Plan 2021

The Climate Action Plan sets out a range of measures to reduce emissions in the transport sector. These measures consist of a mix of investments in sustainable transport infrastructure designed to deliver an additional 500,000 daily journeys by walking, cycling and public transport. Under chapter 15 “Transport” the following climate actions are identified and considered relevant to this project:

Action 231 - Continue the improvement and expansion of the Active Travel and Greenway Network

Action 233 – Construct an additional 1,000km of cycling and walking infrastructure

Action 234 – Encourage an increased level of modal shift towards Active Travel (walking and cycling) and away from private car use

3.1.4 National Sustainable Mobility Policy (April 2022)

This document sets out a strategic framework to 2030 for active travel and public transport to support Ireland's carbon emissions targets. The Policy forms part of Ireland's climate action agenda with several complementary actions in the Climate Action Plan 2021.

The policy focuses on 3 key principles and is supported by 10 goals. Of those the most relevant to this project are:

- Improve mobility safety
- Expand availability of sustainable mobility in regional and rural areas
- Encourage people to choose sustainable mobility over the private car

- Design Infrastructure according to Universal Design Principles and the Hierarchy of Road Users model

3.1.5 Road Safety Strategy 2021-2030

The Road Safety Strategy seeks to achieve a long term goal of zero road deaths or serious injuries by 2050. The strategy underpinning the EU Road Safety Policy Framework (2021-2030) and the UN's Second Decade of Action for Road Safety (2021-2030).

Seven Safe System priority intervention areas have been identified including safe and healthy modes of travel to promote and protect road users engaging in public transport or active travel. It involves the promotion of safer public transport modes and the promotion and provision of safe road environments for otherwise healthy active modes. This includes walking and cycling where the risks of death and serious injury are higher than for protected, in-vehicle road users.

3.2 REGIONAL POLICY CONTEXT

3.2.1 Regional Spatial and Economic Strategy (RSES), Eastern Region

The RSES is a link between the National Planning Framework, City & County Development Plans, and Local Economic & Community Plans. The Eastern and Midland Regional Assembly (EMRA), which was established in January 2015, is part of the regional tier of governance in Ireland. Each assembly is centrally involved in the formulation of policies geared towards achieving a greater dispersal of economic growth and development throughout the region. The proposed development is located in the Eastern Region. The region covers nine counties containing twelve local authorities namely – Longford, Westmeath, Offaly, Laois, Louth, **Meath**, Kildare, Wicklow, Fingal, South Dublin and Dún Laoghaire-Rathdown County Councils along with Dublin City Council. The region includes 3 subregions or Strategic Planning Areas (SPAs), namely the Midland, Eastern and Dublin, see Figure 3-1. The 38 strong membership of the Assembly is predominantly nominated by these local authorities to represent the region as policy makers to create a better region and a brighter future for its citizens

The Eastern Regional Assembly RSES sets out a vision for the Southern Region¹:

"To create a sustainable and competitive Region that supports the health and wellbeing of our people and places, from urban to rural, with access to quality housing, travel and employment opportunities for all"

16 Regional Strategic Outcomes (RSOs) are aligned to the UN Sustainable Development Goals, the EU thematic objectives and national policy including the NPF's National Strategic Outcomes (NSOs) to embed a coherent policy hierarchy and to ensure that future investment is targeted towards identified policy recommendations and goals. There is significant policy alignment between the UN SDGs and the National Planning Framework's National Strategic Outcomes (NSOs). The development of Regional Strategic Outcomes in the RSES is also closely aligned and supportive of the NSOs

¹ [EMRA RSES 1.4.5web.pdf](#)



Figure 3-1: RSES Eastern Region Spatial Area

For the RSES this means five primary areas of transition which are at the core of the Strategy:

- sustainable development patterns which promote compact growth, reduce transport demand and encourage low carbon transport modes;
- sustainable transport systems (people and freight);
- carbon storing and sequestering land uses;
- energy efficient buildings and industry; and
- renewable energy.

Policies in the RSES relevant to the proposed development are outlined as follows:

- RPO 9.10 In planning for the creation of healthy and attractive places, there is a need to provide alternatives to the car and to prioritise and promote cycling and walking in the design of streets and public spaces. Local authorities shall have regard to the Guiding Principles for 'Healthy Placemaking' and 'Integration of Land Use and Transport' as set out in the RSES.
- RPO 9.13: Local authorities and relevant agencies shall ensure that new social infrastructure developments are accessible and inclusive for a range of users by adopting a universal design approach and provide for an age friendly society in which people of all ages can live full, active, valued and healthy lives.
- RPO 7.13: EMRA will work with local authorities, the OPW and other relevant departments and agencies to implement the recommendations of the CFRAM programme to ensure that flood risk management policies and infrastructure are progressively implemented.
- RPO 7.15: Local authorities shall take opportunities to enhance biodiversity and amenities and to ensure the protection of environmentally sensitive sites and habitats, including where flood risk management measures are planned.

- RPO 7.32: With the assistance and support of the Climate Action Regional Offices, local authorities shall develop, adopt and implement local climate adaptation and mitigation strategies which shall address issues including local vulnerability to climate risks and identify and prioritise actions, in accordance with the Guiding Principles of the National Adaptation Framework, National Mitigation Plan.
- RPO 7.43: Climate Action Regional Offices and local authorities should consider the identification of critical infrastructure within their functional areas, and particularly of the interdependencies between different types of sectoral infrastructure, as a first step in 'future-proofing' services and to help to inform longerterm adaptation planning and investment priorities.
- RPO 8.1: The integration of transport and land use planning in the Region shall be consistent with the guiding principles expressed in the transport strategy of the RSES.
- RPO 8.2: The capacity and safety of the Region's strategic land transport networks will be managed and enhanced, including through the management of travel demand in order to ensure their optimal use.
- RPO 8.4: Land use plans within the GDA shall demonstrate a consistency with the NTA's Transport Strategy for the Greater Dublin Area and plans with or outside of the GDA shall be consistent with the guiding principles expressed in the RSES.
- RPO 8.6: In order to give local expression to the regional level Transport Strategy within the Region in conjunction with the NTA, Local Transport Plans (LTP) will be prepared for selected settlements in the Region.
- RPO 8.7: To promote the use of mobility management and travel plans to bring about behaviour change and more sustainable transport use.

3.3 LOCAL POLICY CONTEXT

The need to examine the feasibility of a new road which will connect the lands at Newtownmoyaghy with the L6219/L2211 has been identified in the following documents:

- Meath County Development Plan 2021-2027 – Kilcock Environs Written Statement²
- Kilcock Local Area Plan 2015-2021³

3.3.1 Meath County Council Development Plan 2021 - 2027

The Meath County Development Plan 2021-2027 sets out the following policy objectives which are applicable to this project:

Movement and Access Policies

- **MOV POL 1** - To support and facilitate the integration of land use with transportation infrastructure, through the development of sustainable compact settlements which are well served by public transport, in line with the guiding principles outlined in RPO 8.1 of the EMRA RSES 2019-2031.
- **MOV POL 3** - To promote sustainable land use planning measures which facilitate transportation efficiency, economic returns on transport investment, minimisation of environmental impacts and a general shift towards the greater use of public transportation throughout the County.

²<https://consult.meath.ie/en/consultation/meath-adopted-county-development-plan/chapter/kilcock-environs>

³<https://kildarecoco.ie/AllServices/Planning/LocalAreaPlans/LocalAreaPlans/KilcockLocalAreaPlan2015-2021/Adopted%20Kilcock%20LAP%2020152021.pdf>

- **MOV POL 25** - To implement the actions of the Meath Road Safety Strategy and promote road and traffic safety measures in conjunction with Government Departments, the Road Safety Authority, and other agencies.
- **MOV POL 26** - To provide for and carry out improvements to sections of national, regional, and county roads that are deficient in terms of alignment, structural condition, or capacity, where resources permit, and to seek to maintain that standard thereafter. To ensure that, where possible, any maintenance and improvement strategies have regard to future climates.

Movement and Access Objectives

- **MOV OBJ 40** - To develop an annual strategic road network plan for upgrading and required works for national, regional, and strategically important local roads for the targeting of funding.
- **MOV OBJ 42** - To develop and implement, in consultation with the Department of Transport a programme for the upgrading, improvement and maintenance of the non-national road network in the County.
- **MOV OBJ 48** - To implement maintenance and improvement of roads in the County as set out in the Schedule of Municipal District Works and the Council's Annual Roadwork's Programme funded from the Council's own resources and State Agency grants.
- **MOV OBJ 49** - To support essential public road infrastructure including, bypasses of local towns and villages and proposed national road schemes and where necessary reserve the corridors of any such proposed routes free of development, which would interfere with the provision of such proposals. Each of project will subject to the outcome of the Appropriate Assessment process.

Written Statements – Kilcock Environs Objectives

- **KIL OBJ 5** - To examine the feasibility of a new road which will connect the lands at Newtownmoyaghy with the L6219/L2211.
- **KIL OBJ 6** - To manage flood risk and development in Kilcock in accordance with the policies and objectives set down in Volume 1 of the County Development Plan in relation to 'Flood Risk Management'.

3.3.2 Kilcock Local Area Plan 2015-2021

The Kilcock Local Area Plan includes similar policies and objectives as the proceeding Development Plan include;

Road Capacity Improvement Policies

- **Mt 21** - To develop, maintain and improve as required, the local road network to ensure a high standard of road quality and safety in accordance with the requirements of this plan and relevant legislation.

Road Capacity Improvement Objectives

- **MTO 23** - To maintain, and improve as required, the local road network to ensure a high standard of road quality and safety.
MTO 26 - To coordinate and co-operate with Meath County Council in the design and construction of the road network serving Kilcock.

3.3.3 Meath Local Economic and Community Plan (2016–2021)

- Objective 2.5.2: Promote an increase in physical activity levels across the county for all.
- Action 2.5.2.1: Promote & develop free recreation facilities as part of a drive to increase physical activity levels and opportunities in the county for all. This work programme to be carried out in cooperation with the Meath County Tourism Strategy.
- Objective 3.8.8: Improve the liveability of communities through improved local facilities.
- Action 3.8.8.1: Support the development of safe walking routes and other recreation opportunities in communities involving vulnerable road users in the design, included in which should be better signage and mapping facilities.

3.3.4 Planning History of Application Site and Environs

A planning search was carried out to establish any proposed major developments in the area which may impact on the development of the scheme. The search revealed an application for a major residential development located to the west of the subject site. The proposed development Figure 3-2 consists of the construction of 530 No residential units, all with private amenity space comprising of 454 No. houses, 62 No. duplex units and 14 No. apartments. A neighbourhood centre, 16-classroom primary school, childcare facility and sports changing room facility will also be provided.

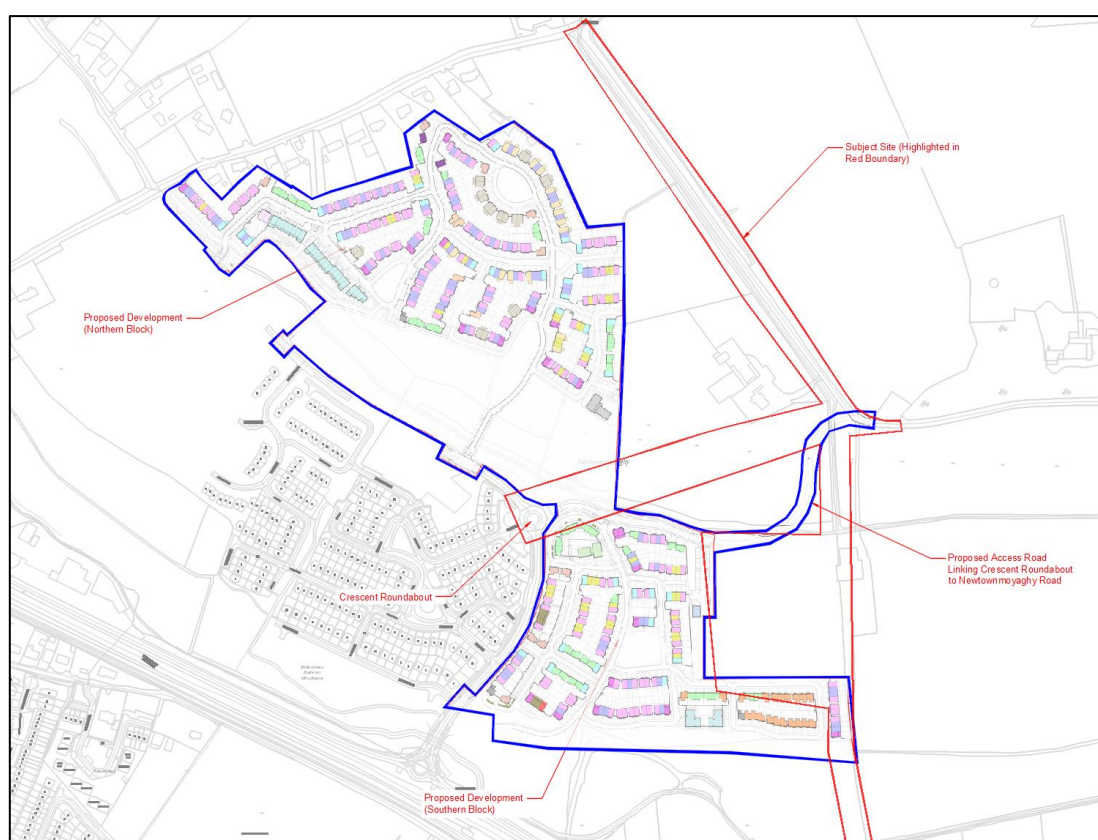


Figure 3-2: Planning Search on the R267

3.4 PLANNING CONCLUSION

The proposed development seeks to provide improved road safety to an existing substandard route, whilst simultaneously providing a widened grass verge, which has space for a shared cycle and pedestrian facilities if required at a future date.

It is a national policy objective to promote sustainable mobility, by linking people and places in a sustainable way, providing that the environmental impacts of individual proposals are acceptable. The RSES for the Eastern Region is aligned with this national policy objective. Finally, the proposal will allow Meath County Council to prioritise the provision of sustainable cycling and walking travel modes.

Overall, the proposed development will contribute positively to the realisation of national, regional and local planning policy objectives and in accordance with the proper planning and sustainable development of the area.

4.0 ECOLOGY

4.1 INTRODUCTION

This biodiversity chapter has been prepared to examine the possible ecological impacts of the proposed upgrade of the existing Newtownmoyaghy Road and stream diversion at Newtownmoyaghy in Co. Meath, with regards to flora and fauna both within and surrounding the proposed development. The assessment includes an evaluation of the existing site conditions, and an assessment of potential construction and operational impacts. Mitigation measures are recommended where appropriate.

4.2 METHODOLOGY

4.2.1 Legislation & Policy

Legislation and policy relevant to the ecological assessment and referenced herein are as follows:

- Wildlife Act, 1976 and Wildlife (Amendment) Act (2000) including all amendments. In this document, the legislation is referred to collectively as the Wildlife Acts;
- European Communities (EC) (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477/2011, as amended, hereafter referred to as the Birds and Habitats Regulations);
- Convention on the conservation of European wildlife and natural habitats (Bern Convention): Entry into Force in Ireland 01/08/1982;
- Relevant fisheries legislation up to and including the Inland Fisheries (Consolidation) Acts 1959 to 2017;
- Flora (Protection) Order, 2022;
- Meath County Development Plan, 2021– 2027; and
- Ireland's 4th National Biodiversity Action Plan, 2023–2030 produced by the Department of Culture, Heritage and the Gaeltacht.

Reference was also made to the following guidance documents:

- Bird Species of Medium and High Conservation Concern Listed in the Publication Birds of Conservation Concern in Ireland (BoCCI) 2020 – 2026 (Gilbert et al., 2021);
- A Guide to Habitats in Ireland. The Heritage Council (Fossitt, 2000);
- Chartered Institute of Ecology and Environmental Management Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.1. Chartered Institute of Ecology and Environmental Management, Winchester (CIEEM, 2018);
- Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes (NRA, 2005a);
- Guidelines for the Treatment of Badgers prior to the Construction of National Road Schemes (NRA, 2005b);
- NRA Guidelines for the Treatment of Otters prior to the Construction of National Roads Schemes (NRA, 2006a);

- Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes (NRA,2006b).
- Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes (NRA,2008);
- Guidelines for Assessment of Ecological Impacts of National Road Schemes. (Revision 2, National Roads Authority) (NRA (2009);
- The Management of Invasive Alien Plant Species on National Roads- Technical Guidance (TII,2020); and
- Best Practice Guidance for Habitat Survey and Mapping. Ireland's Heritage Council: Kilkenny, Ireland (Smith et al.,2011).

4.2.2 Study Area

The study area for the Biodiversity Assessment comprised the proposed development area, plus the wider surrounding hinterland. The study area comprises all lands located within the zone of influence (Zol) of the proposed development. The Zol is described hereunder.

4.2.2.1 Zone of Influence

The current guidance on ecological assessments (CIEEM, 2018) states that:

"The 'zone of influence' for a project is the area over which ecological features may be affected by biophysical changes as a result of the proposed project and associated activities. This is likely to extend beyond the project site, for example where there are ecological or hydrological links beyond the site boundaries" and that "The zone of influence will vary for different ecological features depending on their sensitivity to an environmental change."

The Zol was therefore defined through a desk-based assessment with regard to the sensitivity of habitats and species likely to be present / previously recorded in the locality of the proposed development site, areas with connectivity (physical, hydrological or ecological) to the proposed development site boundary and potential impacts which may arise. How the Zol was established is summarised hereunder:

- On the basis of the desk-based assessment, the main habitats located within the proposed development site and surrounding lands were found to likely comprise a mixture of agricultural grasslands, buildings and artificial surfaces, treelines, hedgerows, and a depositing/lowland river. Given the location of the proposed development site, and having regard to the habitats likely to be present (determined through the desktop assessment) the following protected species are likely to be present within the environs of the proposed development site; bat (*Chiroptera spp.*), badger (*Meles meles*), and common farmland bird species.
- The outer extent of the survey area for protected mammal species was therefore defined with regard to the NRA guidelines (NRA, 2005b) which state that noise impacts from construction works can impact breeding badger setts within 150m of construction works. Other protected mammal species likely to be present in the locality will have a smaller Zol, as impacts are predominantly associated with habitat damage and will therefore be captured within the 150m survey buffer. The survey area for bats relates

to their commuting / foraging routes and location of roost sites; the potential for which is determined through field assessment, by an assessment of potential roost sites within the footprint of the works.

- The extent of the survey area for protected bird species was established through potential impacts to birds from the proposed development. The main impacts to birds include; habitat loss, fragmentation of habitat and disturbance. The survey area for birds was therefore defined as the proposed development site boundary to account for habitat loss and a 150m buffer for disturbance. Notwithstanding, bird species will elicit differing behavioural responses to disturbance at different distances from the source of disturbance, therefore all bird species will be assessed individually.
- The Zol of potential impacts on surface water quality in the receiving freshwater environment will be confined to the Newtownmoyaghy Stream and the immediate downstream environment.

4.2.3 Desktop Study

The ecological desktop study completed for the proposed development comprised of the following elements:

- Review of rare and protected fauna including those obtained from the National Parks and Wildlife Service (NPWS)⁴, those available in NPWS reports and on the National Biodiversity Data Centre (NBDC) website ⁵;
- Review of Ordnance Survey maps and aerial photography to determine broad habitats that occur within the study area;
- Identification of European Sites with links to the proposed development;
- A review of published data and documents from Bat Conservation Ireland, Bird-Watch Ireland, Botanical Society of Britain and Inland Fisheries Ireland;
- A review of relevant ecological reports/assessments previously completed within the study area; and
- Water Framework Directive Fish Ecological Status 2008-2021 online open data portal (IFI 2021).

4.2.4 Field Survey

Multidisciplinary ecological field surveys were undertaken by qualified and experienced TOBIN Ecologists at the proposed development site on the 25th of April and the 30th of May 2023. The aim of the surveys was to determine the presence or absence of protected habitats and species, including Annex I habitats and Annex II and IV species, as well as Annex I birds. The surveys were also undertaken to assess the suitability of the habitats within the proposed development site to support protected species.

The study area included the proposed development area and a 150m buffer surrounding the site. The data collected was robust and allowed TOBIN to draw accurate, definitive and coherent conclusions on the possible impacts of the proposed development.

⁴ National Parks and Wildlife Service Website: [National Parks & Wildlife Service \(npws.ie\)](https://npws.ie) (Accessed: July, 2024)

⁵ National Biodiversity Data Centre Mapping Website: [Maps - Biodiversity Maps \(biodiversityireland.ie\)](https://biodiversityireland.ie) (Accessed: July, 2024).

A visual aquatic assessment of the section of Newtownmoyaghy Stream to be diverted, was undertaken during ecological surveys to inform the baseline. The results were as follows:

- At the time of survey, the wetted width of the stream was approximately 1.5m wide on average, the average bank height was 1m, and the average bank width 2m.
- The bank structure was poor, particularly the left bank adjacent to the road, which had evidence of collapse.
- The velocity at the time of survey was low to moderate. Higher flows are known to occur in winter, with low flows in summer. The channel is also known to run dry in sections during low flow periods.
- The flow type was a pool, riffle, glide, with sections of low flow/stagnant water.
- The channel was a straight channel and had a low gradient.
- Excessive growth of aquatic vegetation and presence of algae/fungus was recorded. In-stream vegetation included fool's watercress (*Apium nodiflorum*), rosebay willowherb (*Chamaenerion angustilolium*) and brooklime (*Veronica beccabunga*).
- There was an abundance of overhanging vegetation (low species diversity). Species recorded were hawthorn (*Crataegus monogyna*), bramble spp. (*Rubus fruticosus* spp.), ivy (*Hedera helix*) and harts tongue fern (*Asplenium scolopendrium*).
- The substrates were composed primarily of fine sediments, silt and organic matter, occasionally interspersed with cobbles and small boulders.
- Pressures recorded included surface water run-off from the adjacent road, litter, and agricultural pressures from the surrounding lands. A film of residue was also noted on the surface of the water.
- No evidence of protected species was recorded, and the watercourse is considered to have limited salmonid potential due to the lack of oxygen-rich gravel beds and signs of poor water quality. There is potential for fish species including minnow (*Phoxinus phoxinus*) and three-spined stickleback (*Gasterosteus aculeatus*) to occur.
- Kick sampling was not undertaken due to the lack of suitable habitat and dominance of silt, fine sediments, and organic matter.
- The habitat was evaluated as being of local importance (higher value).

Further details of the survey methodologies undertaken are presented hereunder:

4.2.5 Habitat Surveys

The proposed development site was searched for evidence of invasive plant species listed in Part 1 of the Third Schedule of S.I No. 477/2011 – European Communities (Birds and Natural Habitats) Regulations 2011. Species protected under Flora Protection Order, 2015 (S.I. No. 356/2015) or listed under the Irish Red Data List of Irish Plants were also searched for.

Habitat and botanical surveys were undertaken within the proposed development site following the methodology outlined in '*Best Practice Guidance for Habitat Survey and Mapping*' (Smith et al., 2011) and in '*Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes*' (NRA, 2008). The data was recorded, and the habitats encountered during the site visit were classified in accordance with Fossitt (2000) with reference made to the '*Interpretation Manual of EU Habitats*' (EC, 2013) as appropriate.

Habitat and botanical surveys were undertaken in April, which lies within the optimal survey period, of April to September (Smith et al., 2011).

During the ecological field survey the proposed development site was found to comprised of buildings and artificial surfaces (BL3) (tarmac road) with linear features including treelines (WL2), hedgerows (WL1), drainage ditches (FW4), a depositing/lowland river (FW2), and stone walls and other stonework (BL1) bordering the Newtownmoyaghy Road. Flat fields of improved agricultural grassland (GA1) (for sheep rearing) and arable crops (BC1) were recorded at the eastern and western boundaries of the proposed development site.

Treelines that run adjacent to the Newtownmoyaghy Road contained mature species of horse chestnut (*Aesculus hippocastanum*), beech (*Fagus sylvatica*) and pedunculate oak (*Quercus robur*), standing at a height of approximately 15m.

An arborist survey was carried out by Arbor-Care Ltd (Professional Consulting Tree Service), on behalf of Meath County Council, to assess the condition of the mature significant trees along the Newtownmoyaghy Road.

Riparian vegetation recorded on both sides of the Newtownmoyaghy Stream included hawthorn (*Crataegus monogyna*), blackthorn (*Prunus spinosa*), bramble (*Rubus fruticosus* sp.), ivy (*Hedera hibernica*), hart's tongue (*Asplenium scolopendrium*) and black nightshade (*Solanum nigrum*).

No Third Schedule invasive plant species were recorded within the proposed development boundary. Invasive species checks were carried out during the optimal survey period for invasive plant species, which is between April and September (Smith et al., 2000).

4.2.6 Fauna Surveys

A walkover survey to detect the presence or likely presence of protected mammal species, likely to occur within and in the study area of the proposed development site was undertaken.

A targeted badger survey was undertaken following methodologies outlined in Surveying Badgers (Harris et al., 1989). An otter survey followed methodologies outlined in Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes' and targeted surveys for otter following guidance outlined in NRA (2008).

During the survey, no evidence of any Annex I habitats or Annex II species were recorded within the proposed development. No evidence of otter activity, such as holts or scat, were recorded within the study area (the proposed development site plus a 150m buffer) during the survey. No Annex I bird species were recorded within the study area.

Bat surveys were also carried out within the proposed development site. The surveys included, roost assessment surveys, walking transect surveys and static detector surveys. These bat surveys were undertaken in May 2023 and therefore followed the Collins (2016) guidelines. Any requirement for future surveying will be guided by the Collins (2023) guidelines.

Preliminary Roost Assessment Survey

A daytime, preliminary roost assessment survey was undertaken of all trees along the mature treeline (to the east to the Newtownmoyaghy Road), in accordance with the Bat Conservation Trust Guidelines (Collins, 2016). Each tree was assessed as having either 'high', 'moderate', 'low' or 'negligible' bat roost potential depending on the number of roost features present, i.e.- knots, crevices, peeling bark etc.

Where suitable roost features were identified, the feature was further investigated using an inspection bat endoscope (Model 8003AL) (Under License: 103/2023).

Transect Survey

A transect bat survey was carried out on the night of the 30th of May 2023 along the mature treeline. The survey commenced 15 minutes before sunset at 21:28 and finished two hours after sunset at 23:43. All bat species and their activity was recorded using a Bat Box Duet handheld detector and an Echo Meter, Type Touch 2. The results were then recorded on a data sheet. The survey was conducted during optimal surveys conditions-the weather was dry, with a light breeze, and skies were clear. The temperature at the start of the survey was 13°C, the temperature at the end of the survey was 8°C.

Static Detector Survey

Two SM4Bat Full Spectrum static bat detectors were deployed in two places along the mature treeline to the east of the Newtownmoyaghy Road (at 53.401417, -6.651417 and 53.403639, -6.653833), over a period of eight nights (30th of May- 7th of June 2023).

The static detector units have ultrasonic microphones which record echolocation from bats. The bat detector is effectively used as a bat activity data logger, and the habitat type where the bat detector is located is noted to allow interpretation of the results (e.g., Open verses Edge verses Closed habitat types).

As per Collins (2016), the static detector units were programmed to start recording half an hour before sunset and to stop recording half an hour after sunrise to ensure all bat species (including bat species which emerge early and return late) were recorded.

After the eight nights, the static detector units were removed, and the collected data was analysed using Wildlife Acoustic's Kaleidoscope Pro (version 5.5.0). The Auto-ID function was used, but as an accuracy check the recordings of 20% of all common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus*) and Leisler's bat (*Nyctalus leisleri*) species was also carried out, as well as a check of 20% of all noise recordings. For less common species and unidentified (No ID) recordings, a full check of recordings was undertaken. Each sequence of bat pulses were noted as a bat pass to indicate the level of bat activity for each species recorded. This was either expressed as the number of bat passes per hour or per survey night.

4.2.7 Baseline Ecological Receptors

Ecological receptors are evaluated following NRA Guidelines (2009), which are consistent with the approach recommended in the Chartered Institute of Ecology and Environmental Management (CIEEM) *Guidelines for Ecological Impact Assessment in the UK and Ireland* (2018).

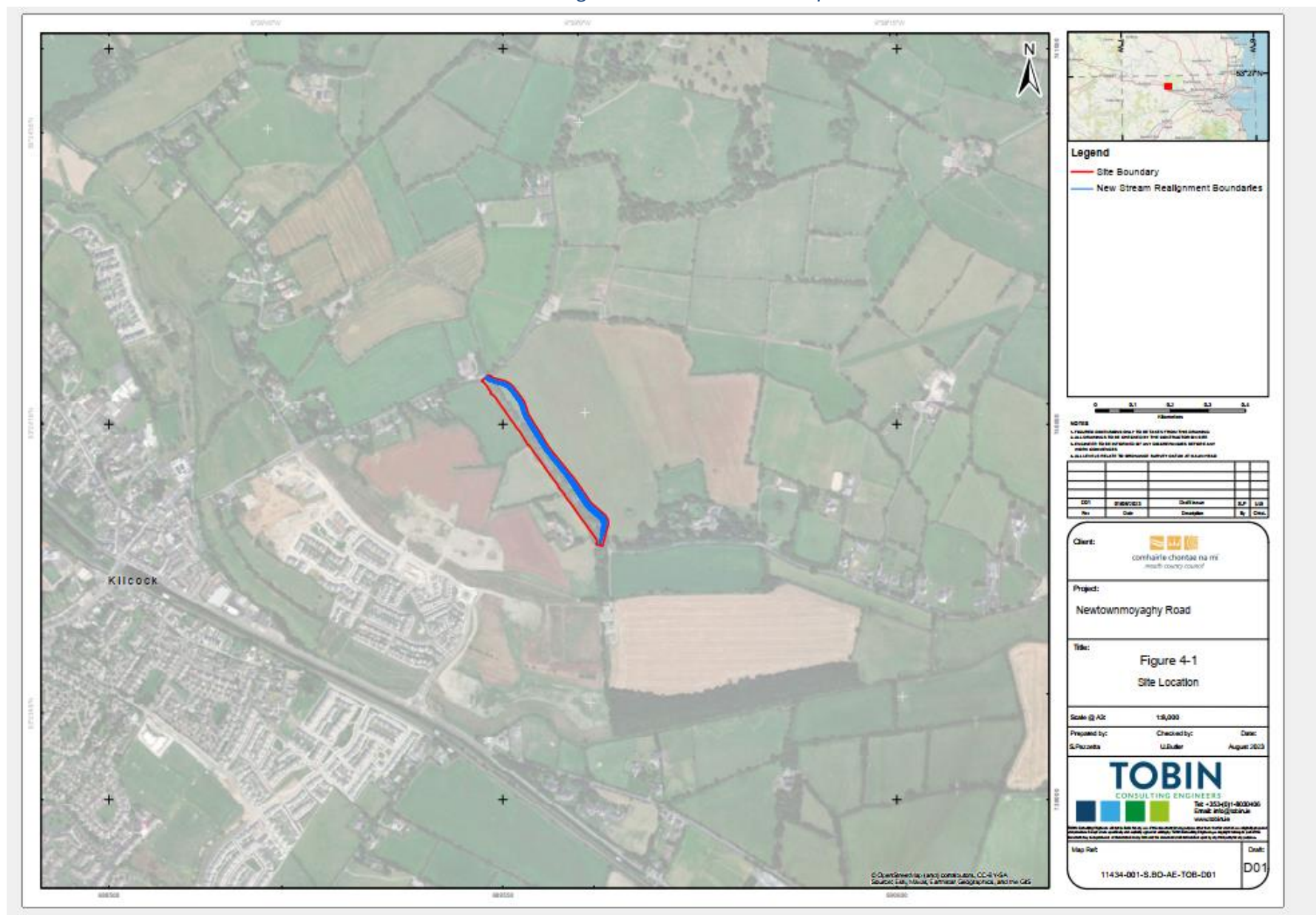
4.3 RECEIVING ENVIRONMENT

4.3.1 Site Description

The proposed development site is situated 1.1km northeast of Kilcock, within the townland of Newtownmoyaghy, County Meath (Figure 4-1). The proposed development site consists of artificial surfaces (existing tarmac roads) bordered by treelines, stone walls and a stream, in a predominantly rural environment. Agricultural fields lie to the east and west of the proposed development site.

The stream to be diverted as part of the proposed development is the Newtownmoyaghy Stream (WFD code Rye_Water_020: IE_EA_09R010300), which is hydrologically connected to the Rye Water Valley/Carton SAC (Site Code: 001398), located 4.6km downstream.

Figure 4-1: Site Location Map



4.3.2 Designated Conservation Status

Sites of International Importance

The Birds Directive (2009/147/EC) and the Habitats Directive (92/42/EEC) put an obligation on EU Member States to establish the Natura 2000 network. The Natura 2000 network comprises sites of the highest biodiversity importance for rare and threatened habitats and species across the EU. In Ireland, the Natura 2000 network of European sites comprises Special Areas of Conservation (SAC) and Special Protection Areas (SPA). SACs are selected for the conservation of Annex I habitats (including priority types which are in danger of disappearance) and Annex II species (other than birds). SPAs are selected for the conservation of Annex I birds and other regularly occurring migratory birds and their habitats.

The proposed development is not contained within any European protected sites. The closest designated European site is the Rye Water Valley/Carton SAC (Site Code: 001398), located approximately 4.6 km downstream from the proposed development. The SAC is designated for narrow-mouthed whorl snail (*Vertigo angustior*), Desmoulin's whorl snail (*Vertigo moulinsiana*) and petrifying springs with tufa formation (*Cratoneurion*). The SAC is hydrologically linked to proposed development via the Newtownmoyaghy Stream within the site, and both occur within the Dublin Groundwater Body (WFD code: IE_EA_G_008).). The proposed development and this SAC are both located in the same catchment (the Liffey and Dublin Bay Catchment-09).

Another SAC that occurs within the 15km radius of the proposed development site is the Ballynafagh Lake SAC (Site Code: 001387), it is located approximately 13km south-west of the proposed development site. The SAC is designated for alkaline fens, Desmoulin's whorl snail (*Vertigo moulinsiana*), and marsh fritillary (*Euphydryas aurinia*). There is no hydrological or hydrogeological connection between the SAC and the proposed development site. No source-pathway-receptor link exists.

The Ballynafagh Bog SAC (Site Code: 000391) is located 13.4km south-west of the proposed development site. The SAC is designated for active raised bogs, degraded raised bogs still capable of natural regeneration, and depressions on peat substrates of the Rhynchosporion. There is no hydrological or hydrogeological connection between the SAC and the proposed development site. No source-pathway-receptor link exists.

The South Dublin Bay SAC (Site Code: 000210) is designated for mudflats and sandflats not covered by seawater at low tide, annual vegetation of drift lines, salicornia and other annuals colonising mud and sand, and embryonic shifting dunes, and is located 37km downstream from the proposed development site. The site is hydrologically linked to the SAC via the Newtownmoyaghy Stream within the proposed development site. A possible source-pathway-receptor link exists.

The South Dublin Bay and River Tolka Estuary SPA (Site Code: 004024), is located 29km downstream of the proposed development. The SPA is designated for fourteen Annex II bird

species. A hydrological pathway exists between the SPA and the proposed development site, via the Newtownmoyaghy Stream. A possible source-pathway-receptor link exists.

The North Dublin Bay SAC (Site Code: 00206), is located 37km downstream and is designated for nine Annex I habitats and one Annex II species petalwort (*Petalophyllum ralfsii*). A hydrological pathway exists between the SAC and the proposed development site, via the Newtownmoyaghy Stream. A possible source-pathway-receptor link exists.

North Bull Island SAC (Site Code: 001006), is located 37km downstream from the proposed development and is designated for 17 Annex II bird species and wetlands and waterbirds. A hydrological pathway exists between the SAC and the proposed development site, via the Newtownmoyaghy Stream. A possible source-pathway-receptor link exists.

Sites of National Importance

Natural Heritage Areas (NHA) are the basic wildlife designation in Ireland. These areas are considered nationally important for the habitats present or which holds species of plants and animals whose habitats needs protection. Under the Wildlife Acts, NHAs are legally protected from damage from the date they are formally proposed for designation. Proposed Natural Heritage Areas (pNHA) were published on a non-statutory basis in 1995⁴ and have not since been statutorily proposed or designated.

There are no NHAs or pNHAs within the proposed development site, the nearest designated site is the Royal Canal pNHA (002103), located ca. 2km south of the proposed development. The second nearest designated site to the proposed development is the Rye Water Valley/Carton pNHA (001398), which is located ca. 4.6km downstream. Five other designated sites were identified, either within a 15km buffer or with hydrological connectivity to the proposed development site, these included: Donadea Wood pNHA (001391) located 8km southwest; Rathmoylan Esker pNHA (000557), located ca. 12km northwest; Ballynafagh Bog pNHA (000391), located ca. 13km southwest; Liffey Valley pNHA (000128), located ca. 14km downstream; and North Dublin Bay pNHA (000206), located ca. 37km downstream.

A source-pathway-receptor link via hydrological connectivity was identified between the proposed development site and the Liffey Valley pNHA (000128), and North Dublin Bay pNHA (000206),

4.3.3 Habitats and Flora

4.3.3.1 Habitats

4.3.3.1.1 Desktop Review

A review of NPWS datasets concluded that no Annex I habitats or Flora Protection Order (FPO) species are located within or surrounding the proposed development site.

4.3.3.1.2 Field Survey

A total of six habitat types were identified within the proposed development site and are described below.

- **Buildings and artificial surfaces (BL3)**

The existing Newtownmoyaghy Road which is proposed to be upgraded is a narrow, straight road comprising a tarmacadam surface. Compaction from traffic and erosion from stream flood events has caused the existing road edge and verge to collapse in discreet sections into the Newtownmoyaghy Stream (EPA Code 09N02), which runs adjacent to the road.

This habitat was evaluated as being of local importance (lower value).

- **Depositing/lowland river (FW2)**

The Newtownmoyaghy Stream(EPA Code: 09N02), is situated along the eastern boundary of the Newtownmoyaghy Road, and is proposed to be diverted as part of the proposed development. The wet width of the stream was approximately 1.5m wide with a moderate velocity at the time of the field survey and flowing in a southerly direction. The banks of the river were noted to be approximately 1m high and 2m wide. Riparian species included hawthorn (*Crataegus monogyna*), bramble spp. (*Rubus fruticosus spp.*), ivy (*Hedera helix*) and harts tongue fern (*Asplenium scolopendrium*).

No evidence of otter was noted along the Newtownmoyaghy Stream during the survey. However, otter are known to occur in the area, it is therefore possible that this species may commute along this stream.

Despite the watercourse being classed as being of good quality for the Water Framework Directive (WFD) 2016-2021 period, the water seemed polluted with a film of residue on the surface in sections during the field survey.

This habitat was evaluated as being of local importance (higher value).



Figure 4-2: Buildings and Artificial Surfaces (Left) and Depositing Lowland River (Right).

- **Treelines (WL2)**
- Treelines were found to run adjacent to the road. The treeline to the east of the road was noted to be mature. Beech (*Fagus sylvatica*) dominated this habitat, sycamore (*Acer pseudoplatanus*) and horse chestnut (*Aesculus hippocastanum*) featured occasionally, while pedunculate oak (*Quercus robur*) and ash (*Fraxinus excelsior*) were rare.
- Arbor-Care Ltd carried out an arborist assessment of significant trees along the mature treeline to the east of the road. The summary of the results presented in Table 4-1 below.

Table 4-1 Results of Tree Survey by Arborist

Category	Quantity
A-Tree of high quality	33
B- Trees of good quality	5
C- Low quality or trees less than 75mm in diameter	1
U- Remove due to poor condition	1
Total trees surveyed	40

Less mature treelines were also recorded during the ecological walkover, to the west of the Newtownmoyaghy Road. Species recorded were similar to the mature treeline described above. However, hawthorn (*Crataegus monogyna*) and ivy also featured frequently.

This habitat was evaluated as being of local importance (higher value).



Figure 4-3: Mature Treeline (Left) and Immature Treelines (Right).

- **Drainage ditches (FW4)**

A drainage ditch was recorded to the east of the Newtownmoyaghy Road. This habitat was found to be muddy, very shallow and dry at the time of the survey.

This habitat was evaluated as being of local importance (lower value).

- **Stone walls and other stonework (BL1)**

Stone walls and other stonework was recorded inside the northeastern boundary of the proposed development site, in the form of a bridge, under which the Newtownmoyaghy Stream flows. A stone wall is present along the northern boundary of the proposed development, along the eastern boundary of the road. Species recorded growing in the stone wall included ivy (*Hedera hibernica*), pignut (*Conopodium majus*) and ivy-leaved toadflax (*Cymbalaria muralis*).

This habitat was evaluated as being of local importance (lower value).

- **Improved agricultural grassland (GA1)**

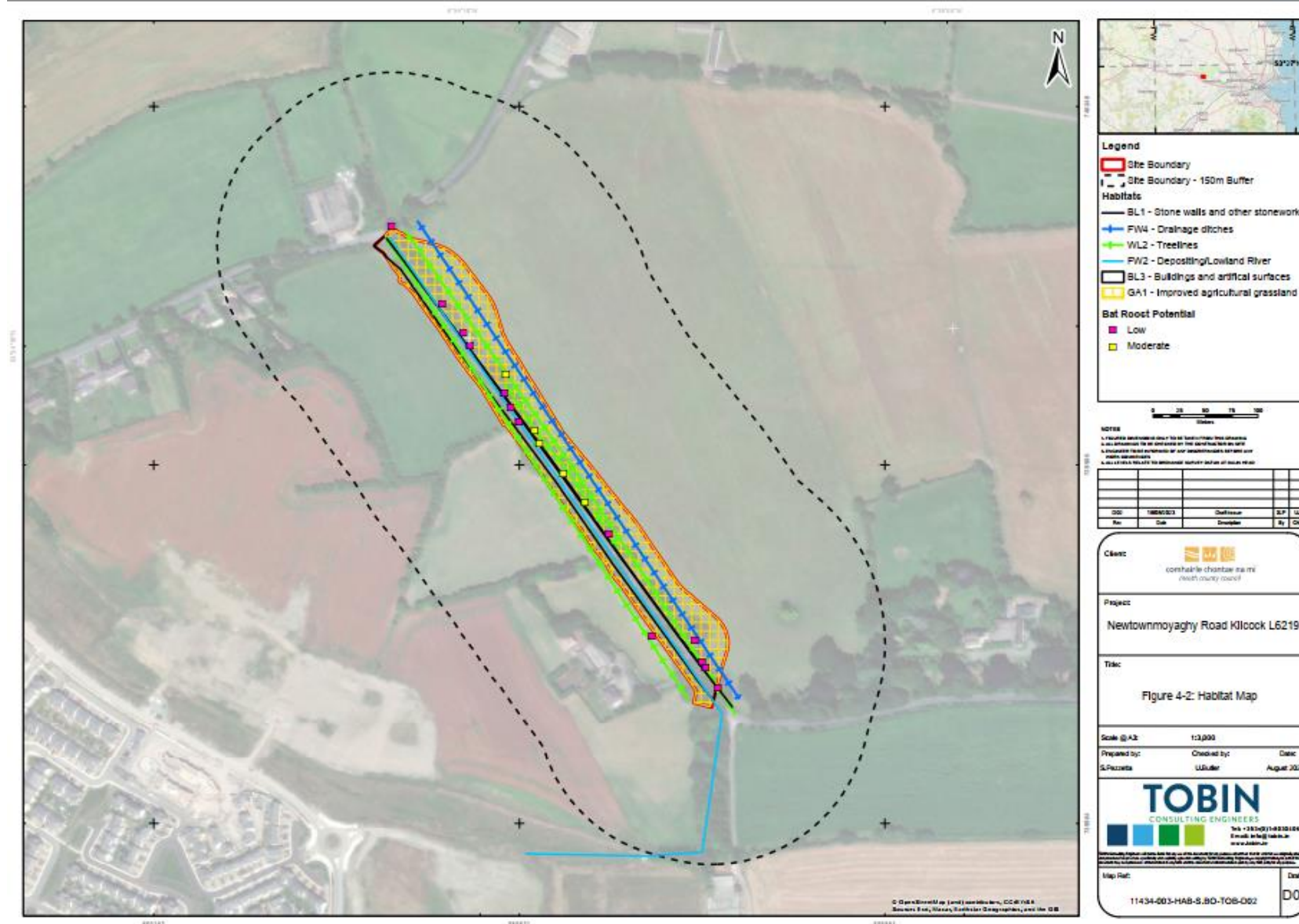
Improved agricultural grassland was recorded on the outer boundaries of the proposed development site, being used predominantly for sheep rearing. The dominant species present was perennial ryegrass (*Lolium perenne*). Dandelion spp. (*Taraxacum vulgaria*) was recorded frequently, while common nettle (*Urtica dioica*), dock (*Rumex hydrolapathum*) and spear thistle (*Cirsium vulgare*) were found occasionally.

This habitat was evaluated as being of local importance (lower value).



Figure 4-4: Drainage Ditch (Left) and Stone Walls and Other Stone Work (Right).

Figure 4-5 Habitats Map of the Proposed Development



4.3.3.2 Protected and Invasive Flora

4.3.3.2.1 Desktop Review

A search of the NBDC database⁵ of the 2km Irish grid squares N83Z and N84V, encompassing the proposed development was conducted. No protected flora was recorded within these grid squares. Additionally, no species listed under the Third Schedule of the Natural Habitats Regulations (2011) featured on the species list within either grid square.

4.3.3.2.2 Field Surveys

During the field survey, no protected flora or Third Schedule species were found within the proposed development site.

4.3.3.3 Protected Fauna

4.3.3.3.1 Desktop Review

A review of the NBDC database⁵ for the presence of protected fauna in the 2km grid squares N83X and N84V, in the past 10 years was also conducted. The results of which are presented in Table 4-2 & 4-3.

Table 4-2: Previous Records of Protected Fauna Within the 2km Grid Square N83Z in the Past 10 years.

Grid Square	Scientific Name	Common Name	Date of Last Record	Protected Status	Source NBDC
N83Z	Birds				
	<i>Sturnus vulgaris</i>	Common starling	22/05/2015	Protected Species: Wildlife Acts Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List	Birds of Ireland
	<i>Apus apus</i>	Common Swift	03/04/2023	Protected Species: Wildlife Acts Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List	Swifts of Ireland
	<i>Egretta garzetta</i>	Little Egret	23/02/2020	Protected Species: Wildlife Acts Protected Species: EU Birds Directive Protected Species: EU Birds Directive >> Annex I Bird Species	Birds of Ireland
	Volant Mammals				
	<i>Myotis daubentonii</i>	Daubenton's Bat	28/04/2014	Protected Species: EU Habitats Directive Protected Species: EU Habitats Directive >> Annex IV Protected Species: Wildlife Acts	National Bat Database of Ireland
	<i>Nyctalus leisleri</i>	Lesser Noctule	28/07/2014	Protected Species: EU Habitats Directive Protected Species: EU Habitats Directive >> Annex IV Protected Species: Wildlife Acts	National Bat Database of Ireland
	<i>Pipistrellus pipistrellus sensu lato</i>	Pipistrelle	28/07/2014	Protected Species: EU Habitats Directive Protected Species: EU Habitats Directive >> Annex IV Protected Species: Wildlife Acts	National Bat Database of Ireland
	<i>Pipistrellus pygmaeus</i>	Soprano Pipistrelle	28/07/2014	Protected Species: EU Habitats Directive Protected Species: EU Habitats Directive >> Annex IV Protected Species: Wildlife Acts	National Bat Database of Ireland
	Non-volant Mammals				
	<i>Erinaceus europaeus</i>	West European Hedgehog	20/07/2021	Protected Species: Wildlife Acts	Hedgehogs of Ireland
	<i>Cervus elaphus</i>	Red Deer	06/10/2015	Protected Species: Wildlife Acts	Atlas of Mammals in Ireland 2010-2015
	<i>Martes martes</i>	Pine Marten	14/09/2021	Protected Species: EU Habitats Directive Protected Species: EU Habitats Directive >> Annex V Protected Species: Wildlife Acts	Mammals of Ireland 2016-2025

	<i>Lutra lutra</i>	European Otter	23/12/2015	Protected Species: EU Habitats Directive Protected Species: EU Habitats Directive >> Annex II Protected Species: EU Habitats Directive >> Annex IV Protected Species: Wildlife Acts	Atlas of Mammals in Ireland 2010-2015
	<i>Meles meles</i>	Eurasian Badger	24/01/2012	Protected Species: Wildlife Acts	Atlas of Mammals in Ireland 2010-2015

Table 4-3 Previous Records of Protected Fauna Within the 2km Grid Square N84V in the Past 10 years.

Grid Square	Scientific Name	Common Name		Protected Status	Source NBDC
N84V	Non-volant Mammals				
	<i>Meles meles</i>	Eurasian Badger	31/12/2014	Protected Species: Wildlife Acts	Badger Setts of Ireland Database
	<i>Martes martes</i>	Pine marten	29/07/2021	Protected Species: EU Habitats Directive Protected Species: EU Habitats Directive >> Annex V Protected Species: Wildlife Acts	Mammals of Ireland 2016-2025
	<i>Erinaceus europaeus</i>	West European Hedgehog	10/07/2021	Hedgehogs of Ireland	Protected Species: Wildlife Acts

4.3.3.3.1.1 Protected Fish Species

Between 2008 and 2018 a number of fish species were recorded during the WFD fish ecological status monitoring programme (IFI 2021) approx. 5km downstream of the works on the River Rye (EPA code: 09R01). Sensitive species included Brown Trout (*Salmo trutta*), Inland Fisheries (Consolidation) Acts 1959 to 2017, European Eel (*Anguilla anguilla*), red listed as critically endangered (King et al. 2011) and Lamprey (*Lampetra* sp.) protected under the EU Habitats Directive II and V.

There is potential for the above protected species to occur within the study area and was therefore further investigated within the field surveys (refer to Sections 4.2.4 to 4.2.6 and 4.3.3.2.2).

4.3.3.3.1.2 White-clawed Crayfish

White-clawed crayfish (*Austropotamobius pallipes*) is protected under the EU Habitats Directive Annex II, V and the Wildlife Acts. White-clawed crayfish was recorded ca. 4.6km downstream from the proposed works site (in the Rye Water_020 River, adjacent to Maynooth Community College) (NBDC 2023).

There is potential for white-clawed crayfish to occur within the study area and was therefore further investigated within the field surveys (refer to Sections 4.2.4 to 4.2.6 and 4.3.3.2.2).

4.3.3.3.1.3 Freshwater Pearl Mussel

Freshwater pearl mussel (*Margaritifera margaritifera*) are sensitive to water quality. They preferer clean, nutrient poor, low-calcium rivers. This species is unlikely to be present in the Newtownmoyaghy Stream due to the high calcium level and pollution due to littering and sheep access. This Stream has no hydrological connectivity to watercourses where the freshwater pearl mussel has been recorded and lies within a separate WFD Sub catchment (Ryewater_SC_010) to the nearest Margaritifera sensitive area (Barrow_89).

No impacts are expected to occur on this species as a consequence of the proposed development.

4.3.3.3.2 Field Survey

Results of the field survey carried out on the 25th of April and the 30th of May are outlined in section 4.2.4 to 4.2.6 and hereunder.

4.3.3.3.2.1 Birds

All wild birds, their nests and eggs are protected under the Wildlife Acts.

No Annex I bird species were recorded in the vicinity of the proposed development. However, several other bird species were recorded using the treeline during the field survey. These species included: goldcrest (*Regulus regulus*) wood pigeon (*Columba palumbus*), blackbird (*Turdus infuscatus*), chaffinch (*Fringilla coelebs*), starling (*Sturnis vulgaris*) and wren (*Troglodytes troglodytes fridariensis*). The goldcrest and starling are amber-listed species on the Birds of

Conservation Concern in Ireland (BoCCI) list. All other species are common species regularly found in agricultural landscapes.

Treelines and hedgerows within the proposed development site were assessed for their suitability as breeding bird habitat, it was deemed that these habitats are likely to provide nesting habitat during the breeding season.

Overall, based on the extent of the site and the presence of habitats to support avifauna, the bird populations present are evaluated as being of local importance (higher value).

4.3.3.3.2.2 Bats

All bat species and their roost sites are protected under the Wildlife Acts. There is additional protection for lesser horseshoe bat (*Rhinolophus ferrumequinum*), which is listed as an Annex II species under the EU Habitats Directive.

Preliminary Bat Roost Assessment

No trees within the proposed development site were assessed as having 'high' bat roost potential. Five trees along the mature treeline were found to have 'moderate' bat roost potential, due to the presence of two or more bat roost features, while 13 trees were assessed as having 'low' bat roost potential due to the presence of one bat roost feature. 27 trees were evaluated as having 'negligible' bat roost potential due to the absence of any bat roost features. Under licence (No. 103/2023), an endoscope was used to look inside any knots, cracks or crevices in trees, where possible. No bats were found to be roosting in any of the identified features.

Particular attention was paid to the five trees that will be removed as part of the proposed development. The location of each tree within the proposed development site along with its corresponding identification number is depicted in Figure 4-6. A description of each tree is presented hereunder:

- 1- The pedunculate oak, located at the northern boundary of the proposed development was found to have 'low' bat roost potential due to the presence of a crevice between the tree and its peeling bark. The endoscope could not be used on this crevice due to the height that this bat roost feature is located at on the tree. As the feature could not be further investigated, it is assumed to be a suitable roost feature.
- 2- The beech tree adjacent to the pedunculate oak at the northern boundary of the proposed development was assessed as having 'negligible' bat roost potential, due to the absence of any bat roost features.
- 3- The immature sycamore located toward the southern eastern boundary of the proposed development was assessed as having 'negligible' bat roost potential, due to the absence of a bat roost features.
- 4- The mature beech tree located at the south western boundary of the proposed development was assessed as having 'low' bat roost potential due to the presence of a tree knot. The endoscope could not be used on this crevice due to the height that this bat roost feature is located at on the tree. As the feature could not be further investigated, it is assumed to be a suitable roost feature.
- 5- The immature sycamore tree adjacent to the mature beech tree is also assessed as having 'negligible' bat roost potential, due to the absence of any bat roost features.

Trees to be removed as part of the proposed works and their bat roost potential are indicated in Figure 4-6.



Figure 4-5: Oak Tree With 'Low' Bat Roost Potential (Left) and Beech Tree With 'Negligible' Bat Roost Potential (Right).

Figure 4-6: Results of Tree Survey



Transect Bat Survey

During the transect walkover the most frequently recorded bat species was the common pipistrelle (*Pipistrellus pipistrellus*) which accounted for 21 of the 22 records, while the soprano pipistrelle (*Pipistrellus pygmaeus*) was recorded once. During the transect survey, no Daubenton's bats (*Myotis daubentonii*) were recorded along the Newtownmoyaghy Stream. A summary of the species and activity recorded during the survey is outlined below in Table 4-4

Table 4-4: Bat Transect Survey Results

Time	Bat Transect Reference Number	Species	Activity
22:17	1	Common pipistrelle	Foraging overhead along road
22:20	1	Common pipistrelle	Foraging overhead along road
22:21	1	Common pipistrelle	Foraging overhead along road
22:23	2	Common pipistrelle	Foraging overhead along road
22:31	3	Common pipistrelle	Commuting along road into treeline
22:32	3	Common pipistrelle	Commuting along road into treeline
22:33	3	Common pipistrelle	Commuting along road into treeline
22:33	3	Soprano pipistrelle	Hunting and foraging
22:40	4	Common pipistrelle	Two common pipistrelle commuting
22:44	5	Common pipistrelle	Foraging
22:51	5	Common pipistrelle	Commuting
22:56	6	Common pipistrelle	Hunting
22:57	7	Common pipistrelle	Commuting
23:00	8	Common pipistrelle	Foraging
23:09	9	Common pipistrelle	Foraging
23:14	10	Common pipistrelle	Foraging
23:18	11	Common pipistrelle	Foraging
23:21	12	Common pipistrelle	Commuting
23:26	13	Common pipistrelle	Foraging
23:30	14	Common pipistrelle	Commuting
23:40	15	Common pipistrelle	Foraging

Figure 4-7: Results of Bat Transect Survey



Static Bat Detector

A total of seven bat species were identified during the data analysis of the bat detector recordings, using the Kaleidoscope bat analysis software. The total number of bat passes for each species is presented in Table 4-5 below.

Table 4-5 Bat Passes Per Species Over a Duration of 8 Nights

Detector	Common Pipistrelle	Soprano Pipistrelle	Nathusius Pipistrelle	Leisler's Bat	Daubenton's Bat	Myotis spp.	Brown Long Eared Bat	Unidentified	Total	Hours Recorded	Bat Passes p/h
1	2756	805	3	158	24	9	14	23	3792	80	47.4
2	1149	471	NA	458	13	11	0	3	2105	80	26.3
Total	3905	1276	3	616	37	20	14	26	5897	160	73.7
Bat Passes P/H	24.4	17.3	0.0	8.3	0.2	0.1	0.0	0.1	50.6		

In summary, a total of seven bat species were recorded during the bat surveys. No bat roosts were recorded during the surveys, however commuting and foraging activity was recorded along the mature treeline. It's likely the treeline provides a commuting route for bat species.

The local bat population was assessed as being of Local Importance (higher value).

4.3.3.3.2.3 Badger

No evidence of badger, include badger setts, were recorded within the proposed development site or within the 150m of the site. However, suitable badger foraging habitat exists within the agricultural grasslands and hedgerows surrounding the proposed development site. Therefore, there is potential for badgers to use the area surrounding the proposed development site at least on occasion.

Local badger populations are assessed as being of Local Importance (higher value).

4.3.3.3.2.4 Otter

The Newtownmoyaghy Stream was searched for evidence of otter activity. No evidence of otter activity, including otter holts were recorded. The stream was considered suboptimal (the

water depth being 10cm), however, there is a possibility that the stream could be used as a commuting route to the main river channel of the Rye Water River (WFD Code: IE_EA_09R010400). Local otter populations are assessed as being of Local Importance.

4.3.3.3.2.5 Other Protected Mammals (Non-Volant)

No evidence of any other protected mammal species was recorded during the field surveys. There is potential, however, that the proposed development site may support other protected mammal species such as hedgehog (*Erinaceus europaeus*), pine marten (*Martes martes*) and red deer (*Cervus elaphus*). The NBDC dataset⁵ indicates that these species have previously been recorded within the study area in the past 10 years.

Other protected mammal populations are assessed as being of Local Importance (higher value).

4.3.3.3.2.6 Aquatic Species

Details of the field study and results are noted in Section 4.2.4 to 4.2.6. No aquatic species were noted in the NBDC⁵ dataset for the two 2km grid squares encompassing the proposed development. However, a number of sensitive and protected fish species and crayfish were recorded downstream from the proposed development, (which was noted upon review of IFI dataset records during the desktop survey) and could therefore be at risk resulting from the proposed development.

White-Clawed Crayfish

Although some gravels, cobbles and boulders were observed to be present in the Newtownmoyaghy Stream, the cobbles were heavily calcified and fused together at points along the watercourse, reducing the amount of suitable spawning habitat for crayfish. White-clawed crayfish also require waters with no potential for biocides such as sheep dip, and an absence of local effluents that are likely to lead to a high BOD (biochemical oxygen demand), for example farm effluent. During the field survey, sheep access to the watercourse from the adjacent field was noted. Furthermore, agricultural run-off is likely to occur due to the connectivity of the adjacent agricultural fields to the stream. However, white-clawed crayfish are likely to occur downstream from the proposed development site.

White-clawed crayfish populations are assessed as being of Local Importance (higher value).

Brown Trout

Salmonids (*Salmonidae*) require watercourses with a mixture of gravel, cobbles and boulders (particularly for spawning), where the water is clean, unpolluted and well oxygenated. Adult salmonids favour rivers with deep pools of cool water with areas of over-hanging vegetation to supply shading for the supply of insects for food.

Although some gravels, cobbles, and boulders were observed to be present in the Newtownmoyaghy Stream, the cobbles were heavily calcified and fused together at points along the watercourse, reducing the amount of suitable spawning areas. However, brown trout are likely to occur downstream from the proposed development site. The watercourse was shallow, around 10cm in depth in places, with few pools, reducing low flow habitat suitability for brown trout fry and smolts.

The brown trout populations were assessed as being of Local Importance (higher value).

Lamprey sp.

Lamprey sp. (brook- and river lamprey) require watercourses with a mixture of gravel, cobbles and boulders (particularly for lamprey spawning), where the water is clean, unpolluted and well oxygenated, with areas of low flow where sediment can settle to create habitat for juvenile lamprey (*ammocoetes*). Juvenile lamprey need areas of soft silt in which to borrow and filter feed on microscopic organisms until they reach adulthood.

Although some gravels, were recorded in the Newtownmoyaghy Stream, they were heavily calcified and fused together at points along the watercourse, reducing the amount of suitable spawning areas. Nevertheless, is it possible for lamprey to be present within sections of the Newtownmoyaghy Stream, or downstream.

The lamprey populations were assessed to be of Local importance (higher value).

European Eel

European eel require watercourses with a mixture of gravel, cobbles and boulders (particularly for lamprey spawning), where the water is clean, unpolluted and well oxygenated. European eel favour rivers with deep pools of cool water with areas of overhanging vegetation to supply shading, cover a supply of insects. European eel especially, need dense vegetation and refugia to hide under during the day. Juvenile eel need areas of soft silt in which to borrow and filter feed on microscopic organisms until they reach adulthood.

Although some gravels, cobbles, and boulders were observed to be present in the Newtownmoyaghy Stream, the cobbles were heavily calcified and fused together at points along the watercourse, reducing the amount of suitable spawning areas.

The watercourse was shallow, around 10cm depth in places, with no pools reducing low flow habitat suitability for brown trout fry and smolts.

Despite the watercourse being classed as being of good quality for the Water Framework Directive (WFD) 2016-2021 period, the water seemed polluted with a film of residue on the surface in sections during the field survey.

Nevertheless, is it possible for eel to be present within section of the Newtownmoyaghy Stream, or downstream

European eel populations were assessed to be of Local importance (higher value).

4.4 POTENTIAL IMPACTS

4.4.1 *Impact Assessment Criteria*

The assessment of potential impacts on flora and fauna is based on standard good practice including Environmental Protection Agency (EPA, 2022), CIEEM (2018) and National Roads Authority (NRA) series of guidelines.

4.4.2 *Potential Construction Phase Impacts*

Potential construction phase impacts associated with the proposed development are discussed hereunder.

4.4.2.1 Loss of Habitat

The upgrade of the Newtownmoyaghy Road and diversion of the Newtownmoyaghy Stream will result in ca. 2.5 hectares (ha) of permanent habitat loss as a result of the widening of the Newtownmoyaghy Road and diversion of the Newtownmoyaghy Stream. This habitat predominantly comprises agricultural grassland used for sheep grazing, and arable crop fields which were both assessed as being of Local Importance (lower value).

In addition to this, it is proposed to remove five trees in order to facilitate the upgrade of the Newtownmoyaghy Road. Trees to be removed as a result of the proposed development are depicted in Site Clearance Drawing, Ref: 11434-2006. The pedunculate oak tree, located at the northern boundary and mature beech tree located at the southwestern boundary of the proposed development were assessed as having 'low' bat roost potential due to the presence of a potential roost feature. The removal of these trees could result in the loss of a roost and mortality of a bats if the roost feature is in use at the time of felling.

The removal of the tree adjacent to the pedunculate oak tree will also reduce the length of this wildlife corridor for local bat populations and cause habitat fragmentation. Gaps <5m can interrupt the flight routes of commuting bats (Altringham and Kerth, 2016).

4.4.2.2 Noise and Disturbance

The proposed construction works will result in a temporary increase in noise levels due to the presence of construction vehicles and machinery. The construction works will also result in an increase in personnel and traffic movement to and from the proposed development site. No bat roosts or resting sites of any other protected species was recorded within the Zol of the proposed development site. There will therefore be no disturbance of breeding or resting sites.

Light levels as low as typical full moon levels (0.1 LUX) can alter the flight activity of bats (Voigt et al, 2018). Any level of artificial light above that of moonlight can mask the natural rhythms of lunar sky brightness and disrupt patterns of foraging and mating. However, there are no plans for permanent lighting during the construction phase as the works will be carried out during the summer months, between the hours of 08.00 and 20.00. If lighting is required, it will be localised (at culvert crossings).

4.4.2.3 Introduction or Spread of Invasive Non-Native Species

No Third Schedule invasive plant species were recorded within the proposed development site during the habitat surveys. There is potential, however, that the movement of construction

vehicles and material to and from the site may result in the introduction of invasive species if not appropriately managed. The introduction of invasive plant species has the potential to negatively impact habitats by shading and competitively excluding native plant species, providing less favourable habitats for native fauna (TII, 2020).

The instream works as part of the proposed development could result in the spread of the crayfish plague. Should the equipment and machinery used to carry out instream works be contaminated with crayfish plague, this could result in the introduction of the pathogen to the Newtownmoyaghy Stream and subsequently spread to crayfish waters downstream.

4.4.2.4 Run-off of Sediment and/or Construction Pollution

Site clearance, excavation activities and the stockpiling of material have the potential to result in sediment laden runoff, if not appropriately managed. In addition, the proposed instream works within the Newtownmoyaghy Stream for the channel diversion (as described in Section 2.2), could result in sediment and/or construction pollution discharging downstream, which could pose a significant risk to water quality both in the Newtownmoyaghy Stream and all watercourses downstream.

Increased silt loading in watercourses can stunt aquatic plant growth, limit dissolved oxygen capacity and overall reduce the ecological quality of watercourses, with the most critical period associated with low flow conditions. Surface water runoff could also be contaminated with leaks and spills of fuel, oil or other construction material from construction vehicles/machinery if not appropriately managed. This could result in the degradation of water quality and impacts to aquatic fauna and flora. The abovementioned impacts would directly affect the habitat suitability for brown trout, lamprey sp., European eel and white-clawed crayfish downstream and potentially cause mortalities due to the lack of available dissolved oxygen. An increase in silt can also cause harm to the gills of lamprey and brown trout decreasing their ability to uptake oxygen from the water.

4.4.2.5 Groundwater Impacts

The groundwater vulnerability within the footprint of the proposed development site is classified as “Low” groundwater vulnerability.

Borehole logs did not encounter bedrock at any location. The new channel will be excavated to a maximum depth of 2.8m with a 1:3 ration slope. See Geometric Drawing (Ref:11434 2003-2004) in Appendix B for the new channel excavation depths.

There are no karst features within the proposed development site or the immediate surrounds. The site is underlain by the Dublin Groundwater Body (IE_EA_G_008) This groundwater body was classified as “Good” status in 2021 and the groundwater waterbodies risk score is considered to be “Under Review”. Groundwater and surface water interactions of the Dublin groundwater body are described as poorly productive bedrock. In general, permeability in these rock units is likely to be low (1-10m²/d) (Creighton *et al.*, 1979). Considering the nature of the proposed development, groundwater impacts will be minimal and will not impact and groundwater dependent habitats or species.

4.4.2.6 Dust

The temporary generation of dust in the locality of the works area is likely to arise due to general Construction Phase activities (i.e., movement of construction vehicles and machinery,

road upgrade works, excavation activities of the new channel). Plant communities may be affected by dust deposition (effects on photosynthesis, respiration, transpiration) which could in turn, alter community structure. The Institute of Air Quality Management provide guidelines which prescribes potential dust emission risk classes to ecological receptors (Holman *et al.*, 2014). The guidelines specify that receptor sensitivity is 'High' up to 20m from the source and reduces to 'Medium' at 50m. The spatial limit of dust is therefore considered as 50m from the proposed development site. No protected habitats or protected plants species occur within 50m of the construction works area. All habitats within 50m were assessed as being local importance.

4.4.3 Potential Construction Phase Impacts

4.4.3.1 Drainage

A standard filter drain containing a 400mm diameter slotted pipe will be installed along the new edge of the Newtownmoyaghy Road. The water flowing to this drain will be filtered back to the Newtownmoyaghy Stream from an outlet head wall. This filter will restrict hydrocarbons from entering the Newtownmoyaghy Stream via surface water run-off. In the event that any road run off which is not filtered through filter drains this will be directed through a petrol interceptor before discharging into the Newtownmoyaghy Stream.

4.4.3.2 Lighting

There is no proposal to include any permanent artificial lighting on the site and as such there is no potential for disturbance to nocturnal fauna during the operational phase of the proposed development.

4.4.4 Designated Sites

The proposed development site is not located within any designated conservation sites (SAC's, SPA's, NHA's or pNHA's). The nearest designated site is the Royal Canal pNHA (002103), located ca. 2km south of the proposed development. The next nearest sites to the proposed development are the Rye Water Valley/Carlton SAC and pNHA (001398), which are located ca. 4.6km downstream. Eleven other designated sites were identified, either within a 15km buffer or with hydrological connectivity to the proposed development site as discussed in Section 4.3.3.1.1

An Appropriate Assessment Screening report and Natura Impact Statement (NIS) were completed by TOBIN for the proposed development to inform the Appropriate Assessment process, as required under Article 6 of the EU Habitats Directive and accompanies this report within the Planning Application. The screening assessment concluded, in light of best available scientific data, that there is potential for likely significant effects on the qualifying interests of the South Dublin Bay SAC, South Dublin Bay and River Tolka Estuary SPA, North Dublin Bay SAC and North Bull Island SPA associated with the potential reduction in water quality from the release of suspended solids or pollutants. An NIS was therefore undertaken and concluded that following the application of the detailed mitigation measures, potential adverse effects will be avoided or reduced. Consequently, it is determined, beyond reasonable doubt, that there will be no risk for adverse effects on the qualifying interests and/or on overall site integrity, or in the attainment of their specific conservation objectives for the above mentioned four European Sites. Mitigation measures specific to the protection of water quality of these four European sites have been outlined within the NIS. The listed pNHA's connected via the

hydrological pathway will also be protected via the implementation of these measures as they occur within the same boundaries as the European sites.

4.5 MITIGATION MEASURES

Mitigation measures which will be employed to ensure no significant adverse effects on biodiversity occur as a result of the proposed development, are described hereunder.

4.5.1 Construction Phase Mitigation Measures

4.5.1.1 Ecological Clerk of Works

A suitably qualified Ecological Clerk of Works (ECoW) will be appointed by the Contractor. The ECoW will be available for the duration of the Construction Phase and will ensure that all mitigation measures outlined within this report are implemented during the proposed construction works. The ECoW will monitor the sediment / turbidity levels (e.g. by using a turbidity tube) downstream of the works. The ECoW will take baseline samples before works commence, take daily samples during instream works, and after works have finalised as appropriate and in liaison with the Contractor.

4.5.1.2 Construction Environmental Management Plan

A Construction Environmental Management Plan (CEMP) will be prepared and will be implemented during the Construction Phase of the development. All mitigation measures outlined within this chapter will be incorporated within the CEMP.

4.5.1.3 Management of Habitat

No clearance of vegetation outside the proposed development site will be undertaken. The felling of the five trees will be carried out with regard to the NRA (2006c) guidelines. In addition, the root system of all remaining trees will be protected using Root Protection Areas.

All disturbed ground will be fully reinstated following the completion of the works.

At least five trees will be replanted within the proposed development site, to compensate for the removal of five trees as a result of the works. All trees must be planted at least 5m from the new watercourse channel, keeping in line with IFI guidelines (IFI, 2016). Planting position will depend on the species, some trees such as oak will require more space for growing than hawthorn, for example. Suggested species to plant within the proposed development are outlined in Table 4-6 below, along with the area required for the growth of each species. Species have been chosen, keeping in line with those that are present in the local area of the proposed development. All trees purchased must be native and as locally sources as possible.

Table 4-6: Suggested Planting of Trees Within the Proposed Development

Species	Area Required for Tree Canopy	Biodiversity Benefits
Pedunculate oak (<i>Quercus robur</i>)	15-25m in diameter ⁶	Oak trees provide food, shelter, cover and nesting sites for a number of birds, particularly when mature. These trees can grow to be 20-40m tall. Mature oak trees with knots, crevices and peeling bark can provide some shelter for bats.
Hawthorn	4-8m wide in diameter	The flowers provide nectar and pollen for pollinators, the trees provide red berries for birds in autumn, the tree also provides shelter for wildlife.
Hazel	3-5m wide in diameter ⁷	The catkins produced by hazel provide an early source of pollen for pollinators; hazel produces nuts for wildlife in autumn, these trees also provide habitat for wildlife.

Two oak trees should be planted, to replace the mature oak tree and large non-native beech tree being removed as a result of the proposed development.

4.5.1.4 Protected Fauna

Bats

Prior to the commencement of construction, two of the five trees identified to be removed to accommodate the proposed works, are deemed to have 'low' bat roost potential. These trees will be soft felled and brought to the ground in a supported fashion, where it will be left in-situ for 24 hours prior to removal or cutting into smaller sections. This is to enable any bats that may be using the tree, to escape. Furthermore, felling will not be carried out in June, July or early August, in order to ensure that breeding populations of bats are protected. If this is not possible, trees must be felled under supervision of an ECoW, who must inspect the trees prior to felling. They must then be left for 24 hours to allow potentially present bats to escape. The contractor may then process the felled trees as required.

The *Bat Mitigation Guidelines for Ireland* (Marnell et al, 2022) document states that 'that where roosts of 'low' conservation significance are to be lost to development, bat boxes may provide an appropriate form of mitigation'. It is proposed that woodcrete (cement and sawdust) bat boxes (such as those manufactured by *Schwegler*) are installed on trees adjacent to pedunculate oak and beech trees being removed as part of the proposed development. These particular bat boxes appear to be as successful as wooden boxes in attracting bats and are also more durable than those made of wood. Marnell et al (2002) also advises that a mixture of bat box types such as three per tree should cater for seasonal and species requirements. Therefore, three bat boxes should be installed for the two trees with 'low' bat roost potential that are being removed

⁶ [Common Oak \(*Quercus Robur*\) Tree Profile \(tcv.org.uk\)](https://www.tcv.org.uk/common-oak-quercus-robur-tree-profile)

⁷ [Hazel \(*Corylus avellana*\) Tree Profile \(tcv.org.uk\)](https://www.tcv.org.uk/hazel-corylus-avellana-tree-profile)

as a result of the proposed development. Boxes should be exposed to the sun for part of the day (usually south, south-east or south-west)⁸.

The new channel of the river will be constructed before the closure of the old channel, and the diversion of the stream will be carried out in a gradual fashion, over the course of two days. Therefore, there will be no permanent loss of foraging habitat for Daubenton's bat, should this species be using the Newtownmoyaghy Stream for this purpose.

Birds

Trees and other vegetation to be removed to accommodate the proposed development works will not be cleared between 1st of March and 31st of August, to avoid impacts on nesting birds which are protected under the Irish Wildlife Acts. In the unforeseen circumstances where the construction programme does not allow this time restriction to be observed, then the vegetation will be inspected by a qualified ecologist for the presence of breeding birds prior to commencement of the vegetation clearance. Where any nests are found, an appointed ecologist will provide recommendations as to whether a licence is required for vegetation removal and will detail the process for obtaining such derogation from the NPWS.

4.5.1.5 Management of Invasive Species Pathogens

In order to comply with Regulations 49 and 50 of the European Communities (Birds and Natural Habitat) Regulations (2011), the appointed Contractor will ensure biosecurity measures are implemented throughout the construction phase to ensure the introduction and translocation of invasive species and pathogens is prevented.

The following biosecurity measures are prescribed to control the translocation or spread of IAPS and / or pathogens:

- Biosecurity measures will comply with the IFI Biosecurity Protocols including: '*IFI Biosecurity Protocol for Field Survey Work*' (IFI, 2010);
- All plant and machinery used during the works should be thoroughly cleaned and washed before delivery to the site to prevent the spread of hazardous invasive species and pathogens.;
- No construction works will occur outside the proposed development site boundary; and
- No invasive plant species were recorded within the proposed development site. However, in the event that proposed construction works are delayed more than 12 months, a pre-construction invasive species survey will be undertaken. In the event that an invasive plant species, listed in Part 1 of the Third Schedule of S.I No. 477/2011 – European Communities (Birds and Natural Habitats) Regulations 2011 is recorded, a site-specific Invasive Species Management Plan (ISMP) will be prepared.

4.5.1.6 Management of Material Disposal

Topsoil from excavation of the new channel will be stockpiled on site for reuse. The remaining excavated material deemed not suitable for reuse, will be removed off-site and disposed of at

⁸ Bat Conservation Trust (2024). Bat Boxes. Available at: [Putting up your box - Bat Boxes - Bat Conservation Trust \(bats.org.uk\)](https://www.bats.org.uk/putting-up-your-box/) Accessed: July, 2024).

an appropriate permitted or licensed facility based on Waste Management Acts 1996 as amended.

4.5.1.7 Management of Sediment

The following measures will be carried out by the appointed Contractor to minimise and avoid the effects of sedimentation during the proposed Construction Phase.

- Works within and adjacent to watercourses will be suspended during periods of heavy rainfall (i.e. greater than 10mm/hour or greater than 25mm in a 24-hour period);
- Prior to any excavation works commencing, silt fences will be erected at the point where the new channel will join back with the Newtownmoyaghy Stream (see Drawing Ref: 11434-2001), to ensure sediment is prevented from travelling outside of the planning application boundary. Silt fences will also be installed between the interface of stockpiled material and the newly excavated channel to prevent silt from travelling from the stockpile into the new channel. A permeable fabric (Hy-Tex Terraston Premium silt fence, or similar) will be used instead of mesh. The silt fences will be positioned to allow an appropriate working area but will not occur within areas prone to flood. The silt fencing will be erected as per the manufacturer's guidelines, under the ECoW supervision and will be maintained until all ground disturbance has ceased and vegetation re-established. Once installed, the silt fence will be inspected daily during construction and more frequently during heavy rainfall events. The ECoW will also supervise the removal of the silt fences following the completion of the works.
- Instream works will be carried out during low flow, outside of the 1 in 10 -year flood event extents.
- Sedi-mats will be placed within the newly excavated channel, prior to the diversion of the stream. Sedi-mats will also be placed immediately downstream of the proposed development, to further prevent any sediment from travelling to any hydrologically connected watercourses, via the Newtownmoyaghy Stream. Sedi-mats will be removed after construction works have been completed.
- Where deemed necessary, excavations will be covered with tarp or similar material, during high rainfall to avoid the creation of surface water with high concentrations of suspended solids that would require dewatering.
- Prior to the diversion, the newly excavated channel will act as a temporary silt pond. Once the silt has been cleared from the channel and new gravel has been installed, this will also reduce the likelihood of suspended solids being released in the new channel, once the diversion is complete.
- Excavated materials temporarily stockpiled will be stored at least 10m away from watercourses and drainage paths during the divergence works to minimise generating sediment laden runoff during the works.

4.5.1.8 Management of Construction Pollution

The following measures will be carried out by the appointed Contractor to minimise and avoid the effects of water pollution during the Construction Phase.

- An emergency plan to deal with accidental spillages will be drawn up, which all site personnel must adhere to and receive training in.
- Spill-kits and hydrocarbon absorbent packs will be stored in the cabin of all construction vehicles. All machine operators and site staff will be fully trained in the use of this equipment.

- All machinery will be regularly maintained and checked for leaks. Services will not be undertaken within 50m of a surface water conduit. Servicing must be undertaken on level, hard surfaced designated areas where possible.
- Re-fuelling of construction equipment and the addition of hydraulic oil or lubricants to vehicles / equipment will take place in designated hard surface, bunded areas within this compound, where possible, and not on-site. If it is not possible to bring machinery to the refuelling point, fuel will be delivered in a double-skinned mobile fuel bowser. A drip tray will be used beneath the fill point during refuelling operations in order to contain any spillages that may occur.
- Refuelling of plant and vehicles will be undertaken on impermeable and bunded areas, not within 10m of the Newtownmoyaghy Stream.
- All waste will be removed from the site and disposed of by an approved waste contractor in accordance with prevailing waste management regulations.
- On completion of the works, all apparatus, plant, tools, offices, sheds, surplus materials, rubbish and temporary erections or works of any kind will be removed from the site.
- Water runoff from constructed roads and hardstanding areas will be intercepted by the silt curtains, to prevent increased sediment loading to the channel.
- All works must comply with the guidance set out in the guidance document entitled: 'Control of Water Pollution from Construction Sites. Guidance for Consultants and Contractors (C532)' (CIRIA, 2001).

4.5.1.9 Protection of Aquatic Life

The following mitigation measures are prescribed to ensure the prevention of water quality impacts on aquatic life due to the runoff of sediment during the construction works. Chapters Five and Six of this report detail mitigation measures for the control of sediment and pollution run-off.

- All works will adhere to IFI 'Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters' (IFI, 2016).
- Instream works will only occur outside of the Annual Close Season during the permitted summer period of July-September inclusive, outside the 1 in 10-year flood event extents.
- The diversion of the flow from the old channel to the new channel will be managed in a gradual fashion, over the course of two days. This will ensure the continued flow of the stream.
- During the bunding of the existing Newtownmoyaghy Stream via sandbagging (to facilitate transfer over to the new channel), fish salvage where required will be undertaken along the old channel (under licence using electrofishing techniques by certified personnel) and translocation of any fish present will take place to the watercourse directly downstream of the proposed development. This would be under licence issued under Section 14 of the Fisheries (Consolidation) Act, 1959 as substituted by Section 4 of the Fisheries (Amendment) Act, 1962. Records of all translocated fish must be obtained.
- The addition of the imported certified clean gravel to the new channel will not only stabilize the stream bed and reduce levels of suspended solids during the stream diversion, but it will also add habitat value for aquatic life within the new stream. The

addition of pools and boulders to the new stream design will also enhance the stream for aquatic life by creating a richer diversity of resting places.

- Any silt contaminated water from the works area must be treated prior to discharge.
- The channel will be graded, and topsoil placed and reseeded in early June and stabilized as necessary with a geocore/geojut material. This will prevent erosion of the banks and siltation of the watercourse.
- Direct access to the Newtownmoyaghy Stream by vehicles/machinery should not occur, and any crossing of the stream should be done so via the installation of a temporary clear span structure.

The abovementioned mitigation measures for water quality effects will ensure protection of aquatic life.

4.5.1.10 Dust Control

- During periods of extended dry weather, dust suppression may be necessary along haul roads and at work areas. When rainfall levels are <0.2mm per day dust suppression is unlikely to occur naturally (Holman et al., 2014; BRE, 2003). In such cases, water which will be brought to site in tankers, will be pumped into a bowser or water spreader to dampen down haul roads and work areas to prevent the generation of dust where required. Water bowser movements will be carefully monitored to avoid, insofar as reasonably possible, increased runoff.
- Water for dust suppression will not be obtained from the Newtownmoyaghy Stream.
- A designated vehicle wheel wash area will be created adjacent to the main site entrance where all HGVs will be cleaned prior to leaving the site.
- All stockpiled material will be covered with tarp or similar material, and if necessary, during periods of dry weather will be watered to increase stability and suppress dust.

4.5.2 Operational Phase Water Pollution Control

Surface water runoff from the Newtownmoyaghy Road will be filtered through a standard filter drain, which consists of gravel filled trenches with a 400mm pipe at the base, will be installed along the new roadside edge (of the Newtownmoyaghy Road). The water flowing to this drain (i.e. surface water runoff such as rainwater) will be filtered back to the Newtownmoyaghy Stream from an outlet head wall. The standard filtered drain will prevent the risk of traces of hydrocarbons directly entering the watercourse, thus reducing downstream pollution. Roadside maintenance will be carried out by the County Council to ensure there is no blockage of the filter drains and that the drains are effectively functioning for their specified purpose.

4.6 CUMULATIVE ASSESSMENT

A review of projects with permission granted in the vicinity of the proposed development site was undertaken.

The review showed a number of small-scale residential developments, e.g. residential one-off housing developments and housing upgrades. These works are minor in nature and restricted to existing site boundaries with no potential for cumulative effects with the proposed development.

An application for a large scale housing development on the lands adjacent to the eastern boundary of the proposed development site was submitted in 2022. 530 residential units with amenity spaces were proposed. However, both the application and appeal were refused.

Therefore this development will not result in any in-combination effects with the proposed development site.

4.7 RESIDUAL EFFECT

Implementation of the mitigation measures included as part of this PECR chapter will result in residual effects of low magnitude, in the temporary to short-term, and are therefore insignificant overall.

4.8 CONCLUSION

Ecological desk and field studies were undertaken for the proposed Newtownmoyaghy Road development. Key ecological receptors identified with reference to the proposed development, site include the Newtownmoyaghy Stream, connected designated sites, treelines and protected fauna such as bats and birds. Once the mitigation measures outlined in Section 4.5 have been implemented, potential impacts are considered to be of low magnitude in the temporary to short-term and therefore no significant adverse effects are likely to occur on the sensitive ecological features described in this report.

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5.0 SOILS AND GEOLOGY

5.1 INTRODUCTION

This chapter includes an assessment of any potential impact on the geological environment (soils, subsoils and bedrock), as a result of the proposed development at this location.

5.2 METHODOLOGY

The assessment of soils and geology consisted of:

- A desk study of soils, subsoils and bedrock; and
- Interpretation of all data and reporting.

Guidelines used in the preparation of the report included the Environmental Protection Agency (EPA) document 'Guidelines on the Information to be obtained in Environmental Impact Assessment Reports' (2022) and the Institute of Geologists of Ireland (IGI) publication 'Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements' (2013).

Information held by the Geological Survey Ireland (GSI) and EPA was accessed to provide the geological setting of the site. Datasets used to provide the setting of the site included the GSI Spatial Resources Viewer and the EPA/ Teagasc Soil Information System Map Viewers.

Mitigation measures are proposed, where required, to ensure that any proposed activities at the site will not adversely impact upon the geological environment outside of the site boundary.

5.3 RECEIVING ENVIRONMENT

5.3.1 Topography

In terms of topography, the proposed development is low-lying and relatively flat. The majority of the road section lies between elevations of 66.9m and 63.9m above mean sea level (MSL). The lowest elevations are experienced at the southern end of the site, whilst the highest elevations are found at the northern part of the site.

5.3.2 Soils

Reference to the GSI Spatial Resources Viewer and the Teagasc Soil Information System Map Viewer for this area indicates that the dominant soil type are basic minerals which are poorly drained (BminPD) and which fall within the Surface water Gleys and Ground water Gleys soils group. Alluvium is also present in the north of the site and follows the Newtownmoyaghy Stream channel.

Site investigation undertaken on site identified topsoil to a maximum depth of 0.35 meters below ground level (mbgl) and made ground consisting of brown crushed rock fill present between 0.4m to 1.20m bgl.

Figure 5-1: Soils Map



5.3.3 Subsoils

The subsoils underlying the northern section of the site are described by the GSI Quaternary Sediments dataset as Till derived from Limestone (TLs), which corresponds to the underlying bedrock geology and Alluvium (A) which corresponds with Newtownmoyaghy Stream channel.

The subsoil permeability is mapped as low throughout the site.

Based on site investigation undertaken on site there were two subsoil types encountered. The first subsoil type is described as cohesive deposits which are brown slightly sandy gravelly CLAY with occasional cobbles and boulders. The material becomes stiff and dark grey in colour with depth in the majority of the exploratory holes. The second subsoil type is described as granular deposits which are present within and below the cohesive deposits and are grey brown clayey sub rounded to sub angular fine to coarse GRAVEL with occasional cobbles and rare boulders. These deposits are medium dense and become dense with depth. It's noted that were the granular deposits were encountered, instability in trial pits was experienced and a significant groundwater strike was noted in boreholes in these deposits.

Site investigation boreholes hit refusal at depths between 3.5 mbgl to 6.7 mbgl and did not encounter bedrock, which provides a proven minimum subsoil thickness. The new channel will be excavated to a maximum depth of 2.8m and hence will be within the subsoils only.

Figure 5-2: Subsoils (Quaternary Sediments) Map

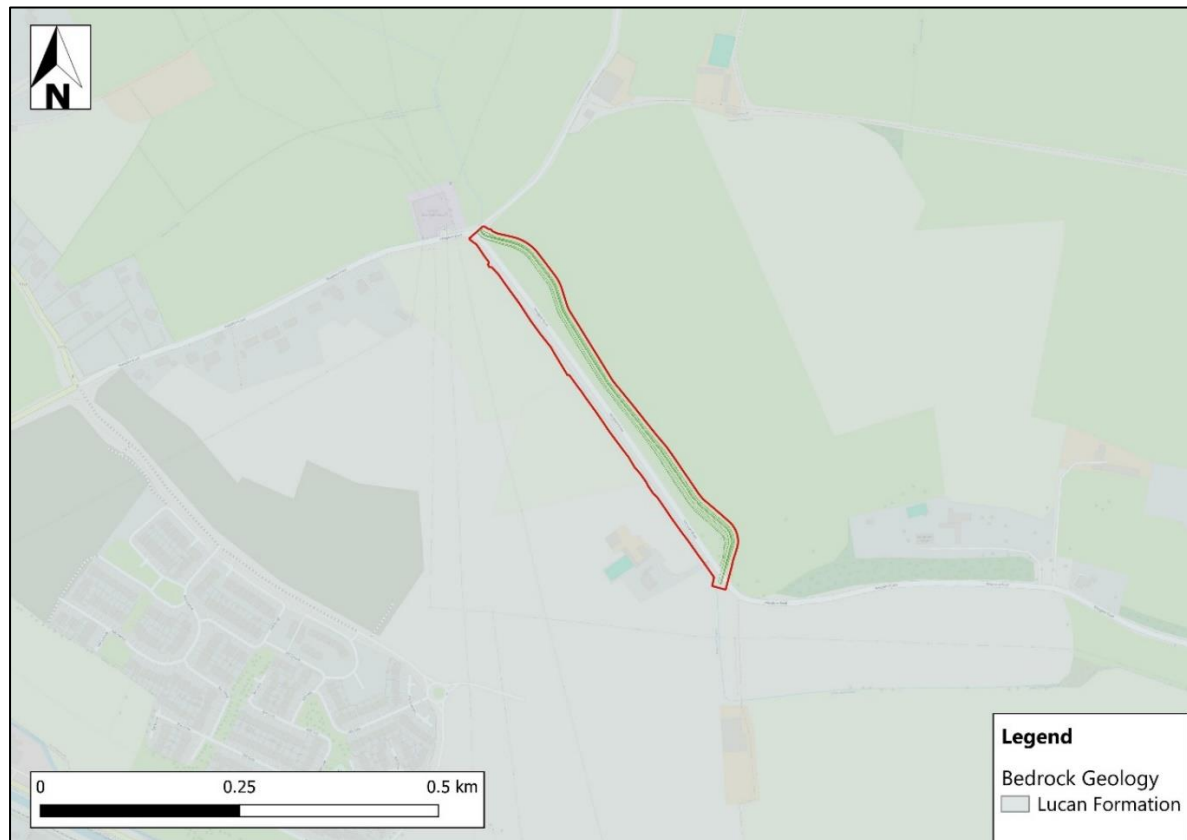


5.3.4 Bedrock Geology

Reference to the GSI Spatial Resources Viewer indicates that the site is underlain by the Lucan Formation, described as dark limestone and shale i.e. the calc limestone of the Dublin area. This bedrock is also part of the Dinantian Upper Impure Limestones rock unit group. No karst features are mapped within the surrounding area of the proposed development site.

Borehole logs tended to hit refusal at depths between 3.5 mbgl to 6.7mbgl. It is unknown if bedrock was encountered at these depths.

Figure 5-3: Bedrock Geology Map



5.4 POTENTIAL IMPACTS

5.4.1 Potential Impacts during the Construction Phase

Elements of the proposed upgrade works that may give rise to impacts have been considered with regards to potential effects on the soils and geology and are as follows:

- Movement of vehicles and machinery associated with improvement works and the potential for spillages of oils, fuels or other pollutants which could infiltrate to the soils and subsoils;
- Excavation activities resulting in the temporary generation of dust in the locality of the works area;
- Movement of heavy vehicles and machinery causing compaction of the ground; and
- Permanent removal of soils and subsoils on a site specific level.

Excavation of soils and subsoil material during the localised earthworks as described above could potentially increase the risk of soil erosion, which in turn could destabilise the ground on a local level. There is also the potential of leakage and spillage of fuels on-site from vehicles during construction works.

The pre-mitigation potential effects on the soils and geology are considered to be negative, short term to permanent and of moderate significance.

5.4.2 Potential Impacts during the Operational Phase

There will be no significant impacts on soils, subsoils or bedrock during the operational phase of the proposed development. However, due to the nature of the development there will be machinery periodically on site for road maintenance. This could lead to accidental hydrocarbon emissions, which could cause contamination if they enter the soil and bedrock environment. During road maintenance, there may be a need for excavation of soils, subsoils and bedrock which could have the same potential impacts of similar activities carried out during the construction phase described in 5.4.1 above.

5.5 MITIGATION MEASURES

5.5.1 Construction Phase

Mitigation measures to be taken during the construction phase of the road improvement scheme are detailed below and are included in the Natura Impact Statement and will be developed further in the Construction Environmental Management Plan (CEMP).

During the construction stage, best practice construction methods as set out in CIRIA C741 'Environmental good practice on site guide' will be implemented in order to prevent contamination of the soils and to prevent excessive dust production. This will include proper site management during construction, to ensure that all necessary measures are taken to prevent run-off/ pollutants from infiltrating to ground in the vicinity of the works.

The construction compound and welfare facility will be located within the existing agricultural lands.

All oils and solvents used during the construction phase of the development will be stored within specially constructed dedicated bunded areas. This will minimise any impact on the underlying sub-surface strata.

Refuelling of construction vehicles and the addition of hydraulic oils to vehicles, will take place in a designated area of the site. Spill kits and hydrocarbon adsorbent packs will be stored in this area of the site and operators will be fully trained in the use of this equipment. All machinery will be regularly maintained and checked for leaks. Any refuelling of construction machinery/ vehicles will not be undertaken within 50m of any surface water feature. If it is not possible to bring machinery to the refuelling point, fuel will be delivered in a double-skinned mobile fuel bowser. A drip tray will be used beneath the fill point during refuelling operations to contain any accidental spillages that may occur.

In addition to the proposed road upgrade works, a new filter drain system will be put in place. The new road drainage system will flow into gullies which will connect to the filter drain which has a 400mm pipe at its base. The filtered runoff will then discharge to the lowest section of the scheme.

In the event that any road run off which is not filtered through filter drains this will be directed through a petrol interceptor before discharging into the Newtownmoyaghy Stream.

All construction waste will be sorted and store in on-site skips, prior to removal by a licenced waste management contractor.

As with the above mitigation measures, the following measures for standard practice pollution control and stockpiling management will also be incorporated into the outline CEMP for the project, which the contractor will be obliged to follow to remove any risk of a pollution incident:

- On completion of the works, all apparatus, plant, tools, offices, sheds, surplus materials, rubbish and temporary erections or works of any kind will be removed from the site;
- All works must follow the guidance set out in the Guidance document entitled: CIRIA guidance note Control of Water Pollution from Construction Sites (CIRIA, 2001);
- A 24-hour, seven-day week Emergency Response protocol will be drawn up and implemented. This must be implementable in the unlikely event of an accidental spillage of chemicals, hydrocarbons or release of sediment to the soils and geological environment;
- Excavated material subject to grading requirements may be suitable for reuse as part of the back fill of the existing stream. All excavated material will be temporarily removed to suitable stockpile areas.
- Stockpiling will be limited to areas where the ground is stable and well drained;
- Spoil disposal areas will be located where the risk of soil erosion is minimal;
- Where spoil disposal areas are bunded, the bunds will extend to a level above the top of the spoil;
- Any water discharge from the stockpiles will be monitored. Runoff water will be prevented from flowing directly into nearby watercourses.
- Refuelling of machinery will be carried out on level, hard surfaced designated areas. In the event that refuelling is required outside of these areas, fuel will be transported in a mobile double skinned tank and a spill tray will be employed during re-fuelling operations;
- All machinery will be regularly maintained and checked for leaks. Servicing must be undertaken on level, hard surfaced designated areas;
- An adequate supply of spill kits and hydrocarbon adsorbent packs will be available at labelled stations throughout the sites with all vehicles on-site carrying spill kits. All relevant personnel will be fully trained in the use of the equipment. Any used spill kits will be disposed of appropriately off-site;
- All concrete will be mixed off-site and imported into the site. All concrete browsers will be washed down at a dedicated concrete washout on-site at least 50 m from a drainage ditch or watercourse. Concrete washings will not be disposed of on-site. All washings will be removed off-site and treated at a licensed facility; and
- All equipment and machinery must be cleaned prior to entry as bio security measure. This is to avoid transfer of invasive species on equipment and machinery which may have been used elsewhere to the receiving catchment. Reference will be made to IFI bio security protocol found at <http://www.fisheriesireland.ie/Biosecurity/biosecurity.html>.

The combined application of these measures will ensure that inputs to, and subsequent contamination of, the soil and geological environment do not occur during normal and/ or emergency conditions. With these mitigation measures in place, the probability of contamination and dust production effects on the soils and geology environment is unlikely.

5.5.2 Operational Phase

With regard to the operational phase of the proposed road improvement scheme, no significant impacts on the local geological environment are predicted with the above mitigation measures being adhered to. The predicted impact on soils and geology is considered to be short term, localised and imperceptible.

Any vehicles utilised during the operational phase will be regularly maintained and checked to ensure any damages or leakages are corrected.

There will be no geotechnical impact on bedrock during the operational phase of the proposed development and therefore no mitigation measures are proposed.

5.6 RESIDUAL IMPACT

The nature of the proposed road development dictates that the greatest potential impact for the soil, subsoil and bedrock environment will be in the construction phase. With the implementation of mitigation measures set out in this report and the Natura Impact Statement, a negligible impact on the soil, subsoil and bedrock environment is predicted for the construction phase of the proposed development. With regard to the operational phase of the development, a negligible impact on the local soil, subsoil and bedrock environment is predicted.

5.7 CONCLUSION

The construction of the scheme would result in the disturbance of soil, subsoil and less likely on the bedrock on site. However, the area impacted by the proposed development will be localised and with the implementation of the mitigation measures during the construction phase the impact on the soils and geology will be negligible during both the construction and operational phases.

6.0 WATER

6.1 INTRODUCTION

This chapter describes the existing surface water and groundwater environment and presents an assessment of the potential for impacts arising from the works related to the Newtownmoyaghy Road on this environment.

6.2 METHODOLOGY

The assessment of the water environment consisted of:

- A desk study of surface water and groundwater features; and
- Interpretation of all data and reporting.

Guidelines used in the preparation of the report included the Environmental Protection Agency (EPA) document 'Guidelines on the Information to be obtained in Environmental Impact Assessment Reports' (2022) and the Institute of Geologists of Ireland (IGI) publication 'Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements' (2013).

Information held by the Geological Survey Ireland (GSI) and EPA was accessed to provide the geological setting of the site. Datasets used to provide the setting of the site included the GSI Spatial Resources Viewer and the EPA Water Maps and Office Public Works (OPW) Flood Maps.

6.3 RECEIVING ENVIRONMENT

6.3.1 Surface Water

The purpose of this section is to describe the surface water (hydrological) setting of the study area.

The site lies within the Liffey and Dublin Bay Water Framework Directive (WFD) Catchment, within the Rye Water_SC_010 sub-catchment and within the Rye Water_020 river sub-basin. The surface water features within the area of the development include the Newtownmoyaghy Stream, which is part of the Rye Water_020 river waterbody (WFD code IE_EA_09R010300). This stream enters the Rye Water river (also part of the Rye Water_020 river waterbody) approximately 6km downstream of the proposed development site. The Rye Water river eventually flows into the River Liffey in Leixlip and into the Liffey Estuary Upper at Islandbridge on the west side of Dublin city and ultimately discharging into Dublin Bay, approximately 37km downstream of the proposed development site.

The EPA assesses the water quality of rivers and streams using a biological assessment method and assigns biological river quality (biotic index) ratings from Q5-Q1 to watercourse sections. Q5 denotes a watercourse with good water quality and high community diversity, whereas Q1 denotes very low community diversity and a bad water quality.

Table 6-1 lists the WFD waterbodies and the hydrological pathway from the proposed development to Dublin Bay, and their corresponding water quality status.

Table 6-1: Hydrological Pathway from the Proposed Development Site

WFD Waterbody	WFD Code	Water Quality Status
RYE WATER_020 (Newtownmoyaghy Stream)	IE_EA_09R010300	Good
RYE WATER_030	IE_EA_09R010400	Poor
RYE WATER_040	IE_EA_09R010600	Moderate
LIFFEY_150	IE_EA_09L011900	Good
LIFFEY_160	IE_EA_09L012040	Poor
LIFFEY_170	IE_EA_09L012100	Poor
LIFFEY_180	IE_EA_09L012350	Poor
LIFFEY_190	IE_EA_09L012360	Poor
Liffey Estuary Upper	IE_EA_090_0400	Good
Liffey Estuary Lower	IE_EA_090_0300	Moderate
Dublin Bay	IE_EA_090_0000	Good

The Newtownmoyaghy Stream will be diverted as part of the proposed development. This stream was assigned 'Good' quality status for the WFD 2016-2021 period and is currently under review to determine if it is at risk or not at risk of meeting the WFD target of achieving and/ or maintaining good status by 2027.

6.3.2 Groundwater Receiving Environment

The purpose of this section is to describe the groundwater (hydrogeological) setting of the study area.

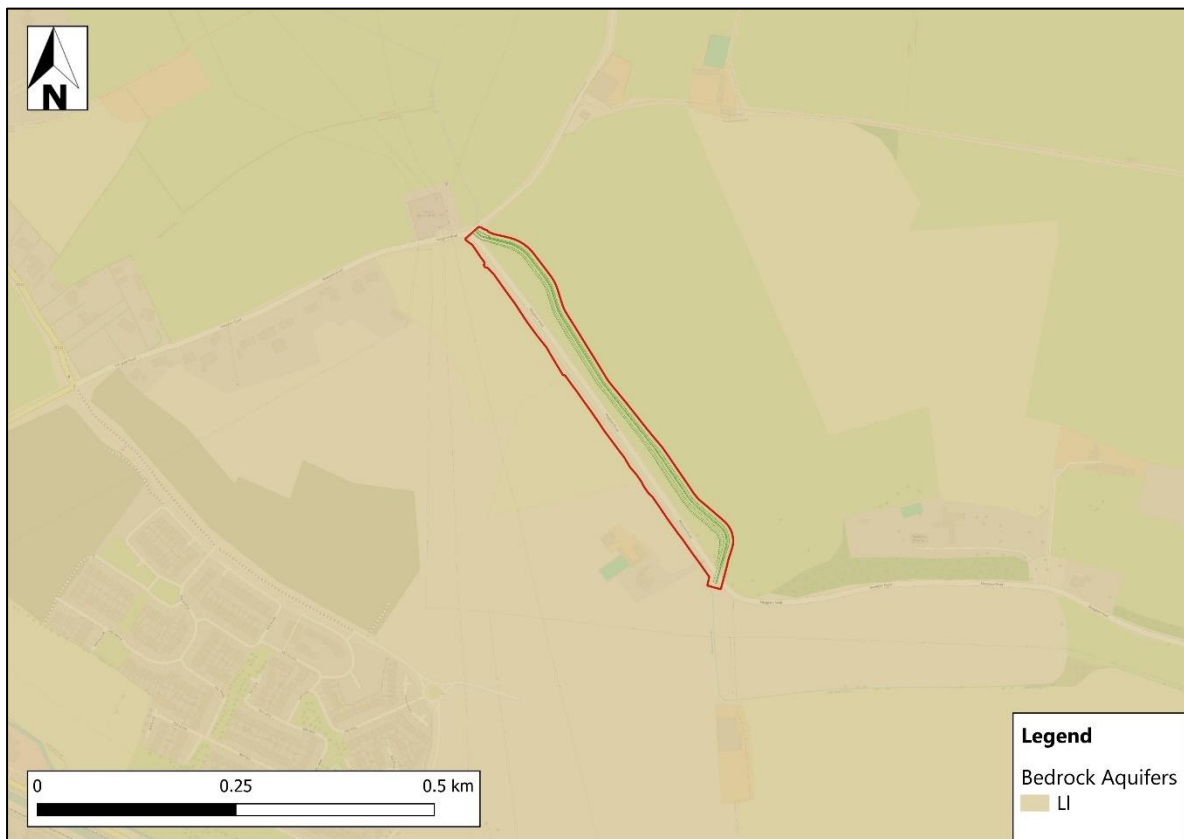
Aquifer Potential and Characteristics

The aquifer potential of a bedrock unit is determined by the groundwater productivity. The productivity is determined based on hydraulic characteristics compiled from borehole data throughout the county.

The underlying bedrock is classified as a 'Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones'. There are no sand and gravel aquifers identified in the area of the proposed development.

There are no mapped karst features within the study area. A review of the historical maps identified a spring approximately in the centre of the northern boundary of the proposed development. This is shown on the historic 25" map, but is not present in the historic 6" map or the Cassini 6" map. Additionally, there are no karst features or GSI wells and springs mapped in this area. A review of aerial photography did not highlight any features of note in this area.

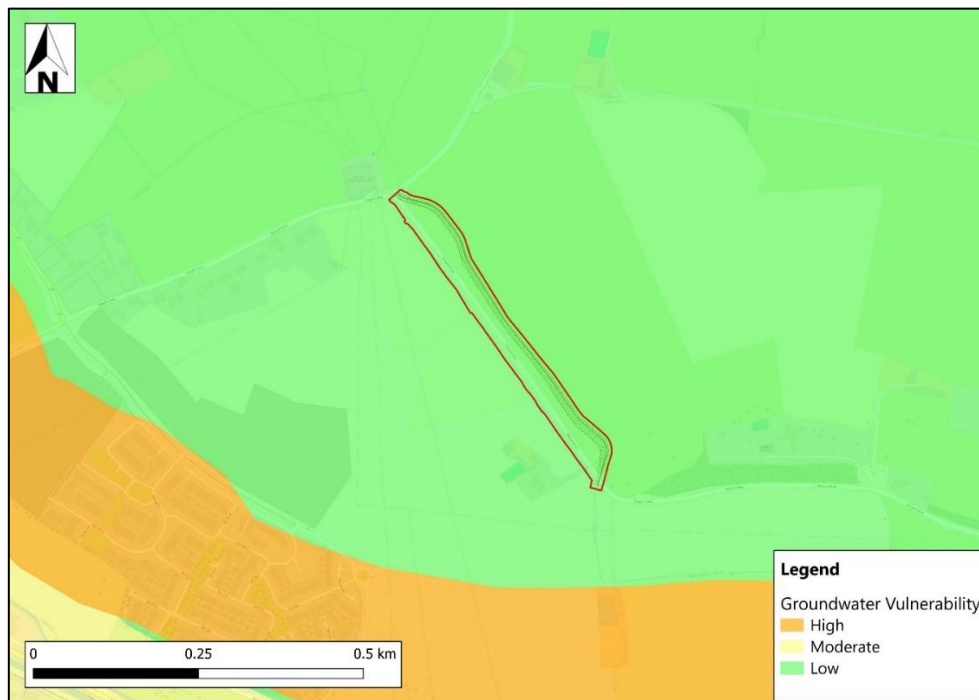
Figure 6-1: Bedrock Aquifers



Groundwater Vulnerability

Groundwater vulnerability represents the intrinsic geological and hydrogeological features at a site that determine the ease at which groundwater may become contaminated. It is representative of the subsoil thickness, the subsoil type as well as the aquifer type. Groundwater vulnerability is classified as low in the area of the proposed works.

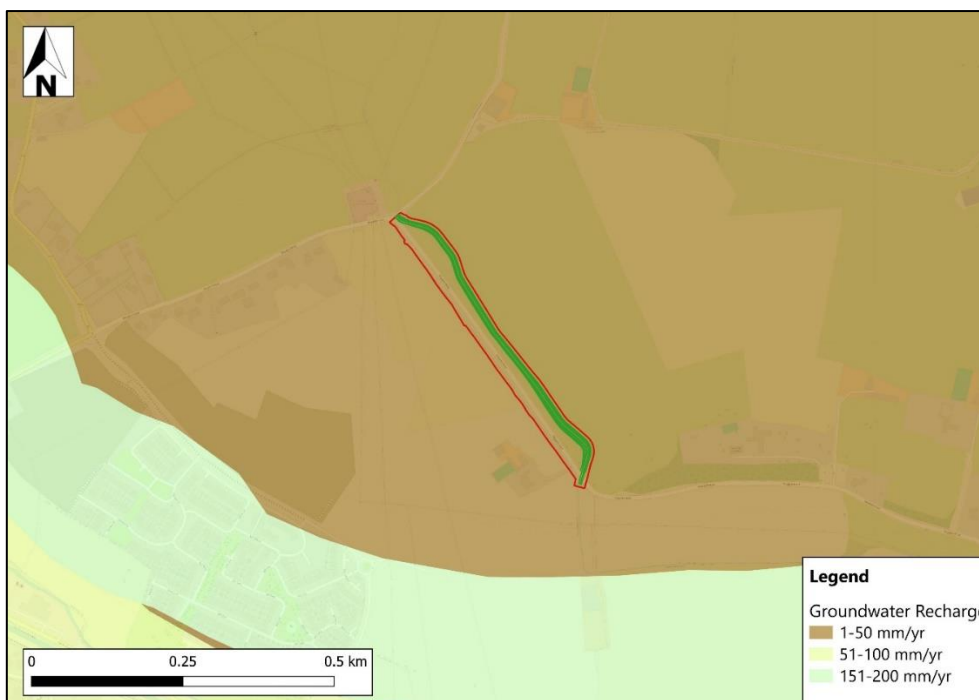
Figure 6-2: Ground Water Vulnerability Map



Groundwater Recharge

Groundwater recharge in the area of the proposed development is typically low. The effective rainfall is 436 mm/yr and the recharge coefficient in the area around the site is 7.5%, giving an average annual recharge value of 31 mm/yr.

Figure 6-3: Ground Water Vulnerability Map



Groundwater Source Protection Zones and Group Water Schemes

As reported by the EPA and the GSI, groundwater sources, particularly public, group scheme and industrial supplies, are of critical importance in many regions. Consequently, the objective of a Source Protection Zone is to provide protection by placing tighter controls on activities within all or part of the source protection area of the supply.

The proposed development site is not within a ZOC for any public or private water supplies, and there are no group water schemes mapped close to the area. Additionally, there are no GSI mapped groundwater wells or springs in the immediate area of the proposed development.

Groundwater Quality and Risk

The proposed development site is located within the Dublin Groundwater Body (European_Code: IE_EA_G_008). The Groundwater Body WFD status 2016-2021 is classified as being of 'Good' quality and is currently under review to determine if it is at risk or not at risk of meeting the WFD target of achieving and/ or maintaining good status by 2027.

Site Specific Groundwater Data

During the site investigation works, groundwater strikes were encountered within the granular deposits and within the cohesive deposits where gravel is present, between 1.4 mbgl and 4.5 mbgl. When encountered, drilling stopped and the water levels were monitored for 20 minutes. It was noted that groundwater levels rose to within 0.7 m of the ground level indicating areas of confined groundwater within the subsoils and a shallow potentiometric surface, i.e. the level at which confined water rises to when released from the overlying confining layer.

It is noted that the new channel will be excavated to a maximum depth of 2.8m and hence is likely to encounter the shallow groundwater. It is also noted, that where groundwater is not encountered, the potentiometric surface should be considered during excavation works.

6.4 POTENTIAL IMPACTS

6.4.1 *Potential Impacts during the Construction Phase*

Elements of the proposed upgrade works that may give rise to impacts have been considered with regards to potential effects on the hydrology and hydrogeology environment are as follows:

- Release of sediment and pollutants which may be discharged into surface water, particularly during high rainfall events. Contaminated runoff and/ or sediment may drain into the Newtownmoyaghy Stream,
- Movement of vehicles and machinery associated with improvement works and the potential for spillages of oils, fuels or other contaminants which could be transported to the surface water system during rainfall events;
- Transportation, pouring of asphalt onsite and washing of concrete lorry flume, creating a risk of entry into surface water;
- Increased silt loading which may stunt aquatic plant growth, limit dissolved oxygen capacity and overall reduce the ecological quality of watercourses, with the most critical period associated with low flow conditions;
- Excavation activities may also result in the temporary generation of dust in the locality of the works area. This could work its way into nearby surface waterbodies;

- The excavation, placement, grading and backfilling of soils may potentially impact on the surrounding surface water environment and the underlying groundwater environment. Surface water run-off from the construction areas may contain elevated suspended solids runoff associated with soil excavation. This run-off may discharge to surface water bodies, affecting water quality.
- The use of concrete to form some structural elements of the proposed infrastructure has the potential to generate high alkalinity surface water run-off, which may discharge to adjacent watercourses, affecting the water quality.
- The use of plant and vehicles on all aspects of the proposed construction works brings with it the potential for hydrocarbon loss to the ground during refuelling operations. The released hydrocarbons would then have the potential to percolate to the underlying groundwater or to contaminate the surface water and downstream surface waterbodies into which the run-off discharges.
- Improper waste disposal and sanitary waste disposal from temporary sanitary facilities during the construction stage may result in contaminated discharge to surface water bodies or to the underlying groundwater body, affecting water quality.

The pre-mitigation potential effects on the surface water and groundwater are considered to be negative, short term and of moderate significance.

6.4.2 Potential Impacts during the Operational Phase

There will be no significant impacts on surface and groundwater during the operational phase of the proposed road development. However, due to the nature of the development there will be machinery periodically on site for road and stream maintenance. As a result, there is still a possibility of leakages and spills that may enter the system. The surrounding surface water environment and the underlying groundwater environment may be impacted by surface water run-off from the construction areas as there could potentially be elevated suspended solids runoff associated with road work excavations. This run-off may discharge to surface water bodies, affecting water quality.

During road maintenance, there may be a need for similar activities that take place in the construction phase which could have the same potential impacts of the activities carried out during the construction phase described in 6.4.1 above.

6.5 MITIGATION MEASURES

6.5.1 Construction Phase

Mitigation measures to be taken during the construction phase of the road improvement scheme are detailed below and are included in the NIS and will be developed further in the Construction Environmental Management Plan (CEMP).

During the construction stage, best practice construction methods as set out in CIRIA C741 'Environmental good practice on site guide' will be implemented in order to prevent water pollution. This will include proper site management during construction, to ensure that all necessary measures are taken to prevent run-off/pollutants from entering any watercourse in the vicinity of the works.

The construction compound and welfare facility will be located within the existing agricultural lands and set back from the watercourse.

The temporary welfare facilities will not have any discharge to ground or surface waters and will be located a minimum of 30m from the Stream. All wastewater will be collected in a tank, and will be emptied as required by a licenced waste collector according to the manufacturer's guidelines.

All oils and solvents used during the construction phase of the development will be stored within specially constructed dedicated bunded areas. This will minimise any impact on the groundwater and eliminate/ reduce the risk of overflow into the nearby watercourse.

Refuelling of construction vehicles and the addition of hydraulic oils to vehicles, will take place in a designated area of the site, away from surface water features. Spill kits and hydrocarbon adsorbent packs will be stored in this area of the site and operators will be fully trained in the use of this equipment. All machinery will be regularly maintained and checked for leaks. Any refuelling of construction machinery/ vehicles will not be undertaken within 50m of any surface water feature. If it is not possible to bring machinery to the refuelling point, fuel will be delivered in a double-skinned mobile fuel bowser. A drip tray will be used beneath the fill point during refuelling operations to contain any accidental spillages that may occur.

In addition to the proposed road upgrade works, a new filter drain system will be put in place to provide for road runoff. The new road drainage system will flow into gullies which will connect to a filter drain and a 400mm pipe to the lowest section of the scheme.

In the event that any road run off which is not filtered through filter drains this will be directed through a petrol interceptor before discharging into the Newtownmoyaghy Stream.

All construction waste will be sorted and store in on-site skips, prior to removal by a licenced waste management contractor.

Best practice on-site erosion control measures will be incorporated into the construction phase of the proposed development to reduce the potential for sediment and suspended solids in runoff to surface water in this area. Measures will include the following where appropriate:

- Reduce availability of sediment for erosion - the single most effective method of reducing the volume of sediment created by construction is the immediate capping of all roads with high quality, hard wearing crushed washed aggregate such as limestone laid to a transverse grade. Once water drains transverse across a road constructed from hard wearing aggregate, as opposed to longitudinally on low class aggregate, the level of suspended solids is reduced by an order of magnitude;
- Working near a watercourse – Prior to the construction works commencing, silt fences will be installed, by hand, along banks of the stream. Once the silt fences are installed, 1-1.5 tonne sand bags, wrapped in heavy gauge polythene will be positioned along both ends of the stream connection point, creating a barrier around the construction works. The sandbags will be lifted into place using a mechanical excavator;
- No direct discharge to the stream will be permitted at any time during the works. Any sediment collected by settlement tanks/ silt fencing will be transported off site by a licensed waste operator for appropriate disposal; and,
- Working near watercourses during intense rainfall event (>5mm /hour) will be avoided and work will cease entirely near watercourses when it is evident that there is a threat of pollution occurring.

As with the above mitigation measures, the following standard practice pollution control measures will also be incorporated into the CEMP for the project, which the contractor will be obliged to follow to remove any risk of a pollution incident:

- On completion of the works, all apparatus, plant, tools, offices, sheds, surplus materials, rubbish and temporary erections or works of any kind will be removed from the site;
- All works must follow the guidance set out in the Guidance document entitled: CIRIA guidance note Control of Water Pollution from Construction Sites (CIRIA, 2001);
- A 24-hour, seven-day week Emergency Response protocol will be drawn up and implemented. This must be implementable in the unlikely event of an accidental spillage of chemicals, hydrocarbons or release of sediment to the surface or ground water system;
- Excavated material subject to grading requirements may be suitable for reuse as part of the back fill of the existing stream. All excavated material will be temporarily removed to suitable stockpile areas.
- Stockpiling will be limited to areas where the ground is stable and well drained;
- Spoil disposal areas will be located where the risk of soil erosion and water quality deterioration is minimal and must also have an adequate buffer from aquatic zones;
- Where spoil disposal areas are bunded, the bunds will extend to a level above the top of the spoil;
- Any water discharge from the stockpiles will be monitored. Runoff water will be prevented from flowing directly into nearby watercourses;
- Refuelling of machinery will be carried out on level, hard surfaced designated areas. In the event that refuelling is required outside of these areas, fuel will be transported in a mobile double skinned tank and a spill tray will be employed during re-fuelling operations;
- All machinery will be regularly maintained and checked for leaks. Services will not be undertaken within 50 m of aquatic features. Servicing must be undertaken on level, hard surfaced designated areas;
- An adequate supply of spill kits and hydrocarbon adsorbent packs will be available at labelled stations throughout the sites with all vehicles on-site carrying spill kits. All relevant personnel will be fully trained in the use of the equipment. Any used spill kits will be disposed of appropriately off-site;
- All concrete will be mixed off-site and imported into the site. All concrete browsers will be washed down at a dedicated concrete washout on-site at least 50 m from a drainage ditch or watercourse. Concrete washings will not be disposed of on-site to any surface or ground water feature. All washings will be removed off-site and treated at a licensed facility; and
- All equipment and machinery must be cleaned prior to entry as bio security measure. This is to avoid transfer of invasive species on equipment and machinery which may have been used elsewhere to the receiving catchment. Reference will be made to IFI bio security protocol found at <http://www.fisheriesireland.ie/Biosecurity/biosecurity.html>.

The combined application of these measures will ensure that inputs to, and subsequent contamination of, the water environment do not occur during normal and/ or emergency conditions. With these mitigation measures in place, the probability of production effects on the hydrology and hydrogeology environment is unlikely.

6.5.2 Operational Phase

With regard to the operational phase of the proposed road improvement scheme, no significant impacts on the local water environment are predicted with the above mitigation measures being adhered to. The predicted impact on surface water and groundwater is considered to be short term, localised and imperceptible.

Any vehicles utilised during the operational phase will be regularly maintained and checked to ensure any damages or leakages are corrected.

6.6 RESIDUAL IMPACT

The nature of the proposed road development dictates that the greatest potential impact for the water environment will be in the construction phase. With the implementation of mitigation measures set out in this report, the NIS and the measures to be carried forward for inclusion in the Contractors developed CEMP, a negligible impact on the hydrological and hydrogeological environment is predicted for the construction phase of the proposed development. With regard to the operational phase of the development, a negligible impact on the surface water and groundwater environment is predicted.

6.7 CONCLUSION

The area impacted by the proposed development will be quite localised and with the implementation of the mitigation measures during the construction phase, the impact on the water environment will be negligible during both the construction and operational phases.

7.0 FLOOD RISK ASSESSMENT

7.1 INTRODUCTION

TOBIN Consulting Engineers carried out a Flood Risk Assessment (FRA) of the subject site in Newtownmoyaghy, Co. Meath.

Newtownmoyaghy Road L-6219 is a local secondary road situated to the northeast of Kilcock within the Meath County Council Local Authority Area (Figure 2-1). While it is a local secondary route, Newtownmoyaghy Road is used as a 'bypass' or 'rat run' for vehicles avoiding traffic congestion in Kilcock and Maynooth. Meath County Council has provided an estimated and Annual Average Daily Traffic (AADT) figure of approximately 2500.

The existing road edge and verge of Newtownmoyaghy Road has in discrete sections collapsed into the adjacent Newtownmoyaghy Stream due to erosion from stream flood events compounded by vehicles passing close to the road/stream interface. The length of road affected is 550m, which is subjected to flooding in extreme flood events. The present narrow road width increases the risk of vehicles travelling on and, on occasion, over the edge. Temporary non-retaining/non-structural edge barriers are currently in place to help prevent this acting more as a warning system.

This development proposes the provision of an open channel diversion to the east of and away from the existing road. The route of the diversion will pass-through privately-owned lands which will require a land acquisition. The existing roadside stream channel will be backfilled with suitable material including recovered material deemed suitable for reuse from the new channel excavation. This will provide the additional width required for a Type 3 Single (6.0m) Carriageway and widened grass verge.

An estimated 15m long box culvert will be required at the location where the proposed diversion will pass from the East side of the road to the West side before re-connecting into the existing stream and will be designed and approved appropriately through the Section 50 application process.

A full description of the proposed scheme is provided in Section 2.2 of this report.

The landscape surrounding the Newtownmoyaghy Road is relatively flat and consisting of mainly agricultural fields.

The Newtownmoyaghy Stream flowing adjacent to Newtownmoyaghy Road, is a tributary of the Rye Water. The confluence with the Rye Water is located approximately 850m downstream of the subject site. The Newtownmoyaghy Stream flows under the two bridges near the ESB's Kilcock substation, before flowing parallel to the road for approximately 550m where it is crossed by another bridge which gives access for a neighbouring residential property. The stream then flows for another 1100m before out falling to the Rye Water.

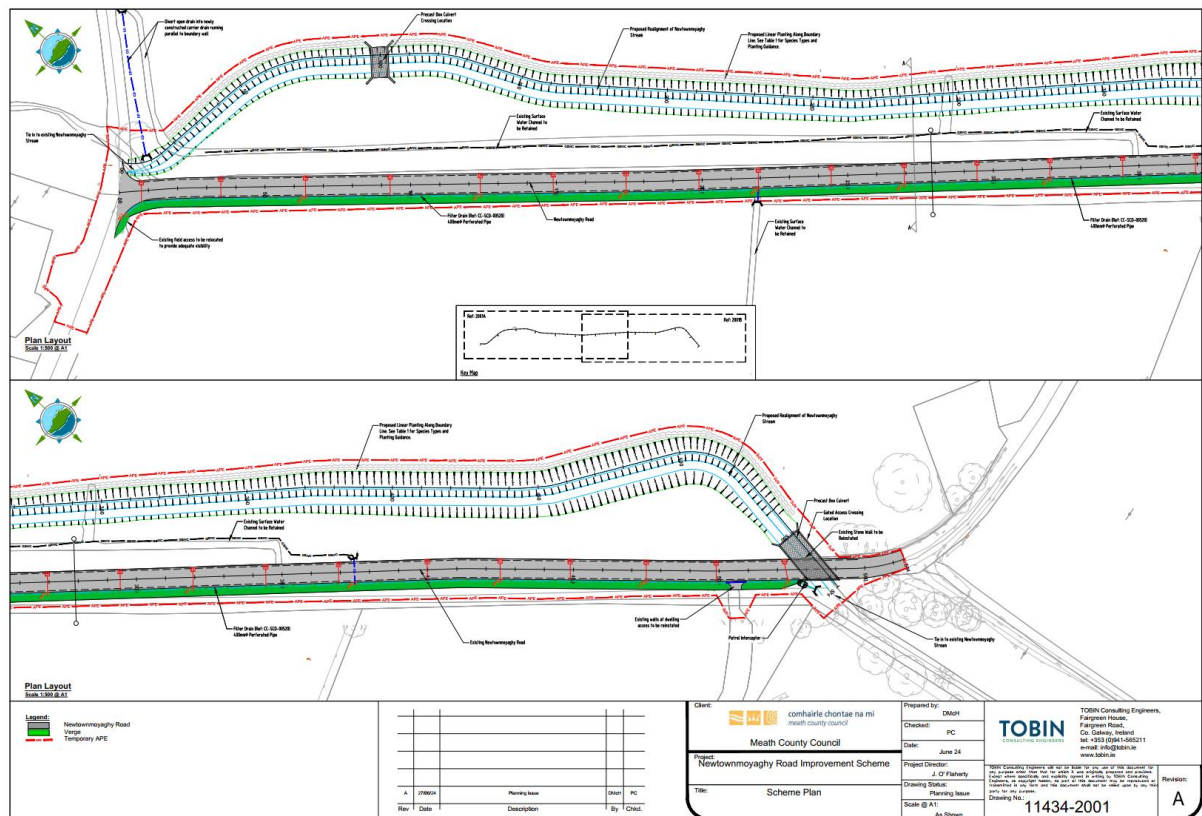


Table 7-1: Decision Matrix for Determining the Appropriateness of a Development

Flood Zone (Probability)	Annual Exceedance Probability (AEP)	Development Appropriateness		
		Highly Vulnerable	Less Vulnerable	Water Compatible
A (High)	<u>Fluvial & Pluvial Flooding</u> More frequent than 1% AEP	Justification Test	Justification Test	Appropriate
	<u>Coastal Flooding</u> More frequent than 0.5% AEP			
B (Medium)	<u>Fluvial & Pluvial Flooding</u> 0.1% to 1% AEP	Justification Test	Appropriate	Appropriate
	<u>Coastal Flooding</u> 0.1% to 0.5% AEP			
C (Low)	<u>Fluvial, Pluvial & Coastal Flooding</u> Less frequent than 0.1% AEP	Appropriate	Appropriate	Appropriate

“Local transport infrastructure” developments (such as the works proposed as part of this scheme) are considered “Less vulnerable” in terms of their sensitivity to flood risk (i.e., Appropriate in Flood Zone B, where the risk of flooding is less than a 1% Annual Exceedance Probability (AEP)).

7.3.2 The Flood Risk Management Climate Change Adaptation Plan

The Flood Risk Management Climate Change Sectoral Adaptation Plan was published in 2019 under the National Adaptation Framework and Climate Action Plan. This plan outlines the OPW’s approach to climate change adaptation in terms of flood risk management.

This approach is based on a current understanding of the potential impacts of climate change on flooding and flood risk. Research has shown that climate change is likely to worsen flooding through more extreme rainfall patterns, more severe river flows, and rising mean sea levels.

To account for these changes, the Adaptation Plan presents two future flood risk scenarios to consider when assessing flood risk:

- Mid-Range Future Scenario (MRFS)
- High-End Future Scenario (HEFS)

Table 7-2 indicates the allowances that should be added to estimates of extreme rainfall depths, peak flood flows, and mean sea levels for the future scenarios.

Table 7-2: Climate Change Adaptation Allowances for Future Flood Risk Scenarios

Parameter	Mid-Range Future Scenario (MRFS)	High-End Future Scenario (HEFS)
Extreme Rainfall Depths	+ 20%	+ 30%
Peak River Flood Flows	+ 20%	+ 30%
Mean Sea Level Rise	+ 0.5 m	+ 1 m

7.3.3 Current Meath County Development Plan 2021-2027 (extended)

The current Meath County Development Plan 2021-2027 was adopted on 22nd September 2021 and came into effect on 3rd November 2021. Chapter 9 outlines Meath County Council's strategy for Environmental Infrastructure.

Section 6.10.2 outlines Meath County Council's approach to flood risk management and sets out the following key policies:

- INF POL 18 To implement the "Planning System and Flood Risk Management –Guidelines for Planning Authorities" (DoEHLG/OPW, 2009) through the use of the sequential approach and application of Justification Tests for Development Management and Development Plans, during the period of this Plan.
- INF POL 19 To implement the findings and recommendations of the Strategic Flood Risk Assessment prepared in conjunction with the County Development Plan review, ensuring climate change is taken into account.
- INF POL 20 To require that a Flood Risk Assessment is carried out for any development proposal, where flood risk may be an issue in accordance with the "Planning System and Flood Risk Management –Guidelines for Planning Authorities" (DoEHLG/OPW, 2009). This assessment shall be appropriate to the scale and nature of risk to and from the potential development and shall consider the impact of climate change.
- INF POL 21 To consult with the Office of Public Works in relation to proposed developments in the vicinity of drainage channels and rivers for which the OPW are responsible.
- INF POL 22 To retain a strip of 10 metres on either side of all channels/flood defence embankments where required, to facilitate access thereto.
- INF POL 23 To consult, where necessary, with Inland Fisheries Ireland, the National Parks and Wildlife Service and other relevant agencies in the provision of flood alleviation measures in the County.
- INF POL 24 To ensure that flood risk management is incorporated into the preparation of Local Area Plans in accordance with 'The Planning System and Flood Risk Management -Guidelines for Planning Authorities (2009)'.
- INF POL 25 To have regard to the recommendations of the Fingal East Meath Flood Risk Assessment and Management Study (FEMFRAMS) and the Eastern Catchment Flood Risk Assessment and Management Study (CFRAMS).
- INF POL 26 To undertake a review of the 'Strategic Flood Risk Assessment for County Meath' in light of the completed flood mapping which has been developed as part of the Eastern Catchment Flood Risk Assessment and Management (CFRAM) Study.
- INF POL 27 To liaise with the Office of Public Works in relation to proposed developments in the vicinity of drainage channels and rivers for which the OPW are responsible, prior to the making of determinations/assumptions on surface water management proposals.

-
- INF POL 28 To consult with the Office of Public Works in relation to proposed developments which include the construction, replacement or alteration of a bridge or culvert and to require that the developers obtain consent from the OPW under Section 50 of the EU (Assessment and Management of Flood Risks) Regulations 2010 and Section 50 of the Arterial Drainage Act 1945, where appropriate.
- INF POL 29 To facilitate the provision of new, or the reinforcement of existing flood defences and protection measures where necessary and in particular to support the implementation of flood schemes being progressed through the planning process during the lifetime of the Plan. The provision of flood defences will be subject to the outcome of the Appropriate Assessment process. It is an objective of the Council.

7.4 INITIAL FLOOD RISK ASESMENT

7.4.1 Past Flood Events

The OPW's National Flood Information Portal⁹ provides past flood event mapping with records of flooding reports, meeting minutes, photos, and/or hydrometric data. Figure 7-2 summarizes recorded locations of recurring flood events noted in the vicinity of the subject site.



Figure 7-2: OPW Flood Map of Past Flood Events

There is one past flood event recorded within the subject site. The flood event (Flood ID-10480) occurred on the 8th of January 2005. The flood event is a fluvial flood event known as the Rye Water Newtown Prospect Kilcock, see Figure 7-3 below.

⁹ floodinfo.ie



Figure 7-3: Picture from 2005 Flood Event

7.4.2 OPW Preliminary Flood Risk Assessment (PFRA) Study

In 2009, the OPW produced a series of maps to assist in the development of a broad-scale FRA throughout Ireland. These maps were produced from several sources.

The OPW's National Preliminary Flood Risk Assessment (PFRA) Overview Report from March 2012 noted that *"the flood extents shown on these maps are based on broad-scale simple analysis and may not be accurate for a specific location"*¹⁰.

Limitations on potential sources of error associated with the PFRA maps include:

- Assumed channel capacity (due to absence of channel survey information)
- Absence of flood defences and other drainage improvements and channel structures (bridges, weirs, culverts)
- Local errors in the national Digital Terrain Model (DTM)

Figure 7-4 provides an overview of the fluvial, coastal, pluvial, and groundwater indicative flood extents in the vicinity of the subject site. The PFRA mapping shows that the subject site is susceptible to fluvial flooding during the 1 in 100-year flood event.

Figure 7-5 outlines the PFRA fluvial flood extents. These extents show that the subject site is susceptible to fluvial flooding during the 1 in 10, 100 and 1,000-year flood events.

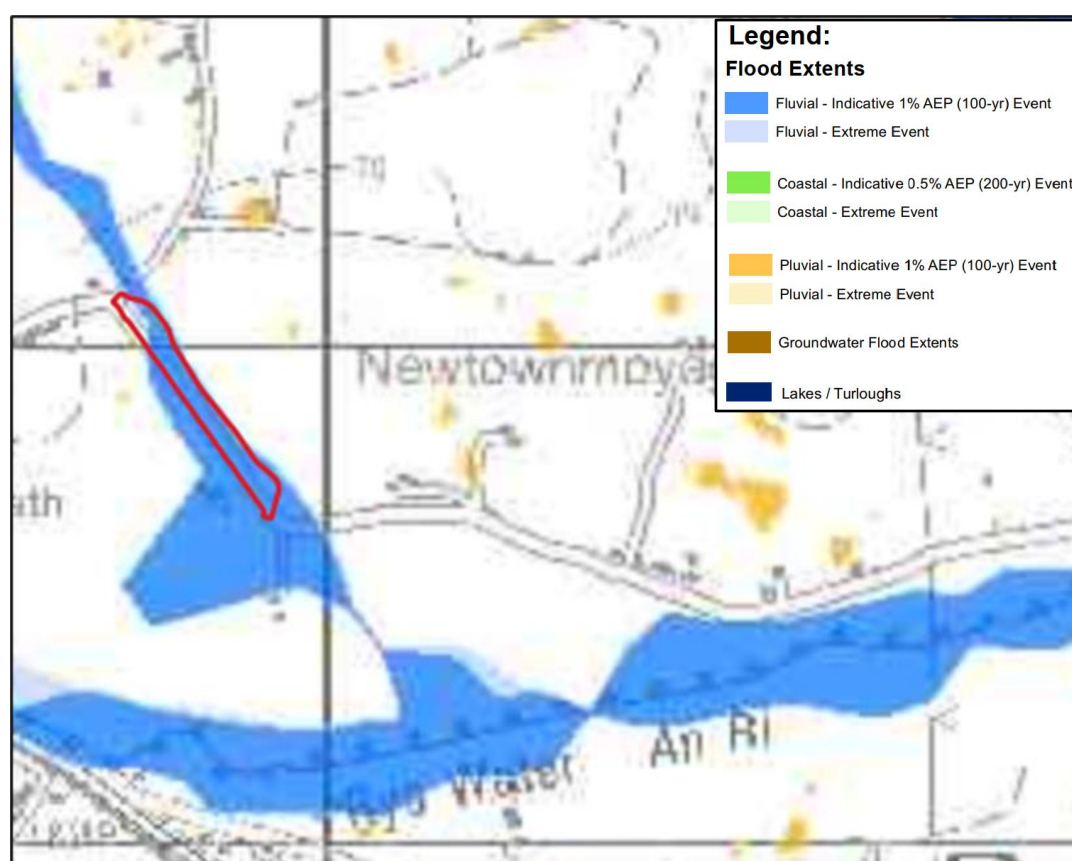


Figure 7-4: Indicative Flood Mapping [extract from PFRA Map 254 & 255]

¹⁰ The National Preliminary Flood Risk Assessment (PFRA) Overview Report, OPW (March 2012)

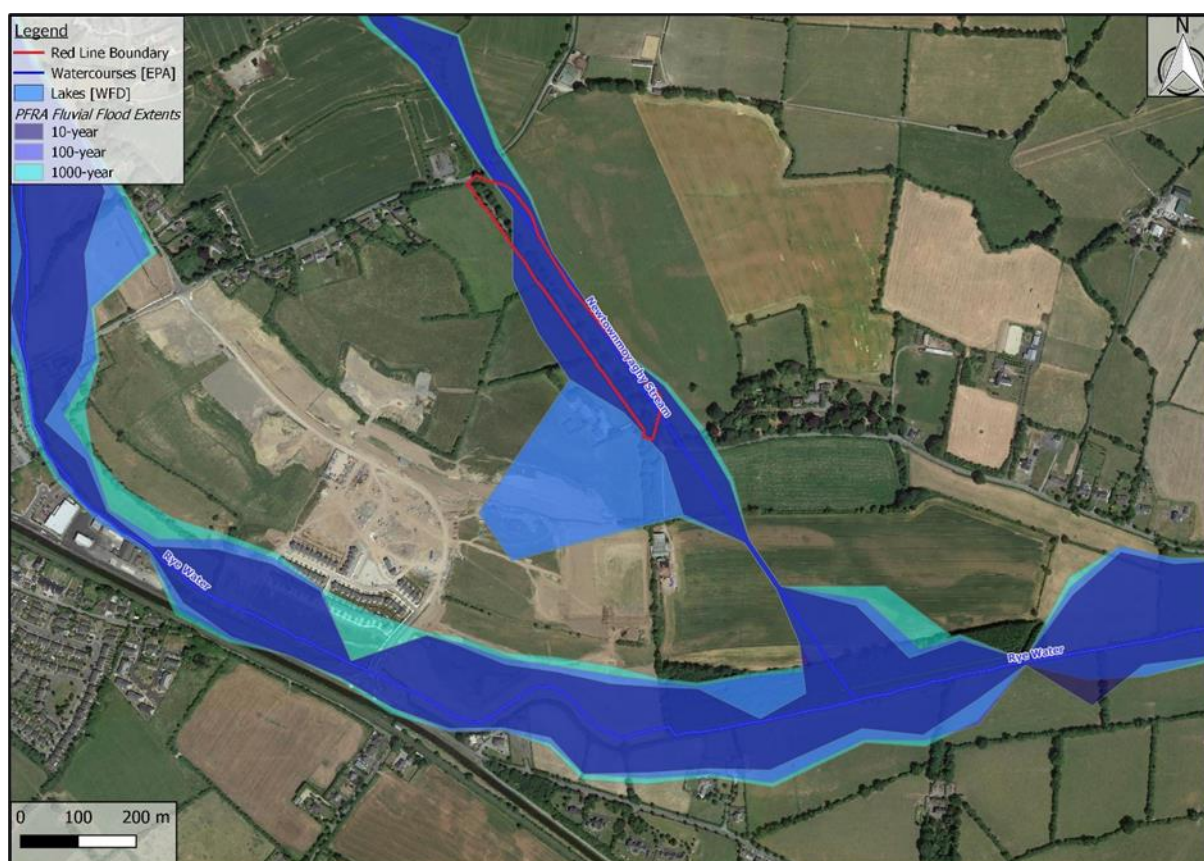


Figure 7-5: PFRA Flood Extents

7.4.3 Catchment Flood Risk Assessment and Management Area (CFRAM)

In 2015, the OPW produced flood maps as part of the Catchment Flood Risk Assessment and Management (CFRAM) Study. The flood extents in these maps are based on detailed modelling of Areas for Further Assessment identified by the National Preliminary Flood Risk Assessment.

CFRAM mapping of existing fluvial flood extents, presented in Figure 7-6 indicates that significant portions of the subject site may be at risk of flooding from the Newtownmoyaghy Stream during the 10%, 1% and 0.1% AEP fluvial flood events. Accordingly, a majority of the site is located within Flood Zone A.

During the current 1 in 100-year event (without climate change) the CFRAM study estimates that water levels will vary in the vicinity of the site from **66.32mOD**¹¹ (CFRAM Node: 09DOLA00156) at the upstream portion of the subject site to approximately **64.22mOD** (CFRAM Node: 09DOLA00104) at the downstream extents of the subject site. With the road level at node 09DOLA00156 being circa **66.245mOD**, it is predicted that this portion of the Newtownmoyaghy Road will be inundated.

During the current 1 in 1,000-year event (without climate change) the CFRAM study estimates that water levels will vary in the vicinity of the site from **66.42mOD** (CFRAM Node: 09DOLA00156) at the upstream portion of the subject site to approximately **64.40mOD** (CFRAM Node: 09DOLA00104) at the downstream extents of the subject site.

¹¹ Eastern CFRAM Study Map No: E09KIK_EXFCD_F2_07 (May 2017)

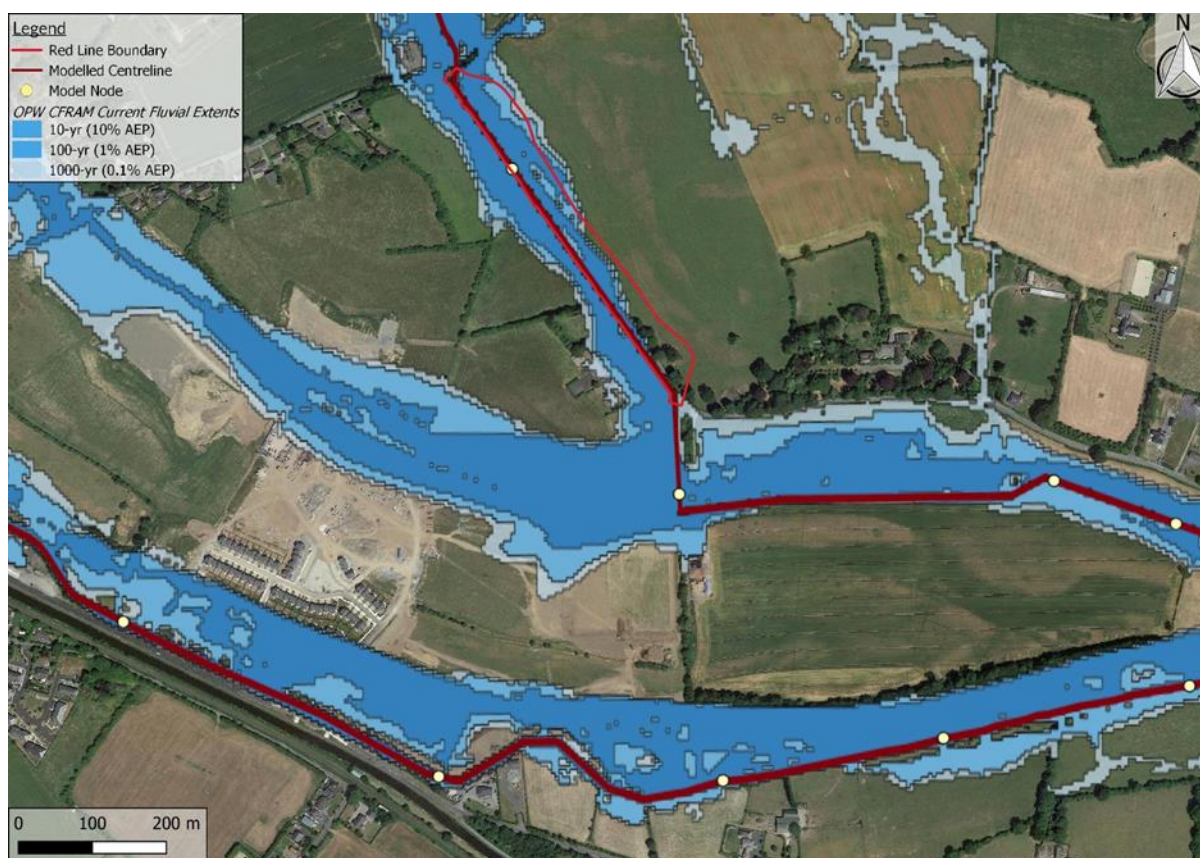


Figure 7-6 CFram Current Extents

The Eastern CFram study also included an assessment of the likely impact of climate change on flood risk in the area. The flood extents for a Mid-Range Future Scenario are shown in Figure 7-7, however no levels for this scenario were provided by the CFram.

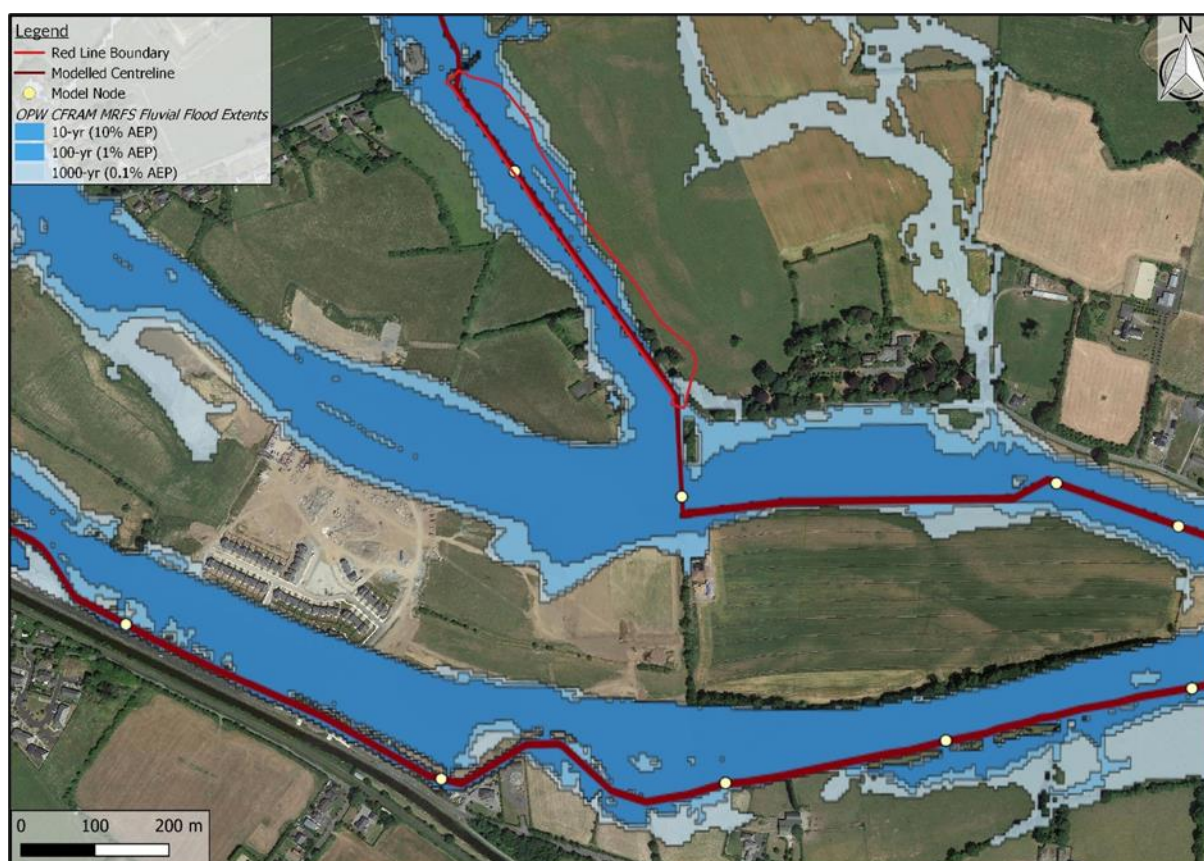


Figure 7-7 CFRAM MRFS Extents

7.4.4 Geological Survey Ireland Mapping

The Geological Survey Ireland (GSI) provides mapping¹⁰ with data related to Ireland's subsurface. Based on the map shown in Figure 7-8, the closest Karst Feature to the subject site is a cave that is located approximately 7km south-east of the subject site. There are no karst features (caves, springs, turloughs, etc.) in the immediate vicinity of the subject site.

GSI surface water mapping shows that there is an area of surface water flooding located approximately 0.8km east of the subject site. This area of surface water flooding is located at the confluence between the Newtownmoyaghy Stream and the Rye Water.

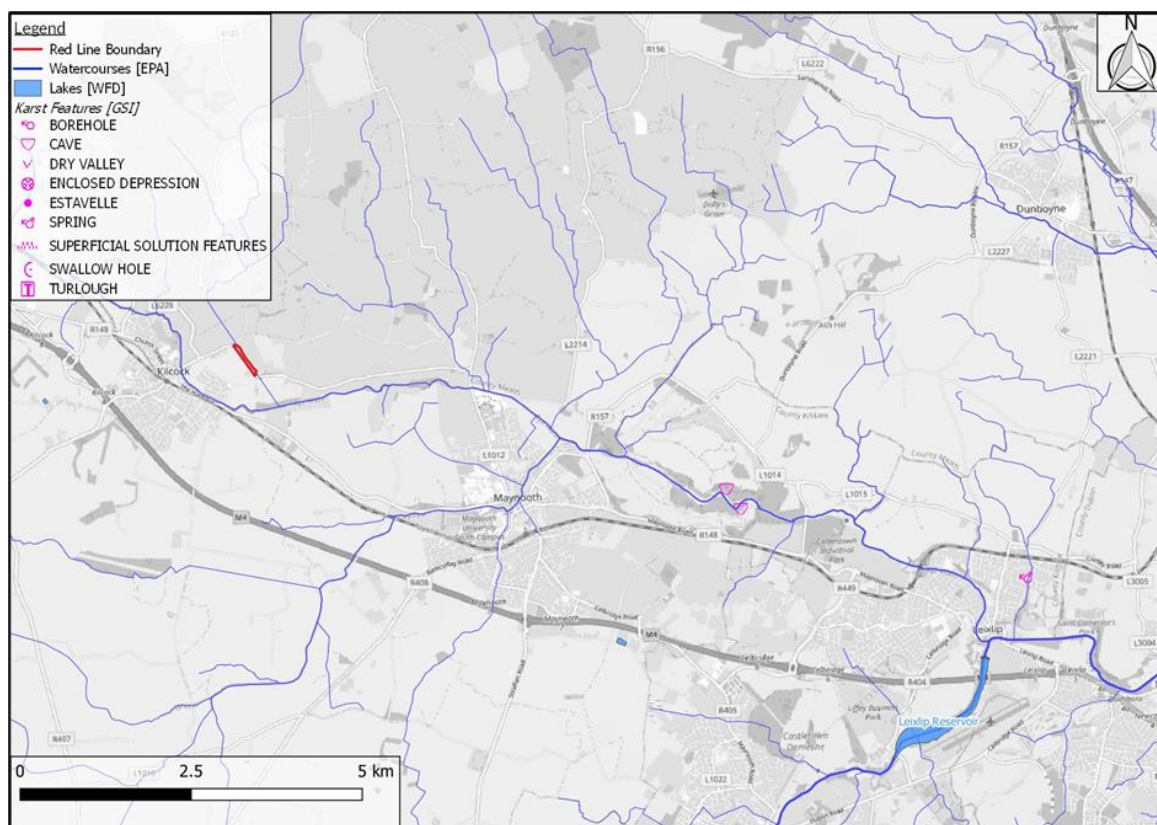


Figure 7-8: GSI Mapping of Karst Features



Figure 7-9: GSI 2015-2016 Surface Water Flood Mapping

7.5 SITE SPECIFIC HYDRAULIC ANALYSIS

7.5.1 Flow Estimation

The catchment area for the Newtownmoyaghy Stream at the subject site was estimated to be approximately 13.5km² based on the OPW's FSU dataset and the topography of the area; see Figure 7-10.

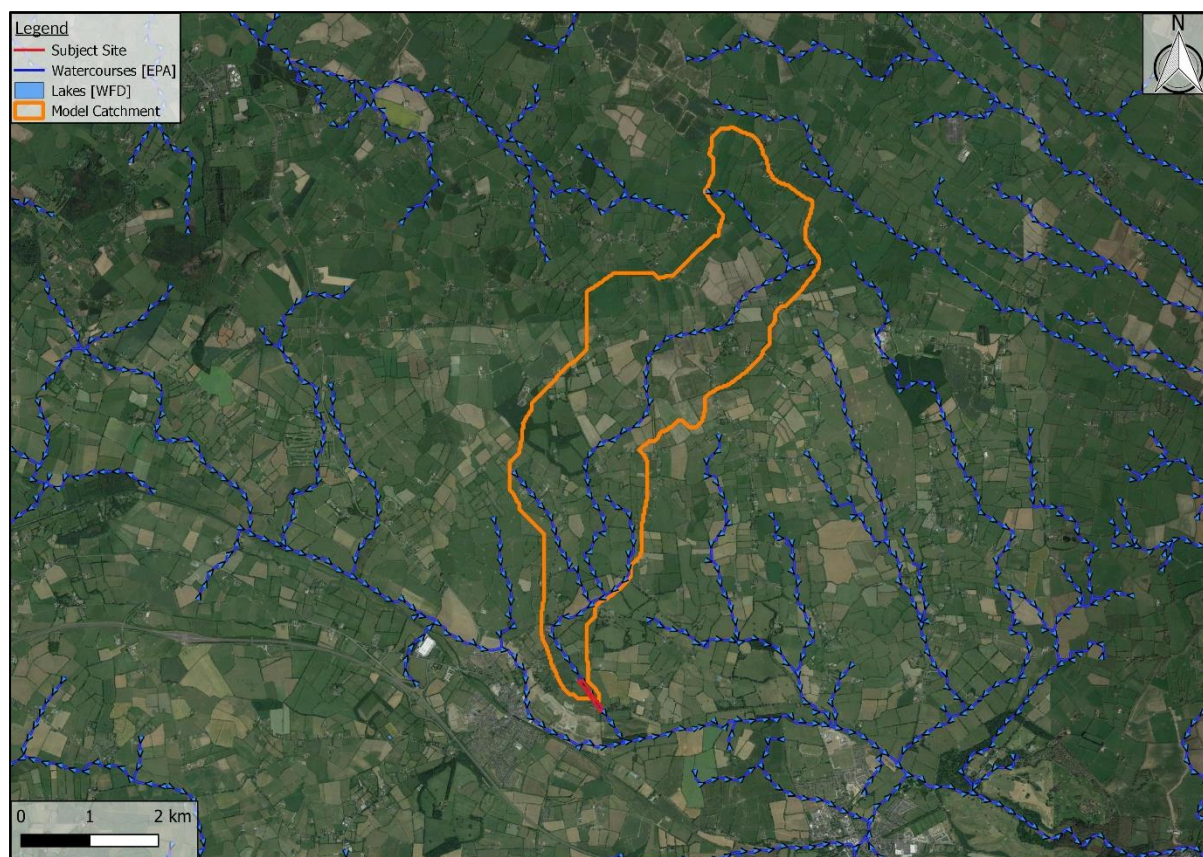


Figure 7-10: Catchment Delineation

Given the size of the Newtownmoyaghy Stream catchment, there are a number of flow estimation methodologies applicable:

- Flood Studies Update (FSU) Method
- Flood Estimation Handbook (FEH) Statistical Method
- Institute of Hydrology report no. 124 (IH124) Method

Extreme flows in the watercourse were estimated based on catchment descriptors, see Table 7-3.

Table 7-3 Summary of Catchment Descriptors

Descriptor	Units	Value	Source
Watercourse	-	Newtownmoyaghy Stream	EPA
Catchment Area	km ²	13.473	FSU/TOBIN
Method Applicability			
FSU	-	YES	FSU
FEH	-	YES	FEH
IH124	-	YES	IH124
Catchment Descriptors			
BFI _{SOIL}	-	0.467	FSU
SAAR	mm	817.660	FSU/MET
FARL	-	1.000	FSU/TOBIN
DRAIN2	km/km ²	1.155	FSU
S1085	m/km	4.498	FSU/DEM
ARTDRAIN2	-	0.000	FSU
URBEXT	-	0.000	FSU
S2	-	0.2	WRAP
S5	-	0.8	WRAP
CWI	-	118.0	graph
URBAN	fraction	0.01	user

Generated GEV growth factors as defined by the FSU were applied to the estimation of Q_{bar} to predict the 10-, 100-, and 1000-year flows, respectively.

Table 7-4 Estimated and CFRAM Flows

Return Period	Method			
	FSU Flow Estimation	FEH Flow Estimation	IH124 Flow Estimation	CFRAM
Q_{MED}	3.28	3.92	4.15	4.96
Q_{10}	5.96	7.14	7.56	8.77
Q_{100}	10.32	12.36	13.08	15.94
Q_{1000}	16.08	19.26	20.38	27.98

A review of the Eastern CFRAM HA09 Hydrology Report was undertaken to review methods employed by the study to estimate the flow in the Newtownmoyaghy Stream. The findings of the hydrology report found that the IH124 methodology was the most applicable for the Newtownmoyaghy Stream catchment. The CFRAM calculated flows were higher than the flows TOBIN calculated using the IH124 approach. To be conservative, the CFRAM calculated flows were adopted for the hydraulic modelling.

The Eastern CFRAM Hydraulics Report mentions flow spilling from the left bank of the Rye Water upstream of the Meath Bridge flows across the R125 and continues through a field, flowing roughly parallel to the main Rye Water channel. This flow eventually meets the Newtownmoyaghy Stream. Peak flow values of approximately 1.4m³/s, 12.7m³/s and 23.4m³/s were found to occur in the 10%, 1% and 0.1% AEP design runs respectively for this overland flow (Table 7-5).

Table 7-5 Summary of Flows for Newtownmoyaghy Stream

Return Period	Units	Newtownmoyaghy Stream	Lateral inflow
10-year Flow	m ³ /s	8.77	1.40
50-year Flow	m ³ /s	13.40	7.30
100-year Flow	m ³ /s	15.94	12.70
1000-year Flow	m ³ /s	27.98	23.40

The new channel is proposed to be constructed between the months of April and September. Therefore, it is critical to ascertain the probability of an extreme event occurring during these months. Using Annual Maximum flow values from the downstream Leixlip Gauging Station (09001), an EV1 analysis was performed for extreme flow probability for an entire year, and separately for between the months April and September, see Figure 7-11. Based on the hydrological similarity between the catchment descriptors of the Rye Water in Leixlip and the Newtownmoyaghy Stream, it is assumed that the two catchments share similar flood seasonality patterns. Therefore from Figure 7-11, it can be denoted that there is 0.5% chance of a 10% AEP flood event occurring between the months of April and September of a given year (i.e., the 10-year 'annual' flood event $\approx$ 200-year 'summer' event).

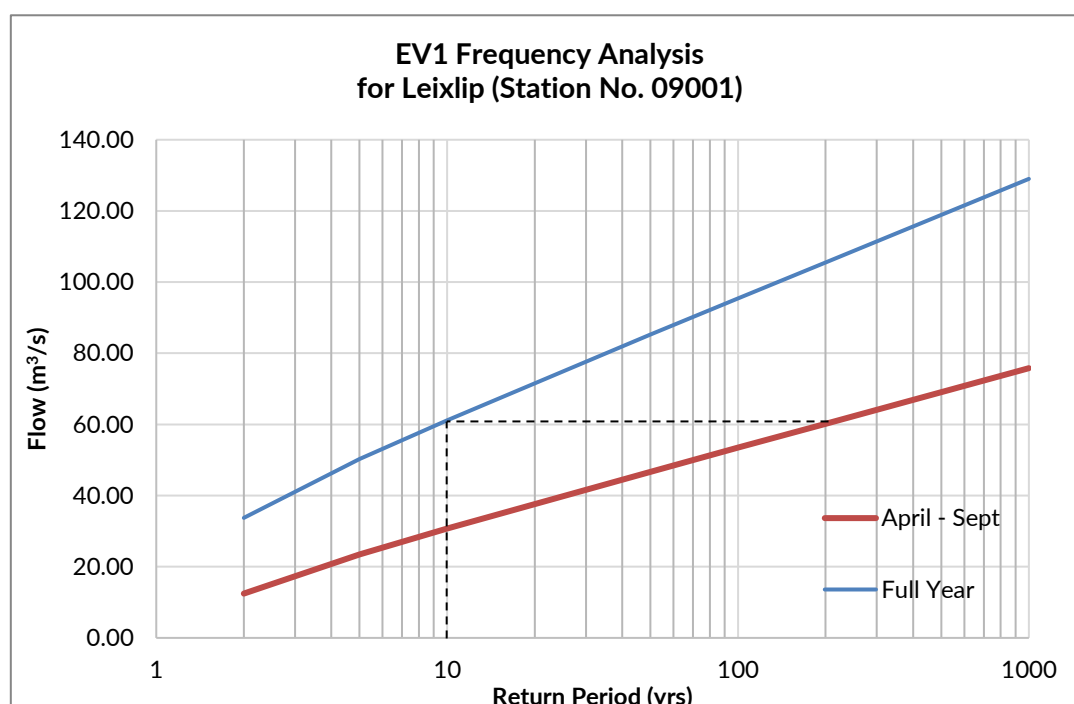


Figure 7-11 EV1 Frequency Analysis

7.5.2 Hydraulic Model Construction

A 1D site-specific hydraulic model of the subject site was developed using the latest version (6.0) of Flood Modeller software. Flood Modeller is designed to perform one-dimensional and two-dimensional hydraulic calculations for a full network of natural and constructed channels. The three primary inputs into the Flood Modeller model are summarised below:

- Geometric Data: Cross-sectional survey of watercourse, bridges, and culverts
- Inflow Data: 10-, 50-, 100-, and 1000-year flows,
- Boundary Condition: Normal Depth downstream boundary
- Terrain Data: 2m OPW DTM

The cross-sectional survey was acquired from the OPW to provide baseline geometric data input for this hydraulic model. The Newtownmoyaghy Stream channel and floodplain were also surveyed by Murphy Geospatial in December 2022. The cross-sectional survey provided geometric data input for this hydraulic model.

This data was supplemented with high-resolution 2m Digital Terrain Model (DTM) LiDAR data to create a ground model of the watercourses and surrounding area.

Roughness values of 0.013, 0.03, 0.04, and 0.06 were applied to the road surface, floodplain, channel, and vegetation/brush respectively, based on published CFRAM values and a review of site photography and channel conditions.

Two hydraulic models were constructed for this project:

- existing channel adjacent to road
- proposed channel east of the road and with existing channel backfilled

See Appendix A for full drawing of modelled cross sections.

Existing Channel

This hydraulic model included four No. bridge structures the details of which are ascertained from OPW cross-sectional data provided. The first bridge, located at cross-section no. 172 (Section 09DOLA00172), is a stone arch bridge that forms part of the Newtownmoyaghy Road. The deck, soffit and invert levels are 67.81mOD, 67.48mOD and 65.55mOD respectively. The bridge opening is approximately 3m wide. The second bridge, located at cross-section no. 170, forms part of the Newtownmoyaghy Road. It is a stone arch bridge with an opening of 1.74m. The deck, soffit and invert levels are 67.06mOD, 66.89mOD and 65.33mOD respectively. The third bridge on the Newtownmoyaghy Stream is located at cross section no. 122 (Section 09DOLA00122). The bridge provides access to a residential dwelling. This residential property is situated within the model boundaries located between sections 09DOLA00141 and 09DOLA00123.

The fourth bridge is located downstream of the study area at cross section 09DOLA00100 and was included in the model to assess any downstream impacts of the proposed scheme.

An overview of the hydraulic model for the existing channel is shown in Figure 7-12.

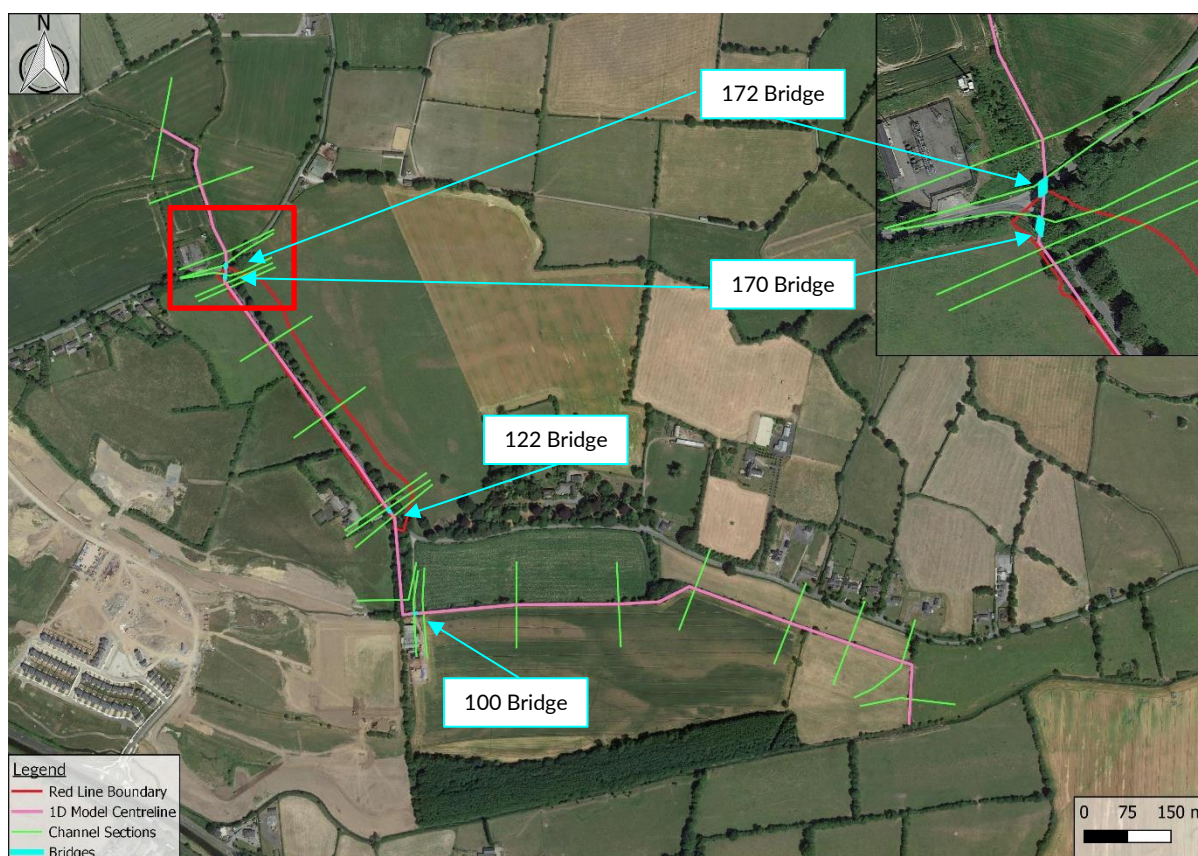


Figure 7-12 Flood Modeller Model Configuration for Existing Channel

Proposed Channel

The new channel will bypass the bridge structure at cross section no.170 (CFRAM Section 09DOLA00170) and travel south to reconnect to the existing Newtownmoyaghy Stream channel via a bridge/box culvert connecting the stream from east to west. Infilling of the existing roadside Newtownmoyaghy Stream will include a conventional filter drain system containing a 400mm pipe to collect primarily surface water road runoff and local drainage on the west side of the road.

This hydraulic model included three No. bridge structures (there is also a proposed field crossing, which if required would be designed such as not to be an impediment to the hydraulic flow conditions). The first bridge is again located at cross-section no. 172 and will keep the same hydraulic properties as in the existing scenario. However, the existing bridge structure at cross-section no.170 no longer serves a primary hydraulic function, except for permitting overtopping overflow from north of the road to backflow to the two-stage channel, with the new channel intercepting the main flows east of the Newtownmoyaghy Road. The proposed channel is designed such that the existing hydraulic conditions are **maintained**, and stream levels are preserved. The new open channel section will operate as a two-stage channel to facilitate a depth of water at low flow. During high flow events, excess water will utilise a wider floodplain cross-sectional area at the higher flood flow elevations.

Arising from the replacement of the roadside stream with a localised filter drainage system and infilling of the bridge crossing at cross section no. 122 (Section 09DOLA00122) which provides access to a residential dwelling, this filter drain is rendered hydraulically redundant except for acting as a local carrier filter drain with 400mm pipe that drains the local area to the west of

the road and accommodating the road surface water run-off. In summary this bridge is removed from the model.

The model incorporates a small section of the existing channel as it will not be backfilled in its entirety. This allows overflow water to continue using the existing path over the road and discharge into the two-stage channel. In simpler terms, an opening near the second bridge will be kept enabling backflow into the two-stage channel. To further accommodate this, the road elevation adjacent to the entrance to the ESB substation will remain the same, and road levels will only gradually be raised (from the 172 bridge onwards) to continue to allow the spill at the right bank of the bridge structure at cross section 172 and over the road in extreme flood events. Doing this will prevent the creation of flood risk elsewhere and will not exacerbate flood risk at the adjacent substation.

The alternative option of raising the road levels in front of the ESB substation, while potentially removing that section of road from the floodplain, could inadvertently exacerbate surcharging at Bridge 172. This may necessitate the subsequent upsizing of the bridge structure, a process requiring a Section 50 application due to potential downstream flood risk implications.

By maintaining road levels adjacent to the substation, no further flood risk is created elsewhere. However, this will maintain the designated overflow path across the road, discharging into the designated section of the existing channel. The proposed channel relocation to the east of the road necessitates a new bridge at the southeasterly end of the Newtownmoyaghy Road near cross-section 118. The proposed bridge structure will consist of multiple box culverts placed in parallel. Sufficient cover from the top of the box culvert to the road level is to be maintained at the road crossing. Again, the cross section will accommodate the two-stage channel design with low flow and high flow sections.

From anecdotal evidence and review of the available CFRAM mapping it is noted that in excess of 300mm of surface water is estimated to exist on sections of the existing road carriageway for the 1% AEP event. Therefore, for the proposed scenario the road has been modelled as being raised by 175mm to accommodate vehicles to pass in higher flood scenarios. Again, the road will be raised gradually at the northern end (near the bridge at Section 170) to continue to allow the spill at the right bank of the bridge structure at cross section 172 and over a short section of road in extreme flood events.

The bridge downstream of the study area at cross section 09DOLA00100 was again included in the model to assess any downstream impacts of the proposed scheme. An overview of the hydraulic model for the proposed channel is shown in Figure 7-13.

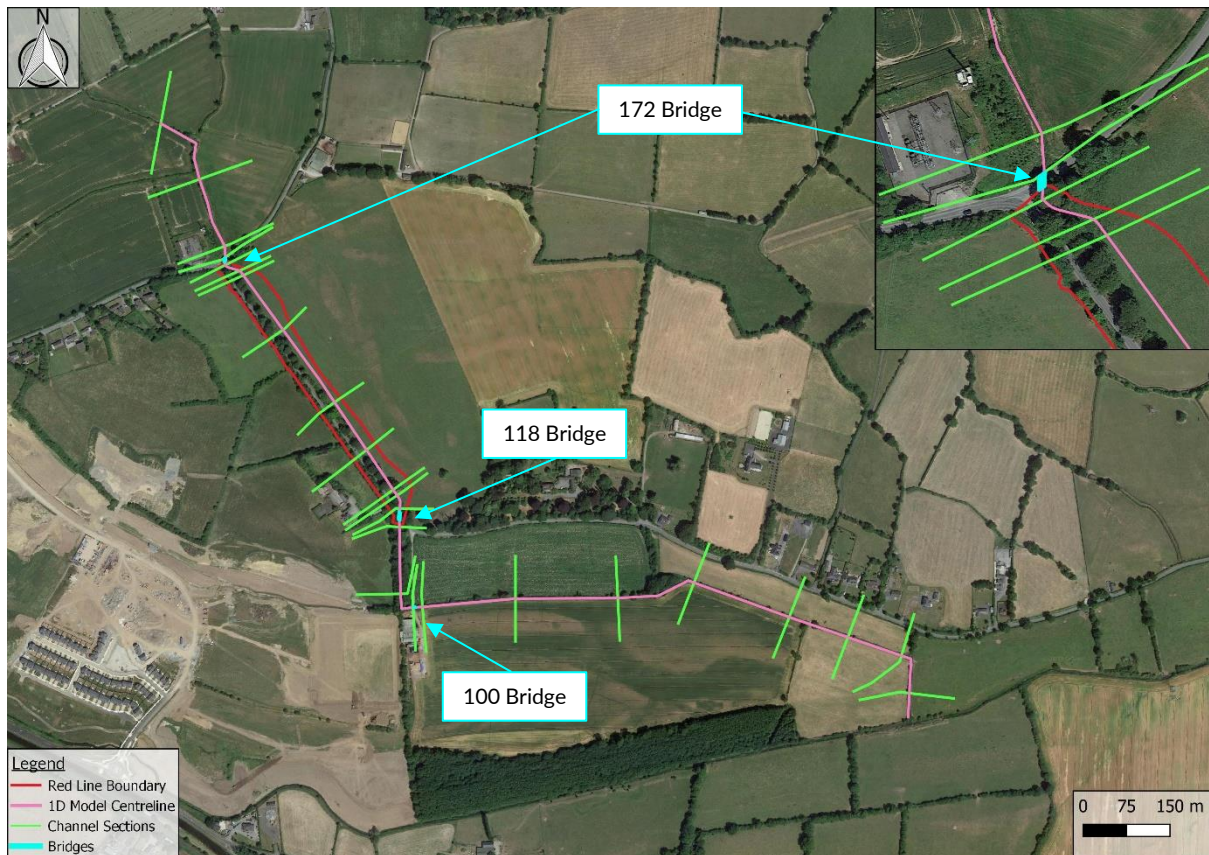


Figure 7-13 Flood Modeller Model Configuration for Proposed Channel

See Appendix A for full drawing of modelled cross sections.

7.5.3 Hydraulic Model Results

Full tabulated cross-sectional results are shown in Appendix B.

Figure 7-14 shows the predicted **10-,100-, and 1000-year** flood extents for the existing scenario in the vicinity of the subject site using the hydraulic model for the existing channel and utilising the CFRAM flows, corresponding to Flood Zones. This has been calibrated against the CFRAM Model.

Issues worth noting on this model scenario are that the Bridge at 122 acts as a hydraulic constraint in the higher flood scenario and the Residential property is at risk of flooding in the higher return period.

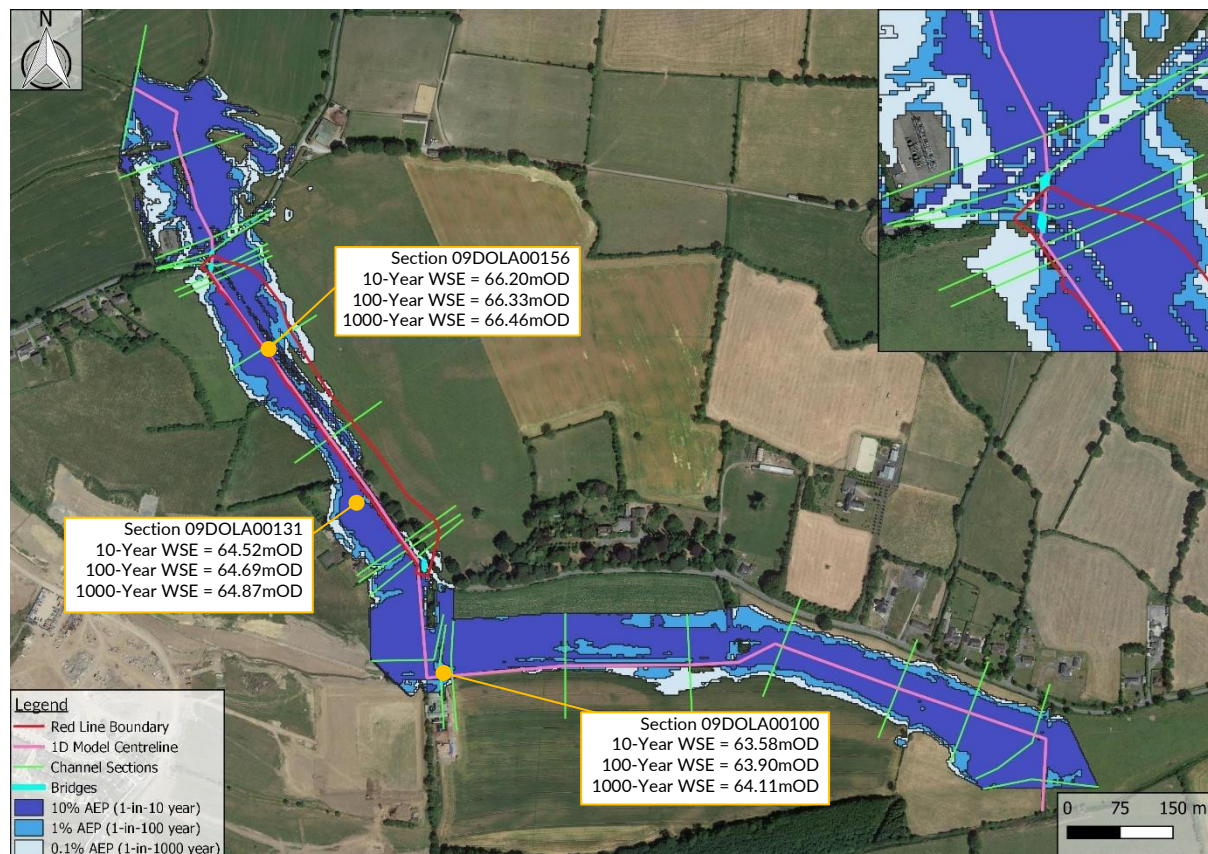


Figure 7-14 Flood Extents for Existing Scenario [10-,100-, & 1000-Year]

Figure 7-15 shows the 10- and 100-year flood extents estimated in the vicinity of the subject site using the hydraulic model for the proposed rerouted channel and the CFRAM Flows estimated as per Table 7-5.

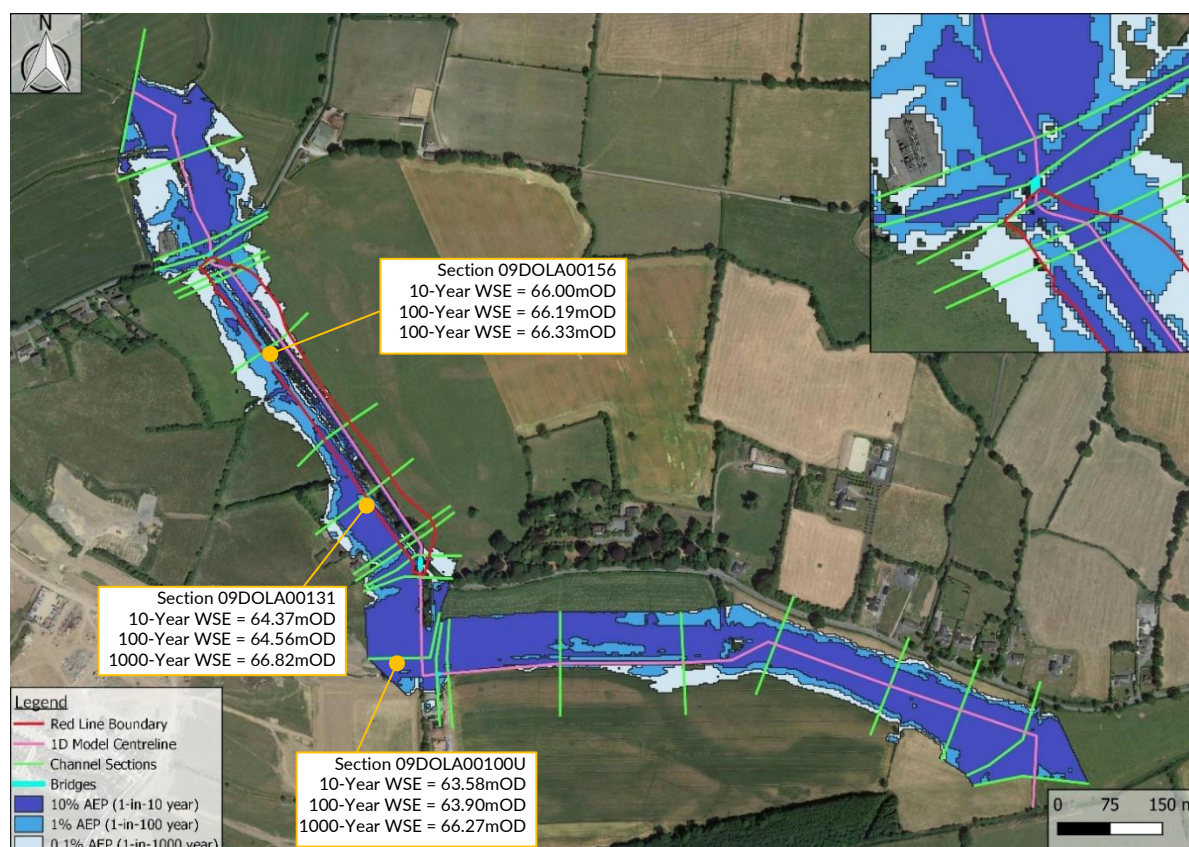


Figure 7-15 Flood Extents for Proposed Scenario [10-, 100-, & 1000-Year]

Table 7-6 and Table 7-7 show the inundation depths along the Newtownmoyaghy Road, for the 10-, 50-, 100-, and 1000-year events, in both the existing and proposed scenarios. The positive heights (highlighted in yellow) signify the inundation at a given cross section. The negative values show the amount of freeboard between the road and the predicted flood level.

In the existing scenario the Newtownmoyaghy road is estimated to be inundated at Section 09DOLA00156 in every modelled return period scenario, with the road elevation at approximately 0.39m below the flood level in the 0.1% AEP event (i.e., max flood depth of 0.39).

In the proposed scenario, flood depth at 09DOLA00156 is reduced to 0.08m in the 1000-year event. This is attributable to:

1. the road having been raised by 175mm.
2. additional hydraulic storage being provided in the 2-stage channel arrangement to account for the loss of hydraulic capacity where the road has been risen, and
3. the removal of a hydraulic constraint that was bridge No. 122

Table 7-6 Inundation along Newtownmoyaghy Road in existing scenario (metres)

Node Label	10-yr	50-yr	100-yr	1000-yr	Road Level (mOD)
09DOLA001695	-0.02	0.01	0.04	0.17	66.80
09DOLA00156	0.12	0.22	0.26	0.39	66.08
09DOLA00141	-0.23	-0.08	-0.02	0.15	65.37
09DOLA00131	-0.61	-0.50	-0.44	-0.26	65.13
09DOLA00122	-0.12	0.03	0.08	0.25	64.27

Flooding on road
No flooding on road

Table 7-7 Inundation along Newtownmoyaghy Road in proposed scenario (metres)

Node Label	10-yr	50-yr	100-yr	1000-yr	Road Level (mOD)
09DOLA001695	-0.49	-0.33	-0.27	-0.10	66.975
09DOLA00156	-0.25	-0.12	-0.06	0.08	66.250
09DOLA00141	-0.52	-0.37	-0.27	-0.10	65.545
09DOLA00131	-0.93	-0.82	-0.74	-0.49	65.305
09DOLA00122	-0.30	-0.23	-0.19	-0.03	64.440

Flooding on road
No flooding on road

See Appendix B for full tabulated results at all of modelled cross sections.

7.5.4 Discussion

As part of this FRA report indicative flood mitigation measures for the proposed scheme were investigated and assessed to quantify the impact on flood risk at the proposed scheme, and elsewhere.

The water level is predicted to drop at every cross section. The construction of the new channel will also render the bridge Section 122 (which provides access to the dwelling) hydraulically redundant, as it will no longer convey flow from the Newtownmoyaghy Stream. The **two-stage cross-section** of the new channel may introduce minor variations in water level. This is due to the differential filling rates between the lower channel and the upper floodplain section, which differs from the behaviour observed in the old channel.

Downstream of the proposed channel and road improvements (Model Nodes 09DOLA00104 to 09DOLA00003), model results show minimal impact to flood risk elsewhere with levels staying identical to pre scheme flood levels.

Table 7-8 Difference in flood levels for Existing and Proposed Scenarios

Description	Node Label	10-yr	50-yr	100-yr	1000-yr
Upstream of Study Area	09DOLA00187	-0.30	-0.21	-0.18	-0.09
ESB Substation	09DOLA00174	-0.13	-0.06	-0.04	-0.02
Newtownmoyaghy Road	09DOLA00172U	-0.22	-0.14	-0.11	-0.05
	09DOLA001695	-0.30	-0.17	-0.14	-0.10
	09DOLA00156	-0.19	-0.17	-0.14	-0.13
	09DOLA00141	-0.11	-0.11	-0.07	-0.07
	09DOLA00131	-0.15	-0.15	-0.12	-0.06
	09DOLA00122	0.00	-0.08	-0.09	-0.11

Rise in water level
Drop in water level

An **ESB substation** is located at Section 09DOLA00174, with flood waters encroaching it from the 10-year event onwards. Water levels are predicted to remain relatively stable with the proposed scheme, with a predicted water level drop in the 10-, 50-, 100-, and 1000-year event of 0.13m, 0.06m, 0.04m, and 0.02m, respectively.

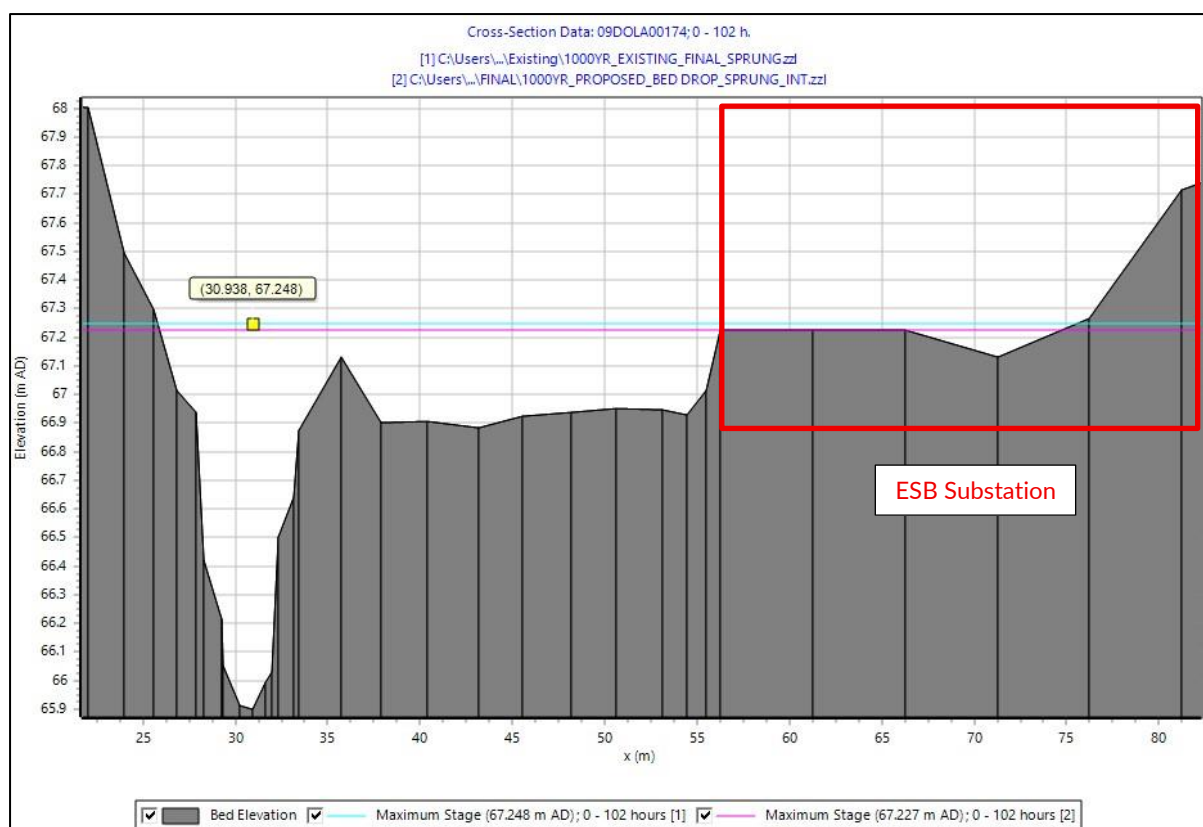


Figure 7-16 1000-year pre and post works flood levels at ESB Substation

The slight drop in water levels may be attributed to the greater capacity of the new proposed channel as well as the small area near the opening of the second bridge which will be kept enabling backflow into the two-stage channel. There is still a spill over the right bank of Bridge 172 which allows water to flow over the road (near the entrance to the ESB substation) and spill into the existing channel. Again, removing this flow path, could inadvertently exacerbate surcharging at Bridge 172, which would otherwise necessitate the subsequent upsizing of the bridge structure, a process requiring a Section 50 application due to potential downstream flood risk implications. By maintaining road levels adjacent to the substation, no further flood risk is created elsewhere. However, a designated overflow path will remain across the road, discharging into the designated section of the existing channel.

As a sensitivity test, the design flows were raised by **3.75%**. This adjustment reflects a similar increase applied to the CFRAM flows (the basis for design flows). This test considers the revised best estimate of $17.60\text{m}^3/\text{s}$ for QMED at the Anne's Bridge gauging station. Even with the slightly increased flows, the difference in flood levels between the existing scenario and the proposed channel design for the 100-year event remained mostly unchanged. Again, there was no increase in flood level witnessed at any cross section. Flood levels at the ESB substation for the adjusted 100-year event were 67.13mOD in the existing scenario and 67.09mOD for the post scheme scenario, showing a 0.04m drop in water levels. The residential property between sections 09DOLA00141 and 09DOLA00123 shows a water level drop in the range 0.13m and 0.40m across the length of the property.

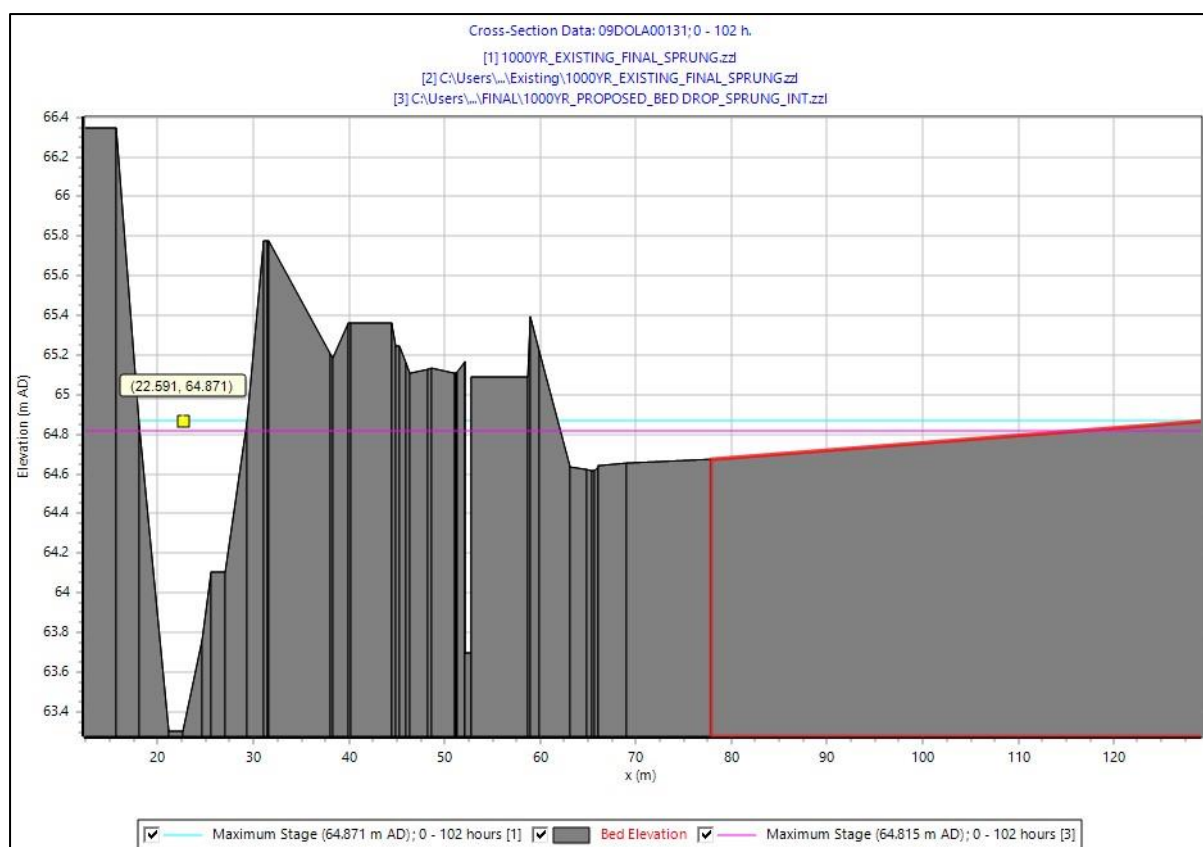


Figure 7-17 1000-year pre and post works flood levels at Residential Property (Note: Pre works flood level is superimposed on proposed cross section)

As another sensitivity test, the 1% AEP MRFS (1-in-100-year event + climate change) event was also simulated, with a 20% increase in peak flood flows. Again, there was no increase in flood level witnessed at any cross section. Flood levels at the ESB substation dropped by 0.03m for the post scheme scenario. The residential property between sections 09DOLA00141 and 09DOLA00123 shows a water level drop in the range 0.10m and 0.05m across the length of the property.

7.6 DETAILED FLOOD RISK ASSESSMENT

With reference to the PSFRM Guidelines, “Local transport infrastructure” (such as the works proposed as part of this scheme) are considered “Less vulnerable” in terms of their sensitivity to flood risk (i.e., Appropriate in Flood Zone B, where the risk of flooding is less than a 1% AEP).

7.6.1 Existing Fluvial Flooding

Based on the results of OPW modelling (CFRAM), the majority of the subject site is located within the predicted 10%, 1%, and 0.1% AEP flood extents. During the current 1% AEP event (without climate change) the CFRAM study estimates that water levels at node 09DOLA00156 at the upstream portion of the subject site to be approximately 66.32mOD. With the road level at node 09DOLA00156 being circa 66.245mOD, it is predicted that this portion of the Newtownmoyaghy Road will be inundated. The levels here for the 0.1% AEP event without climate change are predicted to be 66.42mOD. No MRFS levels were provided by the CFRAM.

The TOBIN hydraulic model indicates that the Newtownmoyaghy Road will be inundated at Section 09DOLA00156 from the 10% AEP event onwards. The road lies 0.26m below the flood level in the 1% AEP event (design event for this scheme). Flooding is also evident at Section 09DOLA001695 from the 50-year event upwards.

7.6.2 Fluvial Flooding Post Works

The proposed project and road improvements will involve changes in existing ground elevations and will optimise surface water drainage to make the area safer for road users within the developed area. The proposed channel is designed such that the existing hydraulic conditions are **maintained**, and stream levels are preserved. Two bridge structures within the existing channel will no longer be used for primary conveyance of flow from the Newtownmoyaghy Stream, however a box culvert is proposed to facilitate the road crossing at the southern eastern end of the site.

A summary of flood levels in the existing and proposed scenarios are shown in Table 7-8.

In the proposed scenario, flooding is relegated to just the 1000-year event at 09DOLA00156, where a flood depth of 0.08m is predicted. The revised channel location, situated further from the road and separated by an area of elevated ground, reduces the risk of flooding affecting the road in the proposed scenario. Additionally, the design of the new channel ensures that it can safely accommodate the flow associated with a 100-year event without breaching its banks. Furthermore, the infilling of the existing roadside Newtownmoyaghy Stream will include a conventional filter drain system and piped system to collect localised surface water road runoff.

Downstream of the proposed channel and road improvements (Model Nodes 09DOLA00104 to 09DOLA00003), model results show minimal impact to flood risk elsewhere.

The most upstream cross section (09DOLA00187), which typically experiences greater variations in water levels, is predicted to drop by up to 0.30 meters from existing water levels in all scenarios.

An **ESB substation** is located at Section 09DOLA00174, with flood waters encroaching it from the 10-year event onwards. Water levels are predicted to remain relatively stable with the proposed scheme, with a predicted water level drop in the 10-, 50-, 100-, and 1000-year event of 0.13m, 0.06m, 0.04m, and 0.02m, respectively.

The slight drop in water levels may be attributed to the greater capacity of the new proposed channel as well as the small area near the opening of the second bridge which will be kept enabling backflow into the two-stage channel. There is still a spill over the right bank of Bridge 172 which allows water to flow over the road (near the entrance to the ESB substation) and spill into the existing channel. Again, removing this flow path, could inadvertently exacerbate surcharging at Bridge 172, which would necessitate the subsequent upsizing of the bridge structure, a process requiring a Section 50 application due to potential downstream flood risk implications. By maintaining road levels adjacent to the substation, no further flood risk is created elsewhere. However, a designated overflow path will remain across the road, discharging into the designated section of the existing channel. A residential property situated within the model boundaries is predicted to be at risk to flooding in the existing scenario and is located between sections 09DOLA00141 and 09DOLA00123. Water levels at 09DOLA00141 drop in all proposed scenarios. This drop is likely since construction of the new channel will render the bridge Section 122 (which provides access to the dwelling) hydraulically redundant, as it will no longer convey flow from the Newtownmoyaghy Stream. The **two-stage**

cross-section of the new channel may introduce minor variations in water level. This is due to the differential filling rates between the lower channel and the upper floodplain section, which differs from the behaviour observed in the old channel. It is also worth noting that the new channel will be located east of the Newtownmoyaghy Stream and will no longer be on the same side of the road as the residential property. Additionally, any surface water that arises on the road will be collected by the introduction of a filter drain containing a 400mm pipe at the infilled channel.

Based on the hydraulic assessment above it is predicted that the proposed channel and road improvements will reduce the probability of flooding along the Newtownmoyaghy Road. This is against a backdrop of where a roadside stream is relocated away from a current location that directly interfaces with narrow roadside edge that has in places collapsed into the stream. The proposed channel is designed such that the existing hydraulic conditions are **maintained**, and stream levels are preserved.

It is also predicted that the proposed channel will not impact flow paths or exacerbate flood risk elsewhere in the area.

7.6.3 Pluvial Flooding

Based on the indicative pluvial flood mapping presented in the OPW Preliminary Flood Risk Assessment, it is estimated that the subject site is not at risk from pluvial flooding during an extreme 0.1% AEP pluvial flood event. There is one area downstream of the subject site that is identified as being susceptible to surface water flooding by GSI mapping. This is located 0.8km east of the subject site and is located adjacent to the confluence between the Newtownmoyaghy Stream and Rye Water. Based on the topographical survey, it is indicated that ground levels tend to gently slope towards the Rye Water.

Therefore, it is estimated that risk of pluvial flooding associated with the proposed development is minimal.

7.6.4 Groundwater Flooding

There are no karst features located in the vicinity of the subject site. There is no record of historical groundwater flooding shown on GSI mapping. Older hydraulic modelling completed by HR Wallingford as part of the PFRA indicated no groundwater flooding in the vicinity of the subject site.

Therefore, it is estimated that risk of groundwater flooding associated with the proposed development is minimal.

7.6.5 Coastal Flooding

The proposed site in Newtownmoyaghy is located more than 30km inland, with minimum site elevations in the region of 63.84mOD. The nearest predicted 0.1% AEP MRFS coastal flood level at Dublin Port is estimated by the Irish Coastal Wave and Water Level Modelling Study (ICWWS) to be approximately 3.80mOD [reference node NE22]¹². Therefore, it is estimated that the subject site is not at risk of coastal flooding.

¹² Irish Coastal Protection Strategy Study—Phase III, Figure No: W / RA / EXT / MRFS / 10 (Dec 2012)

7.7 CONCLUSIONS

Existing Fluvial Flooding:

Based on the results of OPW modelling (CFRAM), most of the subject site is located within the predicted 10%, 1% and 0.1% AEP flood extents. The TOBIN hydraulic model indicates that the Newtownmoyaghy Road will be inundated at Section 09DOLA00156 from the 10% AEP event onwards. The road lies 0.26m below the flood level in the 1% AEP event (design event for this scheme). Flooding is also evident at Section 09DOLA001695 from the 50-year event upwards.

Fluvial Flooding Post Works

The stream channel and road improvements will involve changes in existing ground elevations and will optimise surface water drainage within the developed area. The proposed channel is designed such that the existing hydraulic conditions are **maintained**. Two bridge structures within the existing channel will no longer serve a primary hydraulic function, however a box culvert is proposed to facilitate a new road crossing at the southern eastern end of the site.

In the proposed scenario, flooding is relegated to just the 1000-year event at 09DOLA00156, where a flood depth of 0.08m is predicted. The revised channel location, situated further from the road and separated by an area of elevated ground, reduces the risk of flooding affecting the road in the proposed scenario. Additionally, the infilling of the existing roadside Newtownmoyaghy Stream will include a conventional filter drain system and piped system to collect surface water road runoff.

Downstream of the proposed channel and road improvements, model results show minimal impact to flood risk elsewhere (water level change of <0.01m).

Upstream of the site, section 09DOLA00187, the water level is predicted to drop by up to 0.30m from existing water levels in all return periods.

An **ESB substation** is located at Section 09DOLA00174, with flood waters encroaching it from the 10% AEP event onwards. Water levels are predicted to remain relatively stable with the proposed scheme, with a predicted water level drop in the 10-, 50-, 100-, and 1000-year event of 0.13m, 0.06m, 0.04m, and 0.02m, respectively.

There is still a spill over the right bank of Bridge 172 which allows water to flow over the road (near the entrance to the ESB substation) and spill into the existing channel. Again, removing this flow path, could inadvertently exacerbate surcharging at Bridge 172, which would necessitate the subsequent upsizing of the bridge structure, a process requiring a Section 50 application due to potential downstream flood risk implications. By maintaining road levels adjacent to the substation, no further flood risk is created elsewhere. However, a designated overflow path will remain across the road, discharging into the designated section of the existing channel.

A residential property situated within the model boundaries is predicted to be at risk to flooding in the existing scenario and is located between sections 09DOLA00141 and 09DOLA00123. Water levels at 09DOLA00141 drop in all proposed scenarios. This is likely since construction of the new channel will render the bridge Section 122 (which provides access to the dwelling) hydraulically redundant, as it will no longer convey flow from the Newtownmoyaghy Stream.

The **two-stage cross-section** of the new channel may introduce minor variations in water level. This is due to the differential filling rates between the lower channel and the upper floodplain section, which differs from the behaviour observed in the old channel. It is also worth noting that the new channel will be located east of the Newtownmoyaghy Stream and will no longer be on the same side of the road as the residential property. Additionally, any localised surface water that arises on the road will be collected by the introduction of a filter drain containing a 400mm pipe at the infilled channel.

Based on the hydraulic assessment above it is predicted that the proposed channel and road improvements will reduce the probability of flooding along the Newtownmoyaghy Road. This is against a backdrop of where a roadside stream is relocated away from a current location that directly interfaces with narrow roadside edge that has in places collapsed into the stream. The proposed channel is designed such that the existing hydraulic conditions are **maintained**, and stream levels are preserved.

It is also predicted that the proposed channel will not impact flow paths or exacerbate flood risk elsewhere in the area. Again, it is worth noting that there will continue to be a spill over the right bank of Bridge 172 which allows water to flow over the road (near the entrance to the ESB substation) and spill into the existing channel. Removing this flow path, would otherwise have the potential to exacerbate flooding elsewhere, therefore this flow path must be maintained.

Pluvial Flooding:

Based on the indicative pluvial flood mapping presented in the OPW Preliminary Flood Risk Assessment, and seasonal flood mapping from the Geological Survey Ireland (GSI), it is estimated that the risk of pluvial flooding at the subject site is minimal.

Again, any surface water that arises on the road will be collected by the introduction of a filter drain containing a 400mm pipe at the infilled channel.

Groundwater Flooding:

Based on a review of GSI subsurface mapping of karst features, historic and predicted groundwater flooding in the area, and the PFRA study, the risk of groundwater flooding predicted at the proposed scheme location is minimal.

Coastal Flooding:

It is estimated that the lands are not at risk of coastal flooding due to their elevation.

8.0 TRAFFIC

8.1 INTRODUCTION

This chapter describes the existing traffic situation and presents an assessment of the potential for impacts arising from the works.

8.2 METHODOLOGY

The primary haul route for the Newtownmoyaghy Road also known as the Moyglare Road will be via the existing R125 and R148 roads.

Traffic volumes associated with the works are low in number and relate primarily to the delivery of construction equipment and materials. The methodology used investigates the potential traffic impact and proposes mitigation measures to control potential impacts, including the development and implementation of a Construction Stage Traffic Management Plan by the appointed contractor(s).

8.3 RECEIVING ENVIRONMENT

8.3.1 Development Location

The development location is as laid out in previous chapters on Newtownmoyaghy Road is a local secondary road situated approx. 1km from the town centre of Kilcock Co. Meath. The road, located to the Northeast of the town serves as a busy link road between Kilcock and Maynooth especially at peak traffic commuter times enabling vehicles to avoid the busy R148.

Existing Road Network

The Newtownmoyaghy Road is rural in location and would be classified as a local road based on the existing cross section which varies between 4-6m. The narrow existing cross section requires passing vehicles to operate at points in a give way operation in the localised wider areas. With a tributary of the River Rye (Newtownmoyaghy Stream) running parallel to the Westbound lane, the narrow carriageway points present a serious safety concern to drivers and vulnerable road users alike. Areas of the carriageway edge which drop directly into the stream have also been noted to show signs of subsidence further highlighting the risk.

During peak traffic times commuters use the Newtownmoyaghy Road as a 'bypass' or 'rat run' for vehicles avoiding traffic congestion in Kilcock and Maynooth.

A traffic count survey was procured on behalf of Meath County Council in March 2023. Traffic volumes were obtained from a temporary installed automatic traffic counter located on the Newtownmoyaghy Road just South of the bridge in March 2023 (Figure 8-1). Two additional Junction turning counts were conducted as part of the assessment.

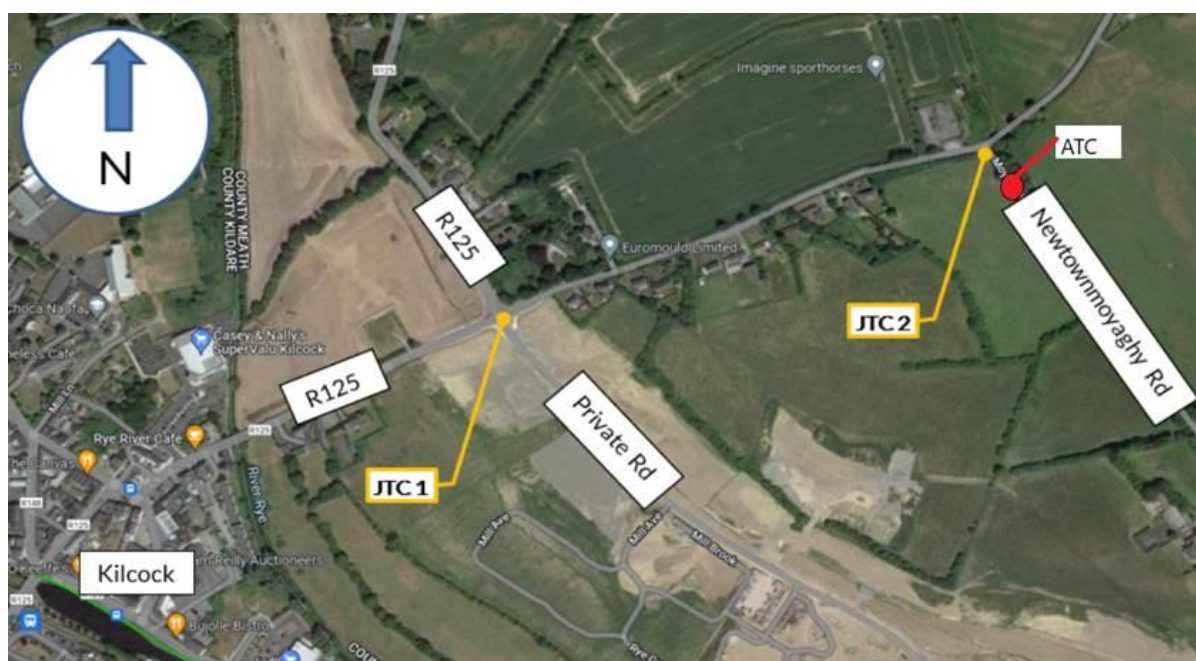


Figure 8-1 Traffic counter locations

Table 8-1 Traffic count data

Automated Traffic Counter (06-12/03/23)	2023
AADT	2,399
%HGV	8.2%

The speed limit on this section of the Newtownmoyaghy road (Moyglare Road) is 60kph.

8.3.2 Proposed Network Improvements

The Newtownmoyaghy Road at this location is substandard in terms of cross-sectional width. With a tributary of the River Rye running parallel to the Westbound lane, the narrow carriageway presents a serious safety concern to drivers and vulnerable road users.

The proposed scheme consists of constructing a new diversion stream in Newtownmoyaghy through agricultural lands on the East side of the Existing Road. This is with a view to closing up the existing open channel Newtownmoyaghy Stream running adjacent to the Newtownmoyaghy Road (Figure 8-2)

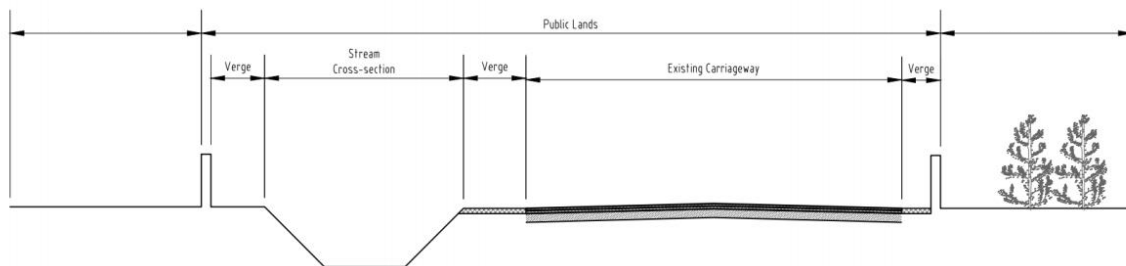


Figure 8-2 Existing cross-sectional layout

The existing roadside stream channel will be backfilled with suitable material including recovered material deemed suitable for reuse from the new channel excavation. This will provide the additional width required for a Type 3 Single (6.0m) Carriageway and widened grass verge, as shown in Figure 8.3 below. The level of the road will be raised by approximately 150-175mm throughout the sections of road subject to flooding. The overall goal of the works is to provide safety and pavement upgrades for all road users to minimise risk of errant vehicles / users leaving the roadway.

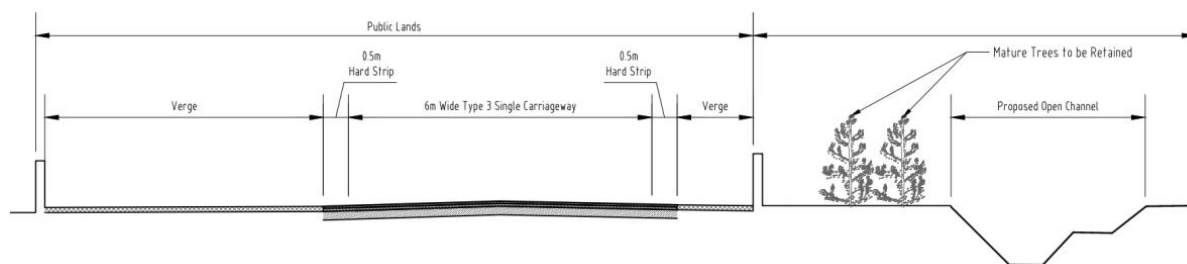


Figure 8-3 Proposed cross-sectional layout

8.3.3 Public Transport

There is no scheduled public transport links running through the subject site.

8.4 POTENTIAL IMPACTS

8.4.1 Predicted Traffic Impact During Development Works

Construction equipment and vehicles required for each construction element / operation will be delivered to site by appropriate vehicles. The vehicles required for the construction of the road improvement are shown in Table 8-2. The main activities associated with the works that will have a potential impact on traffic are as follows:

- **Earthworks/Stream Realignment** - Construction of the proposed new stream on private lands. Backfilling of the existing Newtownmoyaghy Stream adjacent to the road with suitable material including recovered material deemed suitable for reuse from new channel excavation. This work will be mainly carried out off-line but will require interface with Newtownmoyaghy Road traffic for access and egress.
- **General Road Construction** – this includes the road widening and construction of the proposed new verge and filter drain containing a 400mm pipe. Excavation and removal of material is required to construct the proposed improvements. Imported stone and acceptable material will be placed as excavation proceeds.

- Pavement Works – As construction nears the required level, specialist equipment is required to place stone and bituminous bound materials to the appropriate standard. This will be carried out exclusively on the road surface and will require a lane closure.
- Works associated with finishing works including landscaping and line marking will have a minimal impact on traffic.

Table 8-2 Construction Vehicles

	Excavation and General Road Construction	Pavement Works	Lining, landscaping and finishing works
Construction Vehicles and equipment	Tracked Excavators	Paving machine	Mini Tracked Excavator
	Rollers	Planer	Dumper (6 Tonne)
	Tractor & Trailer	Rollers	Line marking lorry
Materials Delivery Vehicles	Delivery / Haulage Trucks	Delivery / Haulage Trucks	Delivery Truck
Staff / Site Vehicles	Four-Wheel Drive	Four-Wheel Drive	Four-Wheel Drive
	Small Vans	Small Vans	Small Vans

It is envisaged that a peak in material delivery vehicles will occur during the pavement section of the works where vehicles are required to line up in convoy to keep the paving machine with enough material to lay to the standards required. An estimated 6 delivery vehicles per hour could be required for this operation.

At the peak of construction, it is anticipated that there will be a requirement for 20 construction workers required at the site. All staff will be required to report and park at the construction site compound. Given the nature of roadworks and their linear nature, construction supervision staff may be required to address issues along the site and therefore, may require a vehicle to travel the site.

The capacity of a Type 3 single carriageway (of 6.0m in width) is 5,000 Annual Average Daily Traffic. The current volume of traffic on the road is 2,399. The low traffic movements for materials delivery vehicles, construction vehicles and equipment and staff / site vehicles envisaged for the works along the Regional/Local Road network are considered to result in minimal impacts on existing traffic levels. There is sufficient capacity along the Regional Road to accommodate the anticipated peak traffic related to this project on the surrounding road network.

There will be temporary disruption to the Newtownmoyaghy Road traffic during construction with single lane closures during online works and a one-day road closure for installation of the of the box culvert sections.

8.4.2 Predicted Traffic Impact During the Operational Phase

There will be no additional construction or maintenance traffic movements associated with the proposed works during the operational phase. There is provision of space within the widened grass verge that it could accommodate a shared cycle and pedestrian facilities at a future date.

8.5 MITIGATION MEASURES

8.5.1 Traffic Management

On completion of the detailed design, a preliminary construction traffic management plan will be developed by the designer and further developed by the appointed contractor to minimise the effects of traffic on the existing road network. This will be a living document and will be amended to facilitate any changes in mainline traffic flow or construction related traffic. This plan will include:

- Geometric Design;
- Position of traffic control point, signals and flag men;
- Width of Lanes;
- Working Areas;
- Safety Zones;
- Crossovers;
- Running lane / provision for emergency vehicles;
- Access and exit locations for construction vehicles;
- Access and exit locations for businesses, property owners and other users;
- All temporary traffic signs, cones, barriers and traffic control signals necessary for the safe direction and control of public traffic and other road users;
- Temporary road lighting ;
- Provision for pedestrians and cyclists, including road crossing details;
- Provision for Temporary Bus Stops where Traffic Management proposals require the removal of an existing Bus Stop;
- Protection/diversion of services, supplies and the like;
- Requirements for Temporary Emergency Telephones;
- Extent of lane closures;
- Details of plant working in the vicinity of the works, and measure to be implemented to ensure public safety;
- Taking up and reinstatement of road studs and markings;
- Existing and proposed permanent road studs and markings;
- Existing and proposed temporary road studs and markings;
- When no road markings and studs are in place during works, lanes will be delineated by cones and Steady State Lamps to delineate edge of travel through night works;
- Phasing of works;
- Timing of operations; and
- Preventing mud and dust on public roads.

8.5.1.1 Site Access & Egress

The construction compound and welfare facilities will be located adjacent to the road in the areas shown within the site application boundary. All oils and solvents used during the construction phase of the development will be stored within specially constructed dedicated bunded areas. This will minimise any impact on the underlying sub-surface strata. Refuelling of

construction vehicles and the addition of hydraulic oils to vehicles, will take place in a designated area of the site, away from surface water features. Spill kits and hydrocarbon adsorbent packs will be stored in this area of the site and operators will be fully trained in the use of this equipment.

The compound will consist of a hardstanding area housing all necessary site offices, site reception, spill kits, canteen and welfare facilities for construction workers. Necessary Covid-19 prevention measures (such as hand wash stations, sign in areas, temperature check areas, etc) will also be identified within the submission, as required. Portaloo's will be provided in the compound initially, with if deemed necessary by the appointed contractor under their welfare requirements, a dedicated toilet block installed at a later date and connected to the existing foul drainage network. Electrical and potable water supply will be provided via temporary connections to the existing services located near the site, in agreement with the service providers. Car parking for construction workers and visitors will be located within the construction compound. Waste facilities will be located within the site compound as necessary. Containers and skips intended for construction waste will be located close to works areas, as required.

The construction site compound will include provision for dust control, surface water control and wheel washing facilities. Incoming construction materials will be offloaded and stored within a materials compound. Location of the site works compound shall be key in ensuring that the vehicular movements do not cause overt disruption in the town.

The site entrances will be sufficiently wide for Heavy Good Vehicles (HGVs) and construction vehicles to enter the site without causing an obstruction on the road network. Provision will be made to ensure there is sufficient space within the site for HGVs to turn before joining the public road network.

Signage will be erected on all approaches to the site to notify motorists of the construction works ahead. Signage at the site entrances will be provided to ensure members of the public do not enter the site road mistakenly.

The site will be secured using temporary fencing or hoarding at all times to ensure that the ongoing works are separated from the public. Netting will be erected on any fencing used, where required, to prevent debris and dust release from the site and provide screening of the construction and demolition works. A secure lockable gate will be erected at the site entrance and visitors to the site will be directed to the adjacent site office. The site management team will carry out regular inspections and maintenance of the security fencing/hoarding while also ensuring areas are kept clean.

Deliveries of materials, plant or machinery to site will be restricted to the working hours identified above. Deliveries will be scheduled as "just-in-time" to ensure the arrival and departure of vehicles will have minimal interference with local residents and other road users. Just-in-time deliveries will also reduce the quantity of materials stockpiled within the site. Deliveries will not be allowed to queue on public roadways.

8.5.1.2 Traffic Management Signage

The following measures will be incorporated into requirements for the contractor:

- Consultation with the relevant authorities for the purpose of identifying and agreeing signage requirements;

- Provision of temporary signage in accordance with Chapter 8 of the Traffic Signs Manual
- Provision of general information signage to inform road users and local communities of the nature and locations of the works, including project contact details.

8.5.1.3 Routing of Construction Traffic

The following measures will be incorporated into requirements for the contractor:

- Permitted access routes to and from the Site shall be via the national and regional road network. The Contractor, his Sub-Contractors and Suppliers shall access\exit the site by sharing road space with through traffic.
- Site access/egress points shall be designed taking into account existing traffic volumes and anticipated type and volumes of site generated traffic.
- Dump trucks, including articulated dump trucks engaged in material haulage are not permitted on the public road network. Importation of materials and disposal of material off-site shall only be carried out utilising tipper lorries to the approval of the Employer's Representative.
- The Contractor, his subcontractors and suppliers shall use only these Permitted Access Routes for all purposes in connection with the works (including the import of acceptable and disposal of unacceptable materials) unless otherwise agreed by the Employer's Representative.
- At any site haul route crossing of public or private right of way, a speed limit of 15kph shall be enforced on the haul route within 50 metres of the crossing.
- The Contractor shall comply with the maximum permissible loads for public roads in Ireland.

8.5.1.4 Timing of Material Deliveries

Deliveries of materials, plant or machinery to site will be restricted to the working hours identified above. Deliveries will be scheduled as "just-in-time" to ensure the arrival and departure of vehicles will have minimal interference with local residents and other road users. Just-in-time deliveries will also reduce the quantity of materials stockpiled within the site. Deliveries will not be allowed to queue on public roadways.

8.5.1.5 Recommended Traffic Management Speed Limits

The speed limit on this section of the Newtownmoyaghy road (Moyglare Road) will be maintained at the existing speed limit of 80kph post works but temporary construction stage speed limit will be subject to review where works are planned on and directly adjacent to the road carriageway.

8.5.1.6 Road Cleaning

- Regular condition surveys of the road network in the vicinity of the site be required
- Where identified / required, the contractor(s) shall carry out road sweeping operations, employing a suction sweeper, to remove any project related dirt and material deposited on the road network by construction / delivery vehicles.
- The contractor(s) shall also ensure that if mud / debris is carried out onto the road when the road sweeper is not present, site staff shall immediately manually clear the debris from the road, under appropriate temporary traffic management control.

8.5.1.7 Enforcement of Traffic Management Plan

All project staff and material suppliers will be required to adhere to the Construction Stage TMP. As outlined above, the principal contractor(s) shall agree and implement monitoring measures to monitor the effectiveness of the Construction Stage TMP and compliance will be monitored by the Site Engineer/Site Manager. Spot checks will also be carried out to ensure that all project staff and material supplies follow the agreed measures adopted in the Construction Stage TMP. Temporary Safety Measures Inspections will be carried out in accordance with CC-STY-04002 of TII Publications.

8.5.1.8 Emergency Procedures During Construction

In the case of an emergency the following procedure shall be followed:

- Emergency Services will be contacted immediately by dialling 112;
- Exact details of the emergency/ incident will be given by the caller to the emergency line operator to allow them to assess the situation and respond in an adequate manner;
- The emergency will then be reported to the Site Team Supervisors and the Safety Officer;
- Where required, appointed site first aiders will attend the emergency immediately; and
- The Safety Officer will ensure that the emergency services are en route.

8.6 CONCLUSION

The proposed project will utilise the National Road network for the construction of the proposed project. Traffic volumes associated with the works are low in number and relate primarily to the delivery of construction equipment and materials. The implementation of an approved Construction Stage Traffic Management Plan will minimise the potential for traffic and transport impacts during construction activities and there will be no residual impact.

9.0 AIR QUALITY – DUST

9.1 METHODOLOGY

As outlined in the TII Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes, assessing the impact and sensitivity of a road is based on the number of properties that could potentially be directly affected.

9.2 RECEIVING ENVIRONMENT

Refer to Section 2.0 for details of existing environment.

The nearest air quality monitoring station to the proposed development site is Station 68, located in Navan Co Meath. The air quality is regularly indicated as ‘Good’ on the EPA Environment Monitoring Website. The EPA air quality index is calculated based on the latest available measurements of ozone, nitrogen dioxide, PM10 and Sulphur Dioxide. Air quality in the county is therefore very good and falls well within EPA standards. The greatest threats to air quality are localised and relate to car emissions and fuel consumption.

9.3 POTENTIAL IMPACTS

There will be some dust and exhaust emissions from construction activities during the construction phase. These impacts will be temporary in duration and are not considered likely to give rise to significant impacts following the implementation of mitigation measures. Dust or pollutants generated from the proposed development will typically arise from:

- Movement of construction vehicles;
- Transport of construction materials to and within the site;
- Excavation, movement and placement of material and stockpiles (excavated soils / fill materials); and
- Wind generated dust from stockpiles and exposed unconsolidated soils and roads.

As the plant and equipment required for the construction of the development will include small scale construction machinery, machine emissions are not expected to be any greater than those used in the construction of domestic and agricultural buildings.

At operational stage no increased traffic is considered likely further to the works, rather the scheme aims to improve an existing substandard stretch of road for all users. Also, given the minimal change to the alignment, the difference in air quality during the operational phase will be negligible. Overall the potential for impacts on air quality is not seen as a significant constraint.

9.4 MITIGATION MEASURES

Potential impacts during the construction stage arising from dust emissions will be minimised through the provision of mitigation measures that will be incorporated into the Construction Environmental Management Plan.

The Contractor will have due regard to relevant guidance such as The Control of Dust and Emissions during Construction and Demolition published by the Greater London Authority (GLA) in 2104 and Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes published by the NRA in 2011.

In order to minimise emission of pollutants from plant and equipment, the following measures will be implemented during the construction works:

- Regular maintenance of plant and equipment will be carried out to ensure that the equipment is operated efficiently and generating minimal air emissions
- Plant or equipment will not be left running unnecessarily and low emission fuels will be used.

The greatest potential impact on air quality during the construction stage will be from dust emissions associated with the construction works. The proactive control of fugitive dust, rather than an inefficient attempt to control dust once released will ensure the prevention of significant emissions. The following measures will be implemented to minimise the potential for dust generation:

- Minimisation of extent of working areas;
- Stockpiling of excavated materials will be limited to the volumes required to practically meet the construction schedule;
- Drop heights of excavated materials into haulage vehicles will be minimised to a practicable level; and
- Daily inspections by site personnel to identify potential sources of dust generation along with implementation measures to remove causes where found.

The following sets out the basis as a Dust Management Plan (DMP), which sets out the measures that will be implemented by the Contractor to minimise and control dust emissions. This DMP will be updated by the Contractor in the CEMP to account for any additional measures identified.

The potential for dust to be emitted depends on the type of construction activity being carried out in conjunction with environmental factors including levels of rainfall, wind speeds and wind direction. The potential for impact from dust depends on the distance to potentially sensitive locations and whether the wind can carry the dust to these locations. The majority of any dust produced will be deposited close to the potential source and any impacts from dust deposition will typically be within 200m of the construction area.

In order to ensure mitigation of the effects of dust nuisance, a series of measures will be implemented.

- Site access roads shall be regularly cleaned and maintained as appropriate; dry sweeping of large areas shall be avoided.
- Hard surface access roads shall be swept to remove mud and aggregate materials from their surface while any un-surfaced access roads shall be restricted to essential site traffic only.
- Any road that has the potential to give rise to fugitive dust must be regularly watered, as appropriate, during dry and/or windy conditions.
- Vehicles delivering material with dust potential to an off-site location shall be enclosed or covered with tarpaulin at all times to restrict the escape of dust.
- Vehicles exiting the site will make use of a wheel wash facility prior to entering onto public roads to ensure mud and other wastes are not tracked onto public roads.
- Public roads outside the site shall be regularly inspected for cleanliness on a daily basis and cleaned using a street sweeper, as necessary.
- Before entrance onto public roads, trucks shall be adequately inspected to ensure no potential for dust emissions.

The following measures will be implemented to prevent significant dust emissions from material stockpiles.

- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind.
- Sand and other aggregates will be stored in bunded areas and not allowed to dry out unless this is required for a particular process, in which case appropriate additional control measures will be put in place.
- Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods.
- At all times, the procedures put in place shall be strictly monitored and assessed.
- In the event of dust nuisance occurring outside the site boundary, appropriate procedures shall be implemented to rectify the problem.

The DMP shall be reviewed at regular intervals during the construction phase to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practices and procedures. Community engagement before works commence on site will be put in place, including a communications plan. All dust and air quality complaints shall be recorded, and causes identified, along with the measures taken to reduce emissions. Daily on and off-site inspections shall occur for nuisance dust and compliance with this DMP. This shall include regular dust soiling checks of surfaces such as street furniture, windows, and cars within 100m of the site boundary. Cleaning shall be provided if necessary.

9.5 CONCLUSION

The implementation of the above mitigation measures will ensure that construction works at the proposed development will not result in an increase in dust levels in the local environment and the potential impact on air quality will be low. It is not anticipated that there will be any impact on air quality because of the operational phase of the development.

10.0 NOISE & VIBRATION

10.1 METHODOLOGY

10.1.1.1 Noise

There is no published statutory Irish guidance relating to the maximum permissible noise level that may be generated during the Construction Phase of a project. Local authorities normally control construction activities by imposing limits on the hours of operation and consider noise limits at their discretion. In general, higher noise levels are generally accepted during a short-term Construction Phase of a project compared to its long-term Operational Phase, as construction works are temporary and tend to be varied.

In the absence of specific statutory guidance, reference has been made to the TII Noise Guidelines 2004 (TII 2004) and TII Noise Guidelines 2014 (TII 2014) in order to set appropriate noise construction criteria. Given that the proposed development will involve a stream diversion construction works adjacent to a road, in private lands, with minor road realignment and resurfacing works, the construction noise criteria outlined in these documents are considered to be the most relevant and appropriate to the proposed project. The TII Noise Guidelines 2004 and TII Noise Guidelines 2014 specify noise levels that are deemed acceptable in terms of construction noise.

During operation, there are no anticipated changes in volumes of vehicle, cycling or foot traffic currently experienced on the existing roadway.

10.1.2 *Vibration*

BS 7385-2 Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration (BSI 1993) gives guidance regarding acceptable vibration in order to avoid damage to buildings. BS 5228-2 Code of practice for noise and vibration control on construction and open sites: Vibration (BSI 2008) reproduces these same guidance values.

During operation, there are not anticipated vibrations effects considered over and above the existing use of the roadway.

10.2 RECEIVING ENVIRONMENT

Refer to previous description under section 2.0

10.3 POTENTIAL IMPACTS

10.3.1 *Noise*

It is predicted that during the construction phase of the proposed development, noise relating to typical construction activities will be generated on site and within the surrounding area. During the construction phase of the proposed development, a variety of items of plant will be in use, such as excavators, lifting equipment, dumper trucks and so on.

The proposed general construction hours are 07:00 to 17:00hrs, Monday to Friday and 08:00 to 14:00hrs on Saturdays. Occasional weekday evening works may also be required; however evening activities will be significantly reduced in order to manage any associated noise impacts in an appropriate manner and more stringent construction noise criteria will be applicable

during any evening works that may be required. As a result, noise emissions from evening activities are expected to be significantly lower than for other general daytime activities.

During operation, no increase in noise levels is anticipated over and above the existing noise levels connected with usage of the existing roadway.

10.3.2 Vibration

The potential for vibration at neighbouring sensitive locations during construction is typically limited to excavation works and lorry movements on uneven road surfaces. Given the small scale nature of works involved, it is not anticipated that the proposed development will give rise to significant vibration effects during construction and the available site investigation information would indicate that rock is unlikely to be encountered.

During operation, no increase in vibration is anticipated over and above the existing levels experienced in connected with the usage of the existing roadway.

10.4 MITIGATION MEASURES

10.4.1 Noise

The TII guidance document specifies noise level limits that it typically deems acceptable in terms of construction noise. To adhere to these levels and number of conditions will be imposed on the successful contractor during construction:

The Contractor shall comply with the contents and recommendations of BS 5228: Parts 1 and 2, the TII's "Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes, 2014" and European Union (Environmental Noise (Directive 2002/49/EC of the European Parliament and of the Council of 25th June 2002 relating to the Assessment and Management of Environmental Noise.

The Contractor shall employ the best means practicable to minimise the noise produced by on Site operations. Permitted normal working hours will be in accordance with Table 1.

Works other than emergency works shall not be permitted outside these working hours. Emergency works may include the replacement of warning lights, signs and other safety items on public roads, the repair of damaged fences, repair of water supplies and other services which have been interrupted, repair to any damaged temporary works and all repairs associated with public safety and working on public roads.

The Contractor shall deal with any complaints in relation to noise and vibration immediately and appropriate measures taken where the limits exceed those specified in Table 10-1.

The ambient noise level, L_{Aeq} (1hr), from all sources measured 2.0m above the ground at noise control station shall either not exceed the appropriate level given in the Schedule or not exceed by more than 3dB(A) the existing ambient noise level, L_{Aeq} , control station measured over the same period, whichever level is greater. The maximum sound level at any noise control station shall not exceed the level given in the Schedule.

All vehicles and mechanical plant used on the works shall be fitted with effective exhaust silencers and shall be maintained in good and efficient working order for the duration of the works in compliance with BS 5228. All compressors shall be "sound reduced" models fitted with properly lined and sealed acoustic covers and shall be kept closed whenever the machines are in use. Any ancillary pneumatic percussive tools shall be fitted with mufflers or silencers of the type recommended by the manufacturers. Pumps and mechanical static plant shall be enclosed by acoustic sheds or screens.

The Contractor shall organise operations with regard to the positioning of plant and the location of haul routes etc., so it minimises Construction noise to adjacent properties.

Table 10-1: Permitted Noise Levels

Schedule		Total Noise Levels at Control Stations		
Period	Hours	Ambient Noise Level, LAeq measured at Control Station: dB(A)	Period of Hours over which LAeq is applicable	Maximum Sound Level (see Note(iv) below measured at Control Station: dB(A))
Mondays to Fridays	09:15-17:00	70	15 Mins	80*
Mondays to Fridays	20:00-06:00	60*	15 Mins	65*
Saturdays	08:00 – 16:30	65	15 Mins	75
Sundays and Bank Holidays	09:00 – 16:00	60*	15 Mins	65*
All unattended plant outside normal working hours		45		

To ensure compliance with the specified noise limit in Table 1, monitoring at Control stations shall be undertaken by the Contractor using a sound level meter. Control Stations shall be established having regard to the nature of the work being carried out, its location and proximity of noise sensitive buildings. The location of the Control Stations need not be within the Works, but the Contractor shall obtain all necessary permissions for stations located outside the Site. The Contractor shall provide for at least two No. separate noise monitoring stations to be in operation at any one time at selected locations specified by the Employer's Representative. The location of the Control Stations shall move relative to the progression of the Works.

The Contractor shall provide instrumentation suitable for monitoring noise. Each sound level meter shall be certified as being in proper working order and shall unless otherwise approved, record noise levels with a print-out showing the noise level in dB(A). The results of the noise monitoring will be made available for inspection at the offices of the Local Authority within 1 week of the measuring of the noise level.

Where the Contractor's execution activities results in the permitted noise levels being exceeded, the Contractor shall stop work in the area and shall not recommence such execution activities until the activities have been modified to reduce the noise impact and until the Contractor has received written consent of the Employer's Representative to recommence the execution activities.

10.4.2 Vibration

The Contractor shall select and utilise methods of working and items of plant so that the maximum measured ground vibrations do not exceed a peak particle velocity of 5mm per second at any occupied property, 10mm per second at any other residential property or 12.5 5mm per second at any boundary wall (block or stone).

Furthermore, the Contractor shall select and utilise methods of working and items of plant so that the maximum measured ground vibrations do not exceed the following peak particle velocities:

- 4mm per second at any location within 100m of freshly poured concrete, i.e. concrete placed within the previous seven days;
- At the closest part of any building or structure, the maximum measured ground vibrations shall not exceed the peak particle velocities specified in the Contract.

Table 10-2: Vibration levels

Frequency (Hz)	Corresponding Peak Particle Velocity (mm/s)
Less than 10	8
10 – 50	12.5
50 – 100 and above	20

The Contractor shall install vibrographs for monitoring vibration as required to demonstrate that the requirements of the above are met. Each vibrograph shall be certified as being in proper working order and shall unless otherwise approved, record vibrations in three directions simultaneously with print-out showing the amplitude and frequency of the vibrations.

10.5 CONCLUSION

The implementation of the above mitigation measures will ensure that construction works at the proposed development will not result in an increase in noise or vibration levels in the local environment and any potential impacts will be low and short term in nature. It is not anticipated that there will be any noise or vibration related impacts during the operational phase of the development over and above the existing use of the roadway.

11.0 ARCHAEOLOGY

11.1 INTRODUCTION

The assessment describes the results of a desk-based study of the potential cultural heritage impacts of the scheme and makes preliminary recommendations as to how these impacts may be avoided or reduced.

The record of Monuments and Places (RMP) is a statutory inventory of archaeological sites protected under the National Monuments Acts 1930-2004 (Section 12, 1994 Act), compiled, and maintained by the Archaeological Survey of Ireland (ASI). The inventory concentrates on pre-1700 AD sites and is based on a previous inventory known as the Sites and Monuments Record (SMR) which does not have legal protection or status (see www.archaeology.ie)

11.2 SUMMARY OF ASSESSMENT

The subject site is not located within a Natural Heritage Area or Special Protection Area as shown in Figure 11-1 below.

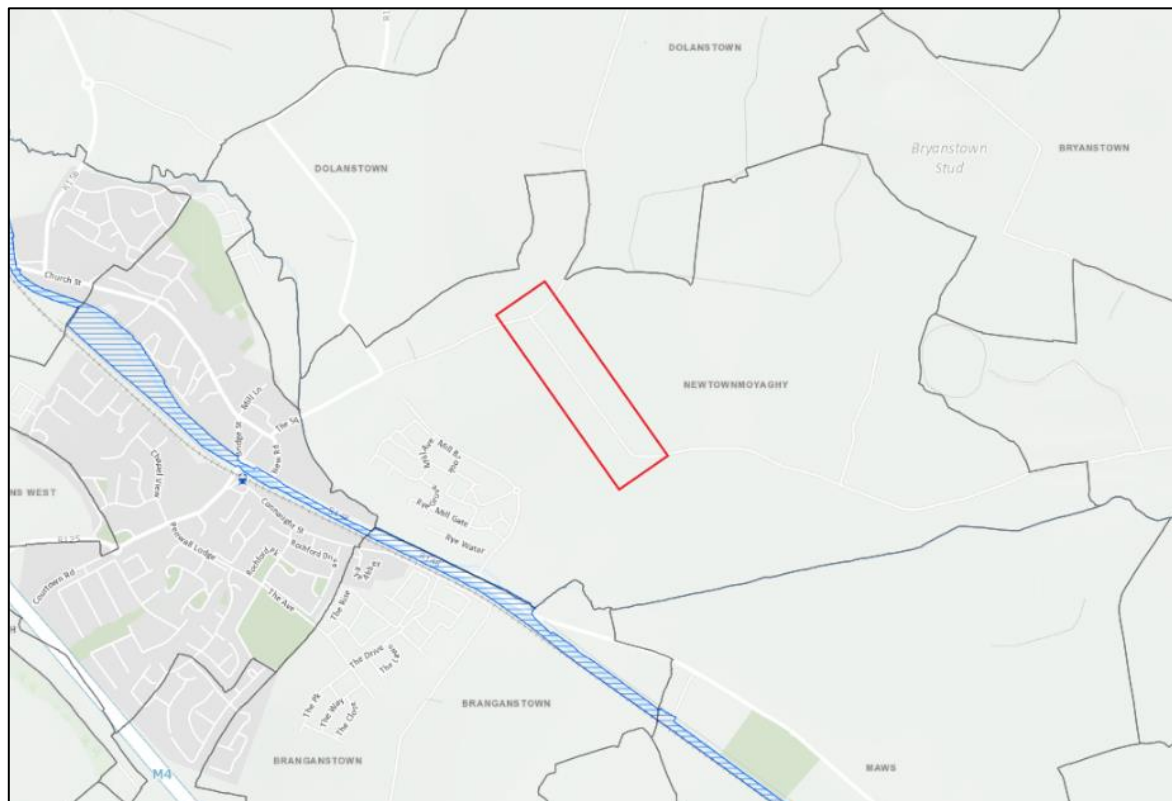


Figure 11-1: NHA and SPA designated sites

There are several RMP sites in the vicinity of the subject site. They comprise of Ring-ditches ME049-A003001, ME049-A003002, ME049-A004001, ME049-A004002, ME049-A004003; and an Enclosure ME049-038. These sites are presented in Table 11-1 below and Figure 11-2.

Table 11-1 Archaeological sites within vicinity of proposed development

SMR No.	Class	Townland	ITM
ME049-038	Enclosure	Newtownmoyaghy	689248, 739865
ME049A003001	Ringditch	Newtownmoyaghy	689563, 739510
ME049A003002	Ringditch	Newtownmoyaghy	689602, 739506
ME049A004001	Ringditch	Newtownmoyaghy	689961, 739490
ME049A004002	Ringditch	Newtownmoyaghy	689966, 739494
ME049A004003	Ringditch	Newtownmoyaghy	689908, 739418

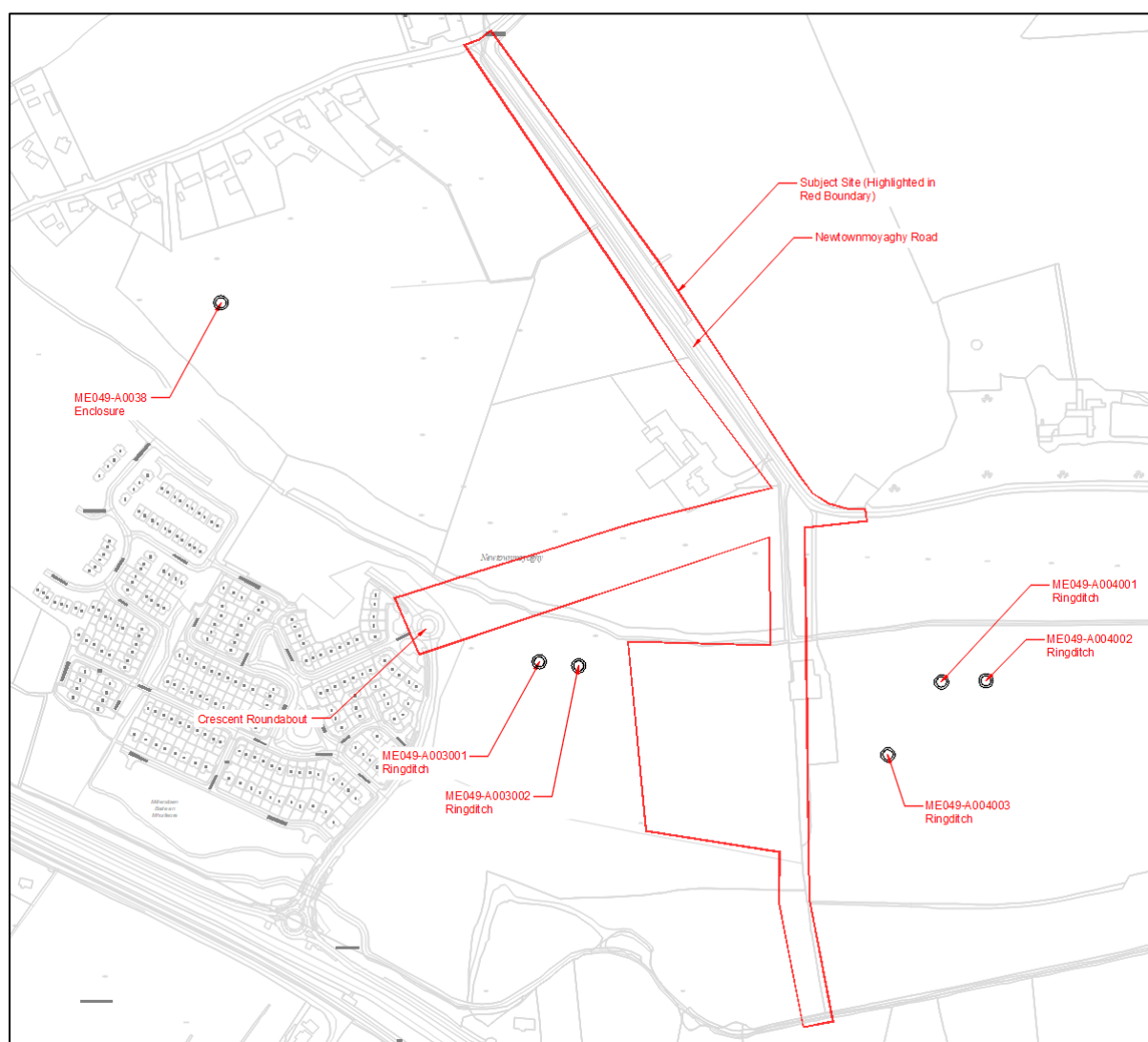


Figure 11-2 Archaeological Sites Within the Vicinity of the Development

No recorded/listed archaeological or built heritage sites are located in the study area; therefore No direct impacts are anticipated for any of the sites.

There is the potential that unidentified archaeological remains will be uncovered within greenfield areas during the diversion Stream works. Consequently, a programme of archaeological monitoring of test excavation shall be undertaken by a suitably qualified licensed archaeologist as part of the works Contract. The test trench layout should be agreed in advance with the assigned archaeologist.

Meath County Council have prepared a supplemental "Archaeology Heritage Desk Based Review and Assessment" dated July 2024. The main conclusion notes that as the project comprises more than the 0.50 ha of land that triggers an archaeological response in the Meath CDP. Therefore, a programme of archaeological trial trenching under Licence to 12% of the land take would be required before construction: to ensure there are no archaeological remains on the project. Should remains be found, then they should be rescue excavated under Licence. If no remains are found, then the project should proceed without further archaeological mitigation.

Pre-construction and post-construction Condition Surveys shall also be carried out of the existing bridge although it is not anticipated that the works will interact directly with this structure.

The above recommendations are subject to the agreement of the National Monuments Service, the National Museum of Ireland, and the assigned Project Archaeologist.

12.0 LANDSCAPE AND VISUAL IMPACT ASSESSMENT

12.1 INTRODUCTION

The scope of the works will not greatly alter the existing as the road and boundaries remain insitu except for the removal of five No. trees. At least five trees will be replanted within the proposed development site, to compensate for the removal of five trees as a result of the works.

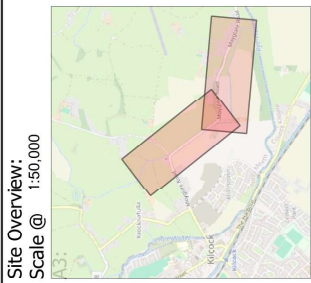
The new channel will be finished flush with the existing ground level and a fence line with localised planting with native hedging will be the only visual above ground feature on the property side of the channel.

The existing roadside stream channel will be backfilled with suitable material including recovered material subject to grading requirements deemed suitable for reuse from the new channel excavation. This will provide the additional width required for a Type 3 Single (6.0m) Carriageway and widened grass verge, which can be developed into a shared cycle and pedestrian facilities at a future date

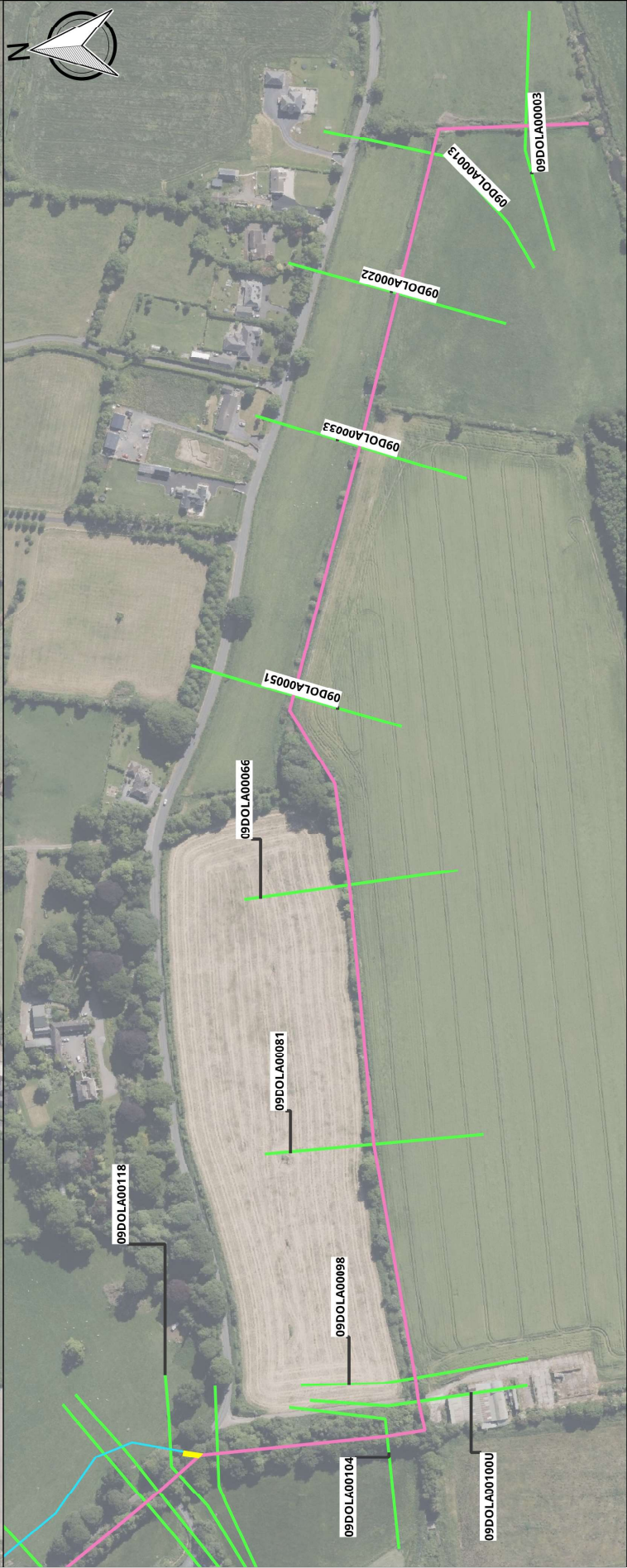
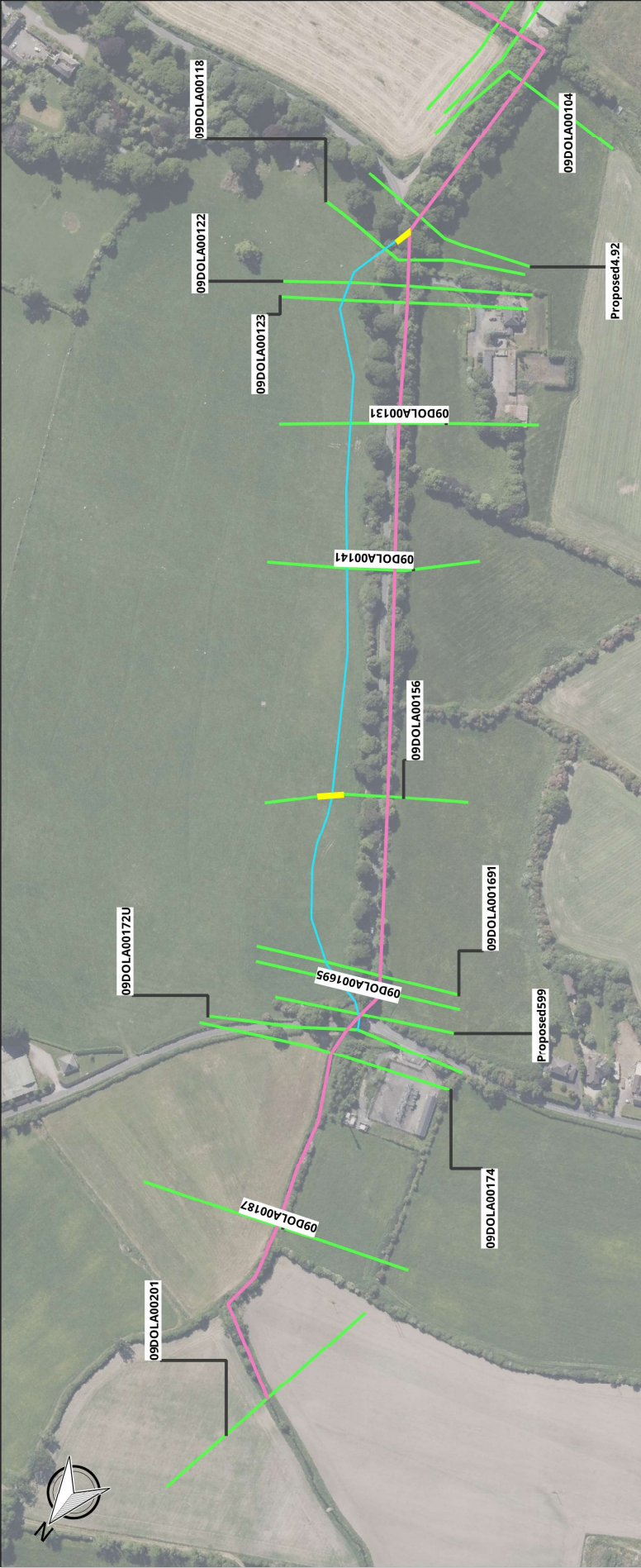
12.2 SUMMARY OF ASSESSMENT

In terms of landscape impacts, the proposed development will involve an alteration to the landform within the application site, but it is considered that the proposed development will have only a limited physical impact on the landscape and therefore the impact within and immediately around the site during the construction period, it is considered to result in a localised significance of no greater than Moderate-slight for a Temporary / Short Term duration. In the long term, once the upgrade works have been completed, the Permanent landscape impact significance will be Slight-imperceptible.

Appendix A MODELLED CROSS SECTION LOCATION



- Legend
- Diverted Channel
 - Existing Channel
 - Cross Sections
 - Crossings



Client	Meath County Council		
Project	Newtownmoyagh Road, Kilcock, Co. Meath		
Title	Modelled Cross Sections		
Scale @ A3: As Shown on Map			
Prepared by:	Checked:	Date:	
FOC	ST	Sept 2025	
Project Director	PC		
Drawing Status	Issue		
TOBIN, Fairgreen House, Fairgreen Road, Galway, Ireland, G65211 t: 091 900 0000 e: info@tobin.ie www.tobin.ie			
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Drawing No.	11434-M01	Issue	
		A	

Appendix B MODEL RESULTS

Existing Scenario

	10	50	100	1000
09DOLA00201	68.25	68.317	68.339	68.438
09DOLA00187	67.875	67.89	67.905	67.956
09DOLA00174	67.013	67.086	67.119	67.248
09DOLA00172U	66.895	66.963	66.994	67.149
CULIN	66.895	66.963	66.994	67.149
CULOUT	66.884	66.94	66.976	67.112
172SPU	66.895	66.963	66.994	67.149
172SPD	66.884	66.94	66.976	67.112
09DOLA00172D	66.884	66.94	66.976	67.112
09DOLA00170U	66.857	66.912	66.949	67.076
170BRU	66.857	66.912	66.949	67.076
170BRD	66.819	66.865	66.899	67.024
170SPU	66.857	66.912	66.949	67.076
170SPD	66.819	66.865	66.899	67.024
09DOLA00170D	66.819	66.865	66.899	67.024
09DOLA001695	66.777	66.812	66.844	66.969
09DOLA00156	66.197	66.294	66.334	66.461
09DOLA00141	65.141	65.286	65.346	65.519
09DOLA00131	64.519	64.634	64.686	64.871
09DOLA00123	64.175	64.314	64.365	64.536
09DOLA00122U	64.143	64.291	64.345	64.52
122BRU	64.143	64.291	64.345	64.52
122BRD	64.002	64.091	64.135	64.3
122SPU	64.143	64.291	64.345	64.52
122SPD	64.002	64.091	64.135	64.3
09DOLA00122D	64.002	64.091	64.135	64.3
09DOLA00118	63.921	64.02	64.079	64.251
09DOLA00104	63.701	63.867	63.957	64.166
09DOLA00100U	63.582	63.806	63.895	64.092
100BRU	63.582	63.806	63.895	64.092
100BRD	63.169	63.526	63.616	63.762
100SPU	63.582	63.806	63.895	64.092
100SPD	63.169	63.526	63.616	63.762
09DOLA00100D	63.169	63.526	63.616	63.762
09DOLA00098	63.182	63.341	63.43	63.626
09DOLA00081	62.809	62.996	63.085	63.279
09DOLA00066	62.389	62.591	62.685	62.887
09DOLA00051	62.068	62.26	62.349	62.546
09DOLA00033	61.523	61.681	61.761	61.939
09DOLA00022	61.252	61.378	61.446	61.604
09DOLA00013	61.068	61.18	61.23	61.345
09DOLA00003	60.769	60.891	60.937	61.036
104LAT	-9999.99	-9999.99	-9999.99	-9999.99
104LI	63.701	63.867	63.957	64.166

Proposed Scenario

	10	50	100	1000
09DOLA00201	68.276	68.345	68.368	68.467
09DOLA00187	67.58	67.684	67.724	67.863
185INT	67.386	67.487	67.529	67.664
180INT	67.229	67.331	67.36	67.48
175INT	67.125	67.256	67.294	67.386
09DOLA00174	66.885	67.029	67.077	67.227
09DOLA00172U	66.675	66.823	66.882	67.1
CULIN	66.675	66.823	66.882	67.1
CULOUT	66.656	66.808	66.862	67.057
172SPU	66.675	66.823	66.882	67.1
172SPD	66.656	66.808	66.862	67.057
09DOLA00172D	66.656	66.808	66.862	67.057
Proposed599	66.534	66.735	66.795	66.965
Proposed599A	66.497	66.713	66.772	66.938
Proposed599B	66.535	66.744	66.8	66.968
Proposed599C	66.528	66.739	66.794	66.957
Proposed599D	66.483	66.673	66.733	66.88
09DOLA001695	66.481	66.64	66.706	66.87
09DOLA00156	66.004	66.128	66.19	66.327
09DOLA00141	65.029	65.175	65.275	65.449
09DOLA00131	64.371	64.48	64.563	64.815
09DOLA00122	64.14	64.214	64.251	64.406
NewAli522.49	64.069	64.14	64.182	64.351
NewAli549.94	63.917	64.041	64.104	64.29
09DOLA00118	63.919	64.049	64.111	64.303
118BRU	63.919	64.049	64.111	64.303
118BRD	63.905	64.015	64.076	64.256
118SPU	63.919	64.049	64.111	64.303
118SPD	63.905	64.015	64.076	64.256
09DOLA00118D	63.905	64.015	64.076	64.256
Proposed4.92	63.837	63.962	64.032	64.22
09DOLA00104	63.701	63.867	63.957	64.166
09DOLA00100U	63.582	63.806	63.895	64.092
100BRU	63.582	63.806	63.895	64.092
100BRD	63.169	63.526	63.616	63.762
100SPU	63.582	63.806	63.895	64.092
100SPD	63.169	63.526	63.616	63.762
09DOLA00100D	63.169	63.526	63.616	63.762
09DOLA00098	63.182	63.341	63.43	63.626
09DOLA00081	62.809	62.996	63.085	63.279
09DOLA00066	62.389	62.591	62.685	62.887
09DOLA00051	62.068	62.26	62.349	62.546
09DOLA00033	61.523	61.681	61.76	61.939
09DOLA00022	61.252	61.378	61.446	61.604
09DOLA00013	61.068	61.18	61.23	61.345
09DOLA00003	60.769	60.891	60.937	61.036
104LAT	-9999.99	-9999.99	-9999.99	-9999.99
104LI	63.701	63.867	63.957	64.166

Existing

	10	50	100	1000
09DOLA00201	68.25	68.32	68.34	68.44
09DOLA00187	67.88	67.89	67.91	67.96
09DOLA00174	67.01	67.09	67.12	67.25
09DOLA00172U	66.90	66.96	66.99	67.15
09DOLA001695	66.78	66.81	66.84	66.97
09DOLA00156	66.20	66.29	66.33	66.46
09DOLA00141	65.14	65.29	65.35	65.52
09DOLA00131	64.52	64.63	64.69	64.87
09DOLA00122	64.14	64.29	64.35	64.52
09DOLA00118	63.92	64.02	64.08	64.25

Proposed

	10	50	100	1000
	68.28	68.35	68.37	68.47
	67.58	67.68	67.72	67.86
	66.89	67.03	67.08	67.23
	66.68	66.82	66.88	67.10
	66.48	66.64	66.71	66.87
	66.00	66.13	66.19	66.33
	65.03	65.18	65.28	65.45
	64.37	64.48	64.56	64.82
	64.14	64.21	64.25	64.41
	63.91	64.02	64.08	64.26

Difference

	10	50	100	1000
	0.03	0.03	0.03	0.03
	-0.30	-0.21	-0.18	-0.09
	-0.13	-0.06	-0.04	-0.02
	-0.22	-0.14	-0.11	-0.05
	-0.30	-0.17	-0.14	-0.10
	-0.19	-0.17	-0.14	-0.13
	-0.11	-0.11	-0.07	-0.07
	-0.15	-0.15	-0.12	-0.06
	0.00	-0.08	-0.09	-0.11
	-0.02	0.00	0.00	0.00

